Hours:

2 hours – sent email folder search

1 hour – OneNote files

1 hour – other digital file searches

1 hour – physical file search & scan

1 hour – inbox & deleted email file search

2 hours – inbox/deleted email folders

8 hours total

CARUS CORPORATION
Coupon Corrosion Analysis Report

Customer: City of Benton Harbor
Benton Harbor, MI via
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

Attention: Todd Luks

Date: October 11, 2019
Date Received: 10/04/19
TECH No.: 19-186
No. of Samples: 12
Analysis Date: 10/04/19
Coupon Tests: 03/25/19-09/30/19

CORROSION TEST REPORT

Inhibitor Fed:	CARUS™ 8600
Inhibitor Feed Rate:	1.5 ppm as C-8600
Test Unit Type:	2904-03 Pipe Rack
Test Coupon Composition:	Mild Steel, Copper, Lead
Date Coupons Placed in System:	03/25/19
Date Coupons Removed From System:	09/30/19
Total Coupon Exposure Time:	4536 Hours/189 Days

Coupon Type/No.	Test Location	Weight Loss (g)	Corrosion Rate (mpy)	Corrosion Appearance
MS 131300	Water Plant	0.3864	1.69	slight pitting on sides, slight local attack & slight pitting
MS 131301	Water Plant	0.1926	0.84	slight pitting on sides, slight local attack & slight pitting
Cu 3083	Water Plant	0.0184	0.07	general
Cu 3084	Water Plant	0.0168	0.06	general
Pb 3674	Water Plant	0.0128	0.04	general
Pb 3675	Water Plant	0.0171	0.05	general
MS 131146	City Hall	1.3797	6.05	pitting on sides, local attack & pitting
MS 131147	City Hall	1.4708	6.45	pitting on sides, local attack & severe pitting
Cu 3077	City Hall	0.0279	0.11	general
Cu 3078	City Hall	0.0440	0.17	general
Pb 3508	City Hall	0.0034	0.01	general
Pb 3509	City Hall	0.0122	0.04	general

The Following Corrosion Rate Scale can be used to evaluate corrosion rates in potable water systems. The scale is based on ASTM Standards D-2688-05 and G1-03.

Corrosion Rate Scale

Mild Steel		Copper
0-2 mpy	Minimal Corrosion	0-0.2 mpy
2-5 mpy	Mild Corrosion	0.2-0.5 mpy
5-10 mpy	Moderate Corrosion	0.5-1.0 mpy
>10 mpy	Severe Corrosion	>1.0 mpy

Analyst: Tina Garcia, Senior TS Laboratory Specialist
TEL: (815) 224-6880

Distribution: T. Postula

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit for installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system. The treatment chemical permitted, based on a recommendation by Elhorn Engineering, was Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was 1.5 milligrams per liter (mg/L) as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City concludes the treatment is not achieving desired results quickly enough. The most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment.

The City met with representatives from EGLE on January 15, 2020, to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting and outline next steps for the City to pursue designation of optimized corrosion control treatment as required by Rule 604f of the administrative rules promulgated under Act 399.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60 certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This

designation is being made under R325.10604f(3)(d). The reason for this change is to speed up treatment effectiveness. EGLE's intent is to quickly put into place treatment that will more efficiently lower corrosion rates in the distribution system for greater protection of public health. This decision is based on corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system but, without further study, it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third-party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c) of the administrative rules promulgated under Act 399. This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immediately verify in writing to the department the valve has been closed according to the permit.

TRANSITION AND TIMELINE

Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

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We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 15, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The Benton Harbor community water supply's 90th percentile value exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from January 1, 2020, through June 30, 2020, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	23	9	0 - 440 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.0	0	0 – 0.2 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. A template has already been provided to you. Please contact EGLE if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit Michigan.gov/LCR.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system.

The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Reduce Corrosion Rates
Minimize lead in the drinking water by reducing corrosion of water pipes and household plumbing that contain lead. This is Benton Harbor's fourth AL exceedance. Benton Harbor has made corrective actions to the corrosion control treatment system per EGLE's direction in a letter dated February 13, 2020. EGLE anticipates this change having a positive impact on the distribution system's corrosion rates and will assess the effectiveness of the current corrosion control treatment based on sequential sampling at homes in the distribution system, corrosion control study results, and future rounds of compliance sampling.

Lead and Copper Monitoring
To show the ALs can be met, continue collecting lead and copper samples from 60 sites between July 1 and December 31, 2020, and again between January 1 and June 30, 2021.

If you need to select new sites, choose the highest Tier sites available within the distribution system, giving Tier 1 sites first priority. Document any changes on your Lead and Copper Sampling Site Plan and submit it to your local district office email address. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of results, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2021. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?

If you can show that both lead and copper ALs are met in two consecutive six-month periods then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks	Collect WQP samples.	Collect one set of WQP samples every two weeks from the entry point to the distribution system for pH, temperature, alkalinity, calcium, conductivity, orthophosphate, chloride, and sulfate.
August 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in the enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required whenever PE required.
Between July 1 and December 31, 2020	Collect samples 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples.	Collect WQP samples from ten locations in the distribution system quarterly.
September 30, 2020	For the January through June 2020 monitoring, send EGLE certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2021	Collect samples 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2021.**
Between January 1 and June 30, 2021	Collect WQP samples.	Collect WQP samples from ten locations in the distribution system quarterly.

Complete By	Requirement	Comments
March 31, 2021	For the July through December 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
July 1, 2021	Report the 2020 AL exceedance in the CCR.	Specific lead health effects language must be included.
September 28, 2021	For the January through June 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from each entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Distribution Checklist, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8457		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
FACILITY OWNER IF NOT IDENTIFIED ABOVE Ellis Mitchell, City Manager			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
COUNTY Berrien			
CONTACT NAME Ellis Mitchell, City Manager	PHONE # 269-927-8457		

Executive Order 2019-06, signed by Governor Gretchen Whitmer on February 20, 2019, renamed the Michigan Department of Environmental Quality (MDEQ) as the Department of Environment, Great Lakes, and Energy (EGLE). Effective April 22, 2019, a reference to the MDEQ will be deemed a reference to EGLE. After April 22, 2019, a reference to the Director of the MDEQ will be deemed to be a reference to the Director of EGLE. The Drinking Water and Municipal Assistance Division (DWMAD) was renamed the Drinking Water and Environmental Health Division (DWEHD). A reference to the DWMAD will be deemed a reference to the DWEHD and a reference to the Director of the DWMAD will be deemed to be a reference to the Director of the DWEHD.

Administrative Consent Order (ACO) ACO-399-07-2019, entered on March 5, 2019, between the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), and the City of Benton Harbor (City), is hereby amended, as follows. Upon the consent of the parties and by the authority granted to EGLE by the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder, it is hereby agreed and ordered:

COMPLIANCE SCHEDULE

Paragraphs 2.1(a & b), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from ACO-399-07-2019. Reference Exhibit A, attached.

A number of the items below refer to a "Capacity Study." In this Amended Consent Order, under Paragraph 2.14, a Capacity Study refers to an assessment of a water system owner's technical, managerial, and financial capacity to consistently provide safe water to the public.

Paragraphs 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.7 **Not later than September 30, 2020**, the City shall formally adopt a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.8 **Not later than August 15, 2020,** the City shall submit the current cross connection program to the DWEHD for review. The DWEHD's review and comments on the current program will assist the City in completing the Capacity Study in paragraph 2.14. **No later than three (3) months following the completion of the Capacity Study**, an updated cross connection program must be submitted to the DWEHD for review to address any implementation changes as a result of the study.

2.10 (a) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to the DWEHD for inventorying and ongoing maintenance of distribution fire hydrants. The plan must address fixing known broken hydrants, as well as preventative maintenance, such as hydrant inspections and flushing.

(b) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to the DWEHD for inventorying and ongoing maintenance of distribution valves. The plan must address fixing known broken valves, as well as preventative maintenance, such as valve turning.

2.11 **Not later than August 1, 2021**, the City shall conduct professional inspections of the City of Benton Harbor water system's elevated tank, or complete the repairs and upgrades recommended during the 2008 Dixon inspection, as included in the City's asset management program dated December 2017.

2.12 **Not later than November 1, 2020**, the City shall submit to the DWEHD a plan for maintaining the raw water intake system, including mussel control, based on inspection findings of the intake and mussel control system during June of 2020.

2.13 **Not later than December 31, 2020**, the City shall repair filter to waste valves at the water plant, and train operators on their use.

The following paragraphs shall be added to Section II – Compliance Schedule:

2.14 **Not later than September 30, 2020**, The City shall submit to the DWEHD, for review and approval, a project scope for completion of a technical, managerial, and financial capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City of Benton Harbor's

water system, in compliance with Act 399. The City shall contract with a qualified consultant to complete the Capacity Study. The Capacity Study scope shall identify the organizational structure, and the required funding, to operate and manage the system, in compliance with Act 399. The Capacity Study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments. Last, the Capacity Study shall identify any technical needs, such as development and storage of water system records to facilitate compliance with Act 399.

Not later than six (6) months following approval of the project scope, the City shall submit a completed Capacity Study for DWEHD approval.

To address any gaps identified by the Capacity Study, the Capacity Study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and management of the City's water system. **Not later than August 1, 2021 and every six (6) months after the DWEHD approves the Capacity Study, the City shall submit a signed statement describing the City's progress** towards completing the implementation plan to achieve adequate capacity.

Capacity Study Phase	Description	Due Date
1: Project Scope and Outcomes	Submit to the DWEHD for input on the study scope and outcomes	September 30, 2020
2: Study Completion	Complete the Capacity Study based on project scope	Six months after approval of scope
3: Implementation	Progress reports to the DWEHD describing city's progress	August 1, 2021 and every six months thereafter

2.15 (a) **Not later than six (6) months following the completion of the Capacity Study** in Paragraph 2.14, as part of the implementation phase, the City shall submit to the DWEHD, a Staffing Plan to address findings from the Capacity Study. The Staffing Plan must indicate the number of staff, managerial oversight, as well as an outline of each position's duties needed to meet the operational and maintenance needs of the water system.

(b) **Not later than twelve (12) months following the DWEHD approval of the Staffing Plan,** the City shall submit to the DWEHD a certification that the staffing plan has been implemented and adequate staffing and managerial oversight is in place.

2.16 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory or a laboratory certified by the DWEHD, or by the United States Environmental Protection Agency, for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to the DWEHD in a timely manner. MCL §325.1007 also

authorizes the DWEHD to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.17 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to the DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter the DWEHD issued to the City.

Not later than sixty (60) days following DWEHD approval of the corrosion control optimization study scope and completion schedule, the City shall secure a signed contract for the corrosion control optimization study.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this Amended Consent Order, except as specifically prescribed in this document. The effective date of this Amended Consent Order shall be the date upon which the Division Director of EGLE, DWEHD signs this document.

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Eric J. Oswald, Director
Drinking Water and Environmental Health Division

7-August-2020
Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

8/5/2020
Date

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

DWEHD Order No. AACO-399-07-2019

EXHIBIT A

In the matter of the First Amended Administrative Consent Order between the City of Benton Harbor and the State of Michigan Department of Environment, Great Lakes, and Energy, below are listed compliance activities that have been completed and are shown for record of completion.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the Asset Management Plan, dated December 2017, however, the second portion of 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

COMPLETION DATE: December 31, 2017

(b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system, in compliance with Act 399.

COMPLETION DATE: May 18, 2020

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data, including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.3 Install metering capabilities on the finished water (completed as part of corrosion control treatment project).

COMPLETION DATE: August 12, 2019

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.5 Obtain an adequately licensed operator-in-charge, solely dedicated to the water distribution system, no later than April 1, 2019.

COMPLETION DATE: May 7, 2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 30, 2019.

COMPLETION DATE: Treatment installed as of March 25, 2019. Corrosion control study insufficient as of June 2020, see First Amended ACO item 2.17.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

COMPLETION DATE: August 9, 2019

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 24, 2019

VIA E-MAIL AND U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from January 1, 2019, through June 30, 2019, Benton Harbor community water supply's ninetieth percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	27 ppb	12	0 ppb – 59 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements, along with a sample copy of your consumer notice, 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format, visit Michigan.gov/LCR. Select the appropriate report form based on whether you are or are not collecting samples from sites with lead services lines.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and information about the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material, along with a PE distribution certification form, must be submitted to EGLE no later than ten days after the PE is due.

Conduct WQP Monitoring
As part of installing corrosion control treatment, you have been requested to collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your second AL exceedance. You recently installed corrosion control treatment using a phosphate product to reduce corrosion. As part of this installation, a coupon study was to be performed. Results from this study should be used to help identify the dosage necessary to sufficiently reduce corrosion rates in the distribution system. EGLE looks forward to receiving the study results and the recommendations based off those results.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between July 1 and December 31, 2019, and again between January 1 and June 30, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1, or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first liter and fifth liter sample from each sampling location.

Within 30 days of learning of results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks (Starting July 1st)	Collect WQP samples. (Entry Point)	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
August 29, 2019	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2019	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
September 28, 2019	For the January through June 2019 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2020	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
March 31, 2020	For the July through December 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
September 29, 2020	For the January through June 2020 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc: Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Ernie Sarkipato, Surface Water Specialist, EGLE
Mr. Jeremy Klein, District Analyst, EGLE
cc/enc: Mr. Mike O'Malley, City of Benton Harbor

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

January 16, 2020

VIA E-MAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from July 1, 2019, through December 31, 2019, Benton Harbor community water supply's 90th percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	32 ppb	10	0 ppb – 72 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. As previously mentioned, it is your intent to develop and distribute the PE materials within three business days to fulfill both the PA and PE requirements simultaneously.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement timely. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your third AL exceedance. A letter regarding changes to your current corrosion control treatment will be sent under separate cover from Mr. Ernie Sarkipato, Surface Water Engineer, Engineering Unit, Environmental Health Section, Drinking Water and Environmental Health

Division (DWEHD); and Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, DWEHD.

Lead and Copper Monitoring
You have already increased your lead and copper monitoring. Please continue to collect samples from 60 sites between January 1 and June 30, 2020, and again between July 1 and December 31, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of the results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Every two weeks	Collect WQP samples. (Entry Point)	Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap). Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
February 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 10, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between January 1 and June 30, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 29, 2020	For the January through June 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2021	For the July through December 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

Joelle Regovich

From: Tracy Jennings <tjennings@cityofbentonharbormi.gov>
Sent: Friday, May 29, 2020 2:04 PM
To: Joelle Regovich
Subject: Fwd: GRANT13119222 Grants.gov Agency Tracking Number Assignment for Application

Here you go

---------- Forwarded message ---------
From: <DoNotReply@grants.gov>
Date: Fri, May 29, 2020 at 1:44 PM
Subject: GRANT13119222 Grants.gov Agency Tracking Number Assignment for Application
To: <mclark@cityofbentonharbormi.gov>
Cc: <tjennings@cityofbentonharbormi.gov>

Grantor agency has assigned the following Agency Tracking Number to your application: fdaaeca1-96fa-4d72-b4c8-8214a6c6d400GRANT13119222.

You will need the Agency Tracking Number when corresponding with the Grantor agency about your application.

Use the Grants.gov Tracking Number at Grants.gov to check your application's status and to review your Agency Tracking Number.
Type: GRANT
Grants.gov Tracking Number: GRANT13119222
UEI: 0589621920000
AOR name: michael r clark
Application Name: City of Benton Harbor Lead Service Lines Replacement Project
Opportunity Number: EPA-OW-OGWDW-19-01
Opportunity Name: Reduction in Lead Exposure Via Drinking Water
https://apply07.grants.gov/apply/login.faces?cleanSession=1

Thank you.
Grants.gov
If you have questions please contact the Grants.gov Contact Center:
support@grants.gov
1-800-518-4726
24 hours a day, 7 days a week. Closed on federal holidays.

PLEASE NOTE: This email is for notification purposes only. Please do not reply to this email for any purpose.

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PLEASE NOTE the NEW telephone number

Tracy-Ann Jennings | tjennings@cityofbentonharbormi.gov
Director, Community and Economic Development
City of Benton Harbor | 200 E. Wall St. | Benton Harbor, MI 49022
P:(269) 204-2776 (Direct) or (269) 927-8400 ext. 8472 | F: (269) 927-0480
www.bhcity.us

U.S. Environmental Protection Agency (EPA)
Office of Water, Office of Ground Water and Drinking Water
Funding Opportunity: Reduction in Lead Exposure Via Drinking Water
Funding Opportunity Number: EPA-OW-OGWDW-19-01
Catalog of Federal Domestic Assistance (CFDA) Number: 66.443

Project Title: City of Benton Harbor Lead Service Lines Replacement Project

National Priority Area: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements

Name of Applicant: City of Benton Harbor

Key Personnel and Contact Information:

Ellis Mitchell, City Manager, emitchell@cityofbentonharbormi.gov, 269-927-8457

Mike O'Malley, Benton Harbor Water Superintendent, momalley@cityofbentonharbor.gov 269-927-8471, option 2

Tracy-Ann Jennings, Director Community and Economic Development, tjennings@cityofbentonharbormi.gov, 269-927-8421

Project Cost:

Federal Fund Grant Request: $14,842,995.30

Non-Federal Match: $1,649,221.70

Total Project Cost: $16,492,217.00

B. Executive Summary

The project will address EPA National Priority Area One: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements.

Benton Harbor's water distribution system is about 100 years old with much of the original infrastructure still in use, including water mains and service lines. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents. The City of Benton Harbor triggered an action level exceedance (ALE) for lead when the regularly scheduled testing in 2018 discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the action level of 15 parts per billion (ppb) for lead in water. Follow-up sample rounds in 2019 confirmed the presence of lead, and the ALE continues to present. To reduce lead exposure to residents, the city will replace all residential lead service lines within the City of Benton Harbor, estimated to be 2,383 lines. Service lines will be replaced with ¾" to 1" copper piping from the main to the home's service connection (both public and private portions).

Replacing known lead hazards in Benton Harbor drinking water will significantly improve the health and safety of over 9,800 residents in a listed disadvantaged community. It will modernize and update aging water infrastructure, providing safe and reliable water delivery for all ages and future generations.

The city has also installed corrosion control treatment following the 2018 ALE, however an optimization study has not yet been completed. A study to optimize the corrosion treatment will help ensure long term stability and reduction of lead throughout the water system. This project includes funding for an optimization study.

As part of public outreach regarding the project, an increased number of residents will have information about lead in drinking water, its harmful effects and steps to take to mitigate risk. A group of state and local stakeholders was recently formed to develop strategies for public outreach on issues regarding drinking water in the city.

The project will create a trackable, accurate GIS database of city infrastructure materials not previously recorded, which will update and upgrade the existing materials inventory.

Project outcomes include an overall reduction in lead exposure and associated health risks in the community through reduction of sources of lead in drinking water systems via infrastructure improvements.

C. Work Plan

1. National Priority Area

a. Approach. The project will address National Priority Area One: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements.

A recent Pilot grant assessment of service line material in the city indicated 87% of residential lines had lead either at the city-owned or privately-owned side. To reduce lead exposure to residents, the proposed project will replace all residential lead service lines within the City of Benton Harbor, estimated to be 2,383 lines. Service lines will be replaced with ¾" to 1" copper piping from the main to the home's service connection (both public and private sides).

The project will also complete an Optimization Study for the existing corrosion control treatment (CCT) to minimize dissolution of lead and copper into drinking water without compromising other health-related water quality goals.

The City of Benton Harbor Water Department provides service to over 9,800 city residents, who are predominately low income. 2018 ACS data for the community indicates a demographic profile of 10.4% White, 85.6% Black, 4.9% Hispanic or Latino, and 0.2% Asian. Neighboring communities of Benton Harbor Township and City of St. Joseph have their own, separate water supplies.

At the beginning of the 20th century, the City of Benton Harbor was a thriving commercial center and popular recreation destination. Over 54 industries provided manufacturing jobs in the region. By the 1950 census, the city population had reached 18,796 residents, nearly double the city's current number. Between 1970 and 1985, thousands of jobs were lost due to closing or downsizing of local manufacturing plants. The city unemployment rate consistently exceeded twenty-five percent during that period and more than twenty percent of families were living below the established poverty level. Absentee landlords and low-income residents combined to result in deteriorating neighborhoods. Retail activity downtown evaporated. Businesses closed or left the city, drastically reducing its tax base. Beginning in 1982, the Michigan Department of Commerce ranked Benton Harbor as the state's most distressed community.

The city continued to struggle financially throughout the 1990s to early 2000s. In February 2010, Michigan Governor Granholm declared a financial emergency in Benton Harbor and in March, a state panel named an emergency financial manager to run the city. State officials reported that Benton Harbor's financial troubles included a deficit that had been growing by double digits, a pension plan underfunded by $10 million, and the city requesting an emergency infusion of cash from the state to make its payroll.

In order to reduce deficits, the city workforce was roughly halved, shrinking from roughly 120 employees in 2010 to 60 in 2014. This was achieved through a mixture of layoffs, service outsourcing and budget cuts. In 2014, the City's finances had improved to a point

where the emergency financial manager could recommend transition to a state-appointed receivership advisory board. The City's accumulated deficit had been eliminated, expenditures were reduced substantially, and the City made 100-percent of its annual pension payments for the first time in a decade.

In July 2016, the state of Michigan fully relinquished oversight of Benton Harbor, following a recommendation from a state-appointed receivership transition advisory board. This now allows the City to manage operations and finances without oversight.

This long financial struggle for the area continues to have impact. 2018 census.gov figures list Benton Harbor MHI at $20,232, with 46.9% of persons in poverty. Rental homes make up 68% of housing in the city, making its rental percentage the highest of all surrounding communities. The 2017 median home value in the city was $49,200. Many neighborhoods have vacant properties and/or blighted homes. With a limited tax base, and many areas to improve, the cost burden of replacing all lead service lines in the city per Michigan Lead and Copper rules is high. The health burden of replacing them only as limited funds allow, under known Action Level Exceedance (ALE) conditions, is even higher.

The state of Michigan has demonstrated that the City of Benton Harbor meets their disadvantaged affordability criteria as determined by its Drinking Water State Revolving Fund program as shown in its 2020 Intended Use Plan. The City has included a letter requesting a reduced cost share/match of 10% in this grant application.

Funding assistance is critical for Benton Harbor to create a reliable, lead free and safe drinking water supply without compromising the progress it has made toward stronger financial health. Water rates, already the highest in the area, do not have the capacity to raise the $16 million necessary to replace lead service lines (LSLs).

See supporting documentation in Project Narrative Attachments.

b. Known Lead Issue. Benton Harbor's water distribution system is about 100 years old with most of the original infrastructure still in use, including water mains and service lines. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents.

The City of Benton Harbor initiated the development of a GIS database during a 2014 Stormwater, Asset Management, and Wastewater (SAW) Grant process. As part of the SAW project work, 2,612 water meters were replaced. In 2017, the City completed a Water System Asset Management Plan which focused on the water distribution system. The water system was added to the GIS database, however, service line data was limited to recent projects where as-builts were available. Data such as installation date, diameter, material, and location description was largely unavailable.

In May 2018, the Michigan Department of Environmental Quality (DEQ, now Department of Environment, Great Lakes and Energy/EGLE) awarded the City of Benton Harbor a $284,000 Lead Abatement Pilot Program Grant to fund a Lead Water Service Verification

and Replacement Project. The results of the work were used to update the city Distribution System Material Inventory and Asset Management Program. Funding also allowed for the replacement of 17 lead water service lines which were identified during the project. Data collected included location, inspection date, inspection status, pipe material public, pipe size public, pipe material private, pipe size private, depth of pipe and notes.

During the investigation period of the Pilot grant, verifications and replacements were conducted simultaneously due to the known lead contamination issues from water sampling. These homes were scheduled for replacement while other homes had issues discovered during "pot holing" where a 3'x3' hole was dug around the curb stop so that pipe material could be identified on both the privately-owned side and the City-owned side. Several homes were found to have leaking or broken lead service lines. These home were then scheduled for replacement. Locating the service line was difficult at some addresses due to the age and condition of the existing site. Many of the services were nearing 100 years in age and were missing or had buried shut offs.

Almost half of the addresses in the GIS were able to be updated with historical material information. From this dataset, a review of the buildings footprint layer identified non-vacant lots from which residential homes were randomly selected for service pipe material verification. A total of 94 homes were verified by "pot holing." The majority of homes have lead on the City side and galvanized on the private side. The results of the field verification were recorded using GPS equipment and integrated into the GIS.

Results from the Pilot Grant have helped the City to identify the scope of lead service replacement lines that needs to occur to mitigate risk. Approximately 87%, or 2,383, of all homes in the City are likely to have lead services lines that need to be replaced.

ALE. The city triggered an action level exceedance (ALE) for lead when the regularly scheduled testing in 2018 discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the action level of 15 parts per billion (ppb) for lead in water. The higher levels of lead were confirmed in two subsequent sample rounds in 2019.

The September 2018 testing report for lead indicated the 90th percentile result at 22 ppb, with a range of 0-60 ppb. Nine sites were above the Action Level Limit of 15 ppb. The DEQ notified the City of an ALE in October 2018. Follow up (non-regulatory) sampling of an additional 336 samples indicated 54 location ranging from 16-62 ppb, 192 households from 1 -14 ppb and 89 households with no value for lead.

Between January 1, 2019 and June 30, 2019, City testing reported a 90th percentile value of lead at 27 ppb, again exceeding the 15 ppb Action Level limit. The range of results was between 0-59 ppb, with twelve sites above 15 ppb. July 1, 2019 to December 31, 2019 testing indicated a 90th percentile value of 32 parts per billion (ppb) for lead, continuing the ALE. The range of results was 0-72 ppb, with ten sites above 15 ppb.

A previous 2015 sample event indicated that while the 90th percentile was not over the action level in 2015, there were two samples that were above 15 ppb.

In response to the action level exceedance in 2018, the city worked to quickly install corrosion treatment and began feeding a phosphate-based corrosion inhibitor on March 25, 2019, with a modified chemical composition implemented in February 2020. Thus far, a reduction in lead levels has not been noted due to the treatment and a CCT optimization study has been requested by EGLE. This grant proposal includes funding for the optimization study.

See supporting documentation in Project Narrative Attachments – Section I. Supporting Documentation of Lead Issue.

c. Public Education. The City dedicates a page on its website to notices and resources on lead in the water supply https://bhcity.us/water/ with a link from its home page. It issued an advisory to drinking water customers in 2018. In August 2019 and February 2020, the City sent a mailer to residents regarding the ALE for lead in the drinking water. The mailers included information on steps to take to reduce exposure to lead in the drinking water, contact information for lead testing in children, and details on how to get free water filters and replacement filters from the Berrien County Health Department. In January 2020, the City issued a press release notifying drinking water customers of another ALE in the drinking water. Several publications picked up the press release. The City also publishes and delivers to customers an annual Consumers Confidence Report with water quality results. The reports are also available on the City website 24 hours a day.

Berrien County Health Department (BCHD) has been instrumental in being a resource for the City to help inform residents and mitigate health risks. It provides information about lead, its effects and precautionary actions to take on its website http://www.berriencounty.org/1568/Lead-Drinking-Water.

Courtney Davis at the BCHD developed and made publicly available an easy to understand timeline of the Action Level Exceedance. Public outreach groups that consist of various governmental partners and grassroots/non-governmental groups have also been assembled to inform and educate the public on the lead risk. While the city is required to conduct public advisory and public education each time an ALE occurs, these are not necessarily tailored to residents and may not reach most people. The goal of this coalition is to engage local residents at their level and on their terms, with consistent and accurate messaging. Some goals for the group are a plain language Q&A, develop a community engagement plan, collaborate on an environmental health web page in the local newspaper, and host a community forum to give residents a voice.

Remediation follow-up monitoring is planned to ensure corrosion control treatment and LSL replacements are working as anticipated. Water sampling will occur during the project period per EGLE requirements. Results will be used to verify that lead levels are reduced as anticipated.

Additionally, the City is working with EGLE on a Technical Managerial and Financial Capacity Study to ensure the city has adequate staffing and financial mechanisms to carry out operation and maintenance of the City's water system. In May 2020, City Commissioners

approved rate increases for water and sewer service to address a water and sewer budget shortfall. Starting July 1, water rates will increase approximately 10 percent annually for the next five years and annual sewer rates will increase by 7 percent for the next five years. This increase is anticipated to bring the sewer/water fund to a self-supporting level but does not provide additional funding for lead replacement.

See supporting documentation in Project Narrative Attachments – Section I. Supporting Documentation of Lead Issue.

d. **Maintaining Lead Level Reductions.** All residential lead service lines are being replaced with copper, with a new service valve and valve box. This should significantly reduce contamination sources within the system and improve reliability of water service. Testing will continue to occur per EGLE requirements to monitor lead levels in residences. Testing will entail collection of two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart from the entry point to the distribution system, Treatment Plant Tap and from ten locations in the distribution system. Samples will be tested twice a year, repeating every third year until both lead and copper Action Levels (ALs) are met during the entire three year period.

Additionally, to show the ALs can be met, lead and copper samples will need to be tested from 60 sites at least twice a year until both lead and copper ALs are met in two consecutive six month periods. Per EGLE, corrosion control treatment may be discontinued if the action levels are met during future rounds of monitoring. Results of the optimization study would also be discussed with various partners for consideration of implementing changes.

The City and Berrien County Health Department offer and will continue to offer lead blood testing for children and free water filters and replacement cartridges to residents. The City of Benton Harbor provides free water testing to residents as well. These services are planned to continue to maintain lead monitoring efforts.

Finally, targeted sampling of sentinel sites in the water system will be conducted as part of this project in coordination with state and county public health officials. The sampling protocol has been established during the 2018 ALE and consists of sequential bottles filled after a period of stagnation. These sentinel sites offer an opportunity to see trends in the system with a good degree of detail.

e. **ALE Status/Opportunity Zone.** The regularly scheduled testing for Benton Harbor in 2018 and 2019 discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the action level of 15 parts per billion (ppb) for lead in water.

The September 2018 testing report for lead indicated the 90th percentile result at 22 ppb, with a range of 0-60 ppb. Nine sites were above the Action Level Limit of 15 ppb. Follow up (non-regulatory) sampling of an additional 336 samples indicated 54 location ranging from 16-62 ppb, 192 households from 1 -14 ppb and 89 households with no value for lead.

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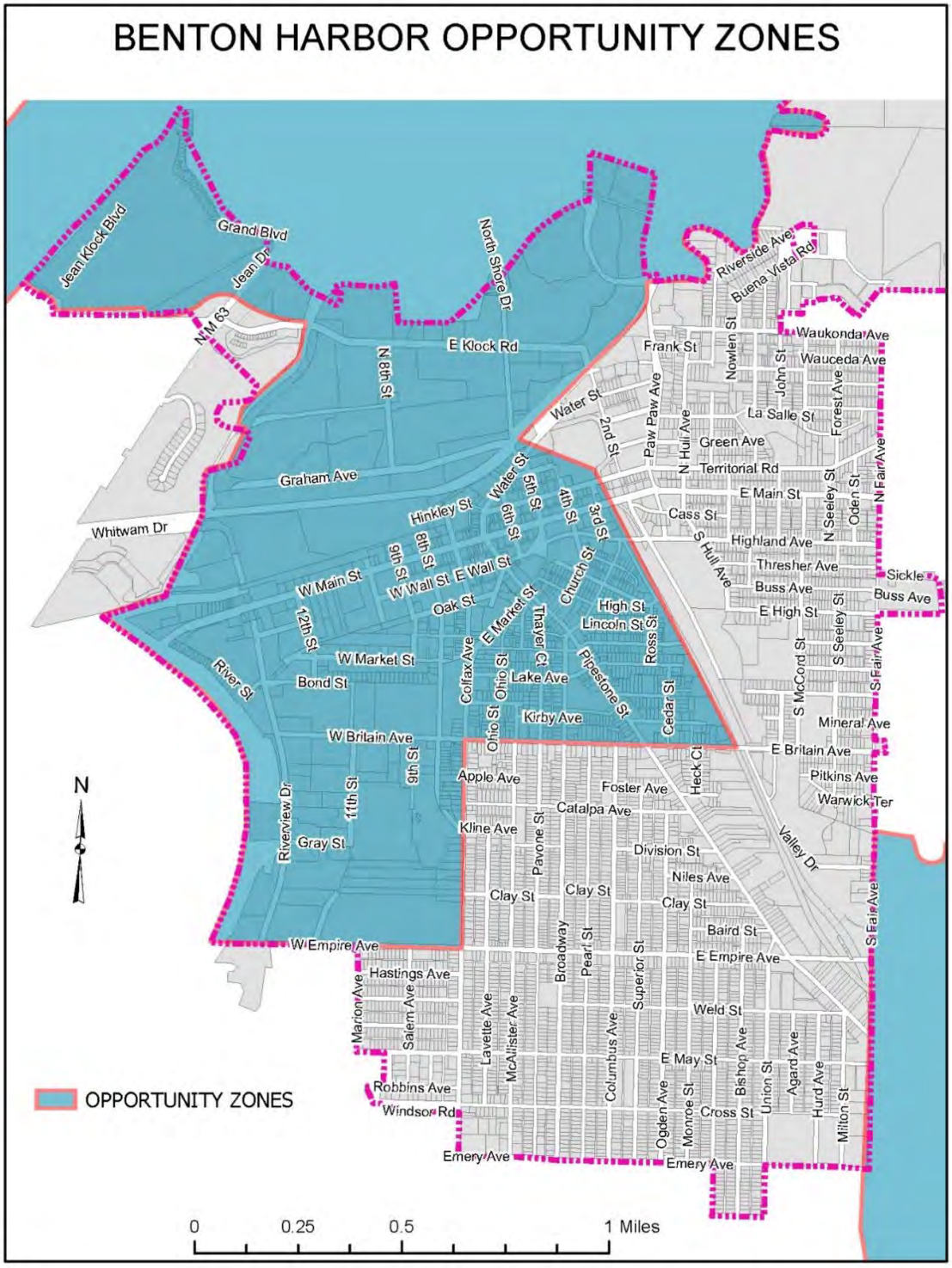
indicated a 90th percentile value of 32 parts per billion (ppb) for lead, continuing the ALE. The range of results was 0-72 ppb with ten sites above 15 ppb.

The water distribution system is also within an Opportunity Zone area. See map below.



f. Lead Service Line Replacement Project:

1. Demonstration that the applicant has considered corrosion control as an option for reducing the concentration of lead in its drinking water.

In response to the Action Level Exceedance in 2018, the City worked to quickly install corrosion treatment and began feeding a phosphate-based corrosion inhibitor on March 25 of 2019. Monitoring of the corrosion treatment by the city operators has consisted of phosphate readings at the water plant and in distribution system. After two rounds of lead and copper samples that did not show improvement, the City was asked to modify the chemical composition and increase the target residual by EGLE staff. The City changed chemicals and started increasing dosing levels in February of 2020. Monitoring of the phosphate levels continues on a daily and weekly basis. Furthermore, the City is now required to monitor for water quality parameters at the plant tap and in distribution.

The grant proposal includes funding for an optimization study of the corrosion treatment to best ensure public health protection moving forward. The study will occur during the first year of the project. The study will assess various types and levels of corrosion inhibitors to best match the treatment to the city's source water. Results of the study would be discussed with various partners for consideration of implementing changes.

See supporting documentation in Project Narrative Attachments – Section I. Supporting Documentation of Lead Issue.

2. Plan to ensure that both the publicly-owned and privately-owned portions of a lead service line will be replaced.

The full length of LSL's on public and private property will be replaced at the same time for each residence. A full LSL replacement means that the entire service line is replaced between the water main in the public right-of-way and the customer's meter, rather than being partially replaced only between the public water main and the private property boundary.

Partial replacements of lead service lines (only up to the private property boundary) are not feasible because partial replacement is prohibited under the Michigan Lead and Copper Rule.

When completed, the project will accomplish four major benefits: (1) improving protection of public health by helping ensure a reliable, safe drinking water supply to all customers; (2) reducing public health risks associated with water main breaks; (3) reducing wasteful and expensive water losses from leaking or broken pipes; and (4) eliminating lead and galvanized service lines.

3. Plan for notifying customers of the replacement of any publicly-owned portion of the lead service line.

Prior to project start, the City will advertise and host a public meeting to review the lead service lines replacement project, the phased approach, and timelines to expect for service replacement. Multiple agencies and authorities will be present at the meeting to

answer questions and provide educational materials. Information will also be available on the City website and Facebook page.

Residents will also be notified via door-hangers and letters when work is to begin along their street. Each resident will be provided a way to identify a date and time for the contractor to enter the property. Customers will be given the name and phone number of a contact person for any construction-related problems. Multiple contractors will be solicited and engaged to complete each project phase, with a goal of completing work in the same neighborhood in a systematic process, minimizing disturbance time throughout neighborhoods.

4. Plan for notifying each customer that a replacement of any publicly-owned portion of a lead service line that is funded by this grant program will not be carried out unless the customer agrees to the simultaneous replacement of the privately-owned portion of the lead service line.

Mailings and public information meetings will highlight the requirement for replacement of the privately owned portion of the line. Additionally, information will be clear that LSL replacements will be at no cost to the owner and will require contractors to enter the home to connect the new service line to the water meter located inside the building. Contractors doing the work will have to provide adequate insurance to protect the owner against any loss that may result from damage caused by negligent construction operations on the owner's property, and require the contractor to provide the City with proof of such coverage; and guarantee to the owner that any work done shall be free from defects in material and workmanship for a period of one year from its completion.

During the Pilot grant process, legal agreements were created to establish homeowner/tenant permissions and obligations for the lead service replacement work. These agreements will be utilized for this project. An agreement to decline service line replacement will also be available to residents.

See supporting documentation in Project Narrative Attachments – Section H – Readiness to Proceed.

5. Plan for ensuring customers are provided filters certified to remove lead, in accordance with applicable standards established by the American National Standards Institute, along with no less than three months of replacement cartridges, and notifying each customer of premise plumbing flushing instructions within 24 hours of the conclusion of each lead service line replacement.

Berrien County Health Department will continue to provide free water filters and replacements to anyone who requests them. This information has been provided to residents in all mailings, and placed on the City and Berrien County Health Department websites. Instructions for installing the filters and recommendations to flush water lines for 30 days after the service replacement is completed will also be given to residents as each home connection is completed.

2. Expeditious Project Readiness to Proceed

Previous lead service line replacements occurred during the MDEQ Pilot grant project in 2018, which has provided the City with a clear process to follow for future replacements. The City is poised to proceed immediately upon approval of grant funding. The City has additionally reached out to EGLE about the proposed project, and has received their enthusiastic support.

Upon award of grant funding, the city will initiate public outreach and educational meetings about the project. It will provide a proposed project schedule on its website, map of planned phases for neighborhoods, work to be done, and details on the importance of lead service line (LSL) replacement. It will issue press releases, set up a contact person for questions, and post details and updates on its website and Facebook pages. A public meeting will be scheduled to provide residents with an opportunity to ask questions and receive details about the project. The City will invite representatives of EGLE, the Berrien County Health Department and its Engineer of Record to assist with questions. Example homeowner/resident agreements granting permission to access private property will be available for review on the city website and at the public meeting. These agreements were previously utilized for the Pilot grant project.

The City expects to utilize a four year project period to replace all residential lead service lines. Additionally, the City will seek a qualified consultant to initiate the CCT Optimization Study in Year 1, to be completed within 12 months.

There is a high probability that many of the water service lines located within the project area are composed of lead or galvanized steel. Benton Harbor's municipal infrastructure was initially installed in the late 19th through mid-20th century and complete records were not kept describing water supply line materials, although it is known that lead was widely used before 1960. Analysis of data assembled during the Pilot grant indicate it is likely 2,383 replacement connections will need to be made. During the project/bid document development stage, the City will utilize all available resources to identify known lead service lines including seeking assistance from a water infrastructure analytics consulting company such as BlueConduit, who had a successful track record of locating probable lead service lines in Flint. With the previous data of how long contractors needed for each LSL replacement during the Pilot grant, completing all replacements is anticipated to take four years. This assumes a schedule of approximately 596 replacements per year. In order to hit this milestone, up to four contractors will be engaged each project year. The City will utilize a public bidding process to select each contractor. When service replacement work is put out to bid, the contractors will be required to submit a "per each" all included price per replacement, to establish a firm total project cost without variables. This will enable the city to evaluate proposed bids on an equal basis. EGLE does not require permits for this process, and contractors would need only to acquire city plumbing permits and county soil erosion and sedimentation control permits.

Previous work from the Pilot grant indicated that a contractor could complete 1 to 2 replacements per day. Each contractor will have to perform "pot hole" investigation at the curb stop to identify lead lines. Previously identified connections in the Pilot grant will be

incorporated into contractor assignments to aid their identification efforts and potentially reduce completion time for the entire project, resulting in more immediate health benefits to residents.

A map has already been created showing four (4) zones of the entire city limits (see map in attachments). The zones are broken into four (4) subzones to identify manageable contractor scopes of residential water services to investigate and potentially replace. A corresponding table shows the number of residential water service connections in each subzone and the sum for each zone recorded in the GIS database. Replacements that were done during the Pilot grant, and work that will be done as part of the fall 2020 DWRF project are excluded in the water service lines counts.

The replacement process involves verifying the service is lead at the curb stop and then proceeding to excavate the curb stop on the main. Once exposed, the existing lead service is turned off, disconnected and removed with new 3/4" to 1" copper piping being pulled at the same time. New copper water service is reconnected to the existing curb stop, a new curb stop and the meter inside the house. A new valve box will be set, all excavations will be backfilled and lawn areas will be restored. Residential water is out of service for approximately 4 hours during the process. Bituminous paving will be replaced at the completion of each LSL replacement.

Contractors will record their progress in the ArcGIS for Collector app to integrate records into the City's GIS infrastructure database. This will allow the city to see real time, up to date progress throughout neighborhoods. An Asset Program Manager will oversee the database throughout the project. Progress reports will be regularly submitted to the City.

Utilizing multiple contractors has many advantages. It allows the City to offer contracts to a wide range of contractors (local, small, women and minority owned), it keeps pricing competitive, it provides timelines that can absorb unexpected delays, it allows the contractor bonding obligation to be lower and not bidding prohibitive, and it allows for each year's contracts to incorporate previous successful strategies and eliminate unsuccessful ones.

As the City does not employ a staff engineer, the City's Engineer of Record, Abonmarche Consultants, will coordinate public notice flyers, bidding, contract award, contractor oversight, and provide progress reports to the city, following EPA solicitation clauses as required. As EPA funded work will be able to utilize Pilot grant processes, public notice flyers, and homeowner access permission forms, the city is ready to expeditiously proceed to the next phase of lead service line replacements.

Also occurring during the LSL replacement period will be upgrades to the city water distribution system and wastewater collection system financed through EGLE's DWRF loan program. This work is planned to occur between September 2020 and October 2021. These improvements will further strengthen protection of public health by ensuring a reliable, safe drinking water supply to all customers in the project area, and preventing failures of sanitary sewers where the probabilities and consequences of structural pipe failure are high. Sanitary sewer replacement will occur in the same street segments as the concurrent replacement of the antiquated water

mains since it would be fiscally irresponsible to replace water mains while leaving in place aged, structurally deficient sewers that are likely to fail in the next few years. This combined infrastructure improvement approach is consistent with the integrated asset management idea of "dig once" that saves both valuable time and resources. The DWRF project will also replace 150 LSLs and includes repairs to the city water tower.

In evaluating the proposed action alternatives for the DWRF funded projects addressing water distribution system, three options were considered. These action alternatives were also part of the evaluation criteria of the need to replace all the existing lead service lines proposed by this project.

a. No action - Taking no action would result in aged water mains remaining in service, with frequent breaks, broken or leaking valves, inadequate water pressures, and threats to public health from contamination. For the water tower, no action could result in ultimate failure of the vitally important asset. No action is unacceptable.

b. Optimum Performance of Existing Facilities - Problems inherent to a pipe itself cannot be solved through improved operational efficiency. Moreover, flushing a 100-year old water main will not remove tuberculation that has built up over decades. With the exception of the water tower, this alternative is infeasible. For the water tower, optimum performance can be achieved by making the necessary repairs, as described in the previous section, to allow maximum efficiency to be achieved.

c. Replacement - Full water main replacement, with full-length replacement of lead/galvanized service lines (LSLR) where encountered, is the only technically feasible solution that simultaneously accomplishes the following: (1) reverses the poor condition of the existing water pipe; (2) addresses technical and constructability considerations such as the comparative depths of the existing sanitary sewer and water main; and (3) resolves the pressure concern. Moreover, it is the only solution that guarantees no replacement of this antiquated water main will be required in a few years due specifically to its age and age-related condition. For the water tower, constructing a new tower is cost-prohibitive, approximately $5 million compared to roughly half million dollars to repair.

With replacement selected as the path forward on the DWRF project, the City is leveraging additional financial commitment to the health needs of its community.

The City will continue to monitor corrosion treatment that began in 2019 during the project period. While successful corrosion control protects users from lead levels, the sheer age and poor condition of city water infrastructure poses a high risk of failure and leaks to users. In addition, sources of lead also exist within customer plumbing systems such as high leaded brass or lead/tin solder copper piping. Replacement of all lines as soon as possible produces the highest and most comprehensive health benefit to the disadvantaged community, particularly when coupled with an optimized corrosion control treatment.

With EPA funding, the City of Benton Harbor will have addressed significant conditions that

are contributing to increased concentrations of lead in drinking water. The City will continue to sample drinking water twice a year, per EGLE requirements, until it has demonstrated Action Level Exceedance is no longer occurring.

See supporting documentation in Project Narrative Attachments – Section H – Readiness to Proceed.

3. Environmental Results and Measuring Progress

a. Stated Objective. This project will support will support EPA Strategic Plan Goal 1: "A Cleaner, Healthier Environment: Deliver a cleaner, safer, and healthier environment for all Americans and future generations by carrying out the Agency's core mission, Objective 1.2: Provide for Clean and Safe Water: Ensure waters are clean through improved water infrastructure and, in partnership with states and tribes, sustainably manage programs to support drinking water, aquatic ecosystems, and recreational, economic, and subsistence activities, of the EPA Strategic Plan."

Replacing known lead hazards in Benton Harbor drinking water will significantly improve the health and safety of residents and reduce the number of communities in the nation that are out of compliance with health-based standards.

It will modernize and update aging water infrastructure in the city, providing safe and reliable water delivery for all ages and future generations. The project will leverage and multiply the benefits of the DWRF funded projects to replace portions of the city water distribution system and wastewater collection system. Modern, reliable, safe drinking water serves to advance economic development within the community by attracting and retaining businesses and residents that can increase the city tax base and contribute to its sustainability.

b. Results/Outputs. Outputs of this project include:

- A reduction in lead in drinking water provided by the Benton Harbor drinking water system due to infrastructure improvements that will replace all residential lead service lines in the city.
- A decrease in the number of lead service lines, and galvanized pipes downstream of lead service lines, in the drinking water system, resulting in a decrease in exposure to lead via drinking water. The goal is to remove all existing residential lead service lines so none remain, dramatically reducing exposure potential.
- An optimized corrosion control treatment to protect public health during and after the lead service line removal activities.
- An increased number of customers will have information about lead in drinking water, achieved through outreach and public education throughout the project. All residents receiving lead service line replacement will receive information on the effects of lead, steps they can take to protect themselves, and city remediation efforts. Public outreach will occur to the entire community.

- The project will create a trackable, accurate GIS database of city infrastructure materials not previously recorded. During the project, an asset management plan coordinator will ensure the information is accurate and complete, ensure all elements have been addressed and confirm there is a process to identify any limitations on the use of the data.

c. Projected Environmental Improvements/Outcomes. Outcomes will include an overall reduction in lead exposure and associated harms through reduction of sources of lead in drinking water systems. Recent testing has shown that residents, especially children, are currently at risk from lead in drinking water. Removing lead at a young age prevents damage to developing bodies and nervous systems that affect learning, behavior, speech, hearing, and growth rates. Pediatric blood testing results can be used to track blood lead levels to understand if reduced childhood lead exposure goals are being met.

The local public school system has also been affected by declining enrollment and reduced budgets. Students are faced with fewer resources for learning each year. Removing the lead exposure in water lines can help eradicate the harm lead is doing to developing bodies and nervous systems and lead to higher testing and learning results, which can be tracked annually.

Benton Harbor can also experience an overall improvement in health outcomes in its community through this removal of source lead. Fewer residents will have their limited household budgets overwhelmed by health care costs, leading to more financially stable households. Outcomes can be measured by tracking the number of households seeking financial assistance through welfare, Medicaid, and the Children's Health Insurance Program.

Multiple years of public outreach during the projects will also lead to an overall increase in public understanding of the health effects of lead and efforts towards the reduction of sources of lead in the drinking water system. This can be measured by analyzing the number of requests for lead blood level testing, requested water kit tests, and requested water filters in the community per year.

4. Milestone Schedule

The Michigan Lead and Copper Rule promulgated in 2018 requires municipal water suppliers to begin removing all lead service lines at a rate averaging 5 percent per year, not to exceed 20 years for completion, starting in 2021. Completion of this project will ensure that Benton Harbor has met these requirements. Additionally, funding support from this EPA opportunity will allow the City to meet these requirements without imposing additional financial hardship on residents and will dramatically shorten the exposure of a known health risk to the public from 20 years to four.

Below is the proposed Milestone Schedule for the Lead Service Line Replacement project:

Year	Task	Timeline
1	Public Outreach Meetings/ Notification Mailings	January 2021

1	Develop bid plans/specs	February 2021
1	Contract with qualified consultant to perform Optimization Study for Corrosion Control Treatment (CCT)	March 2021
1	Bidding Phase 1 & Contractor Agreements	March 2021
1	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2021
1	Phase 1 Project start	April 2021
1	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2021
1	Phase 1 Project end	November 2021
1	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2021
1	Year One Milestone Completion – 596 Total LSL Replacements by end of Year 1. $4,160,554.25 in project costs expended. GIS database updated with field data Optimization Study for CCT initiated	December 2021
2	Homeowner/resident notification mailings Public Outreach	January 2022
2	Bidding Phase 2 & Contractor Agreements	February 2022
2	Completion of Optimization Study for Corrosion Control Treatment (CCT)	March 2022
2	Phase 2 Project start	March 2022
2	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2022
2	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2022
2	Phase 2 Project end	November 2022
2	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2022
2	Year Two Milestone Completion –	December 2022

	596 New LSL Replacements. 1,192 Total by end of Year 2. $8,271,108.50 in project costs expended by end of Year 2. GIS database updated with field data Completion of Optimization Study for CCT.	
3	Homeowner/resident notification mailings Public Outreach	January 2023
3	Bidding Phase 3 & Contractor Agreements	February 2023
3	Phase 3 Project start	March 2023
3	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2023
3	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2023
3	Phase 3 Project end	November 2023
3	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2023
3	Year Three Milestone Completion – 596 New LSL Replacements. 1,788 Total by end of Year 3. $12,381,662.75 in project costs expended by end of Year 3. GIS database updated with field data	December 2023
4	Homeowner/resident notification mailings Public Outreach	January 2024
4	Bidding Phase 4 & Contractor Agreements	February 2024
4	Phase 4 Project start	March 2024
4	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2024
4	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2024
4	Phase 4 Project end	November 2024

4	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2024
4	Year Four Milestone Completion – 595 New LSL Replacements. 2,383 Total by end of Year 4. $16,492,217.00 in project costs expended by end of Year 4. GIS database updated with field data	December 2024
4	Submit Final EPA Grant Reports	March 2025

5. Detailed Budget Narrative

The City GIS infrastructure database identifies 2,739 metered residential water service lines within city limits that have not been replaced. Previous service line replacements completed during the Pilot Grant project period in 2019 ranged from $4,800 - $7,200 per home depending on the distance from the main to the home, averaging $6,000 per home. This included all restoration, curb and pavement restoration. When service replacement work is put out to bid, the contractors will be required to submit a "per each" all included price per replacement, to establish a firm total project cost without variables. This will enable the city to evaluate proposed bids on an equal basis.

Additionally, during the Pilot Grant service line verification process, 87% of lines verified identified lead or galvanized piping on either the City-owned or privately-owned side of the service. To establish a project budget, the City is calculating its replacement costs per the following:

2,739 service lines x 87% = 2,382.93 lines to replace

2,382.93 lines x $6,000/line = $14,297,580.00 to replace LSLs

Engineering Administration fees at 15% of total project cost: $2,144,637.00

An optimization study for corrosion control treatment would also be initiated in Year 1 to be completed within 12 months. A qualified consultant would be hired to perform the study.

Optimization Study Corrosion Control Treatment - $50,000

Total Project Cost: $16,492,217.00

Of the total cost, the City is requesting $14,842,995.30 (90%) from this EPA funding opportunity and is committing to $1,649,221.70 (10%) for a cost share match. See reduced cost share/match letter requesting a 10% match due to the City's disadvantaged status in Project Narrative Attachments.

The City will complete the LSL replacement project over a four year period, or less, depending on contractor capacity. Each year will see the replacement of approximately 596 service lines, at a cost of $4,110,554.25. The Optimization Study's $50,000 cost will be incurred during the

first year of the project.

The City will utilize city income tax revenue each project year to provide its non-federal cost-share. The income tax generated $1,684,794 during the 2018-19 fiscal year. City income tax fund projections out to 2025 show that it can incur up to $500,000 per year ($2 million over four years) in additional expenses, providing for the City's $1,649,221.70 cost-share during this project. Please see funding projection spreadsheet in Project Narrative Attachments.

Contractual expenses will include contractor labor costs for excavation of the curb stop on the main, disconnection and removal of old line, pulling of new copper piping, reconnection of piping to the existing curb stop, and restoration of pavement and lawn areas as needed. Contractor materials cost include 3/4" to 1" copper piping, new curb stops, new meters inside the house and new valve boxes.

Engineering administration tasks will include preparation of bid documents, overseeing bid process, executing contractor agreements, providing public education and outreach about the project, notifying residents of project timeline, acquiring property access agreements from residents, overseeing contractor work, reviewing and approving contractor requests for payment, tracking and recording LSL replacement data in GIS database, final inspections and closeout of project.

Expenses for the Optimization Study for Corrosion Control Treatment will be consultant cost for professional evaluation of the various types and levels of corrosion inhibitors to best match the treatment to the city's source water, thus minimizing dissolution of lead and copper into drinking water without compromising other health-related water quality goals.

6. Programmatic Capability/Experience

a. Organizational Experience

The City of Benton Harbor is a local unit of government. The city charter became effective on April 14, 1945. Under that charter, the city is governed by a council-manager system that combines the political leadership of nine elected commissioners with the professional expertise of a city manager appointed by the commissioners.

The City Manager is the chief administrator of Benton Harbor and is responsible for the day-to-day administration of the city. The manager implements the council's policies and programs while coordinating the delivery of services throughout the city through the various departments in city government. The City Manager will oversee the LSL replacement project, providing regular updates to the City Commission. Current City Manager, Ellis Mitchell, has served as city manager for three other cities – Berkeley, Mo., East St. Louis, Ill., and East Point, Ga, bringing a wide understanding of city management to the project. The City Manager also oversees compliance with multiple federal, state and local funding sources involved in city projects and is well prepared to follow EPA compliance requirements.

The city water distribution system is managed by the Benton Harbor Water Department, under the direction of Mike O'Malley. Recently, City staff successfully oversaw and

completed the modernization and upgrades of the city water filtration plant over a two year period, ending in 2011. The Water Plant now has an anticipated life span in excess of 50 years and can properly treat up to 12 million gallons per day. Funding for the project was acquired through the State of Michigan's Drinking Water Revolving Loan Funds (DWRF), supplemented by American Recovery and Reinvestment Act (ARRA) funds.

The Community and Economic Development strives to foster a better quality of life for Benton Harbor residents by developing viable neighborhoods with safe, suitable housing and by eliminating slums and blight. It oversees the City Home Rehabilitation Loan Program, CDBG program, Vacant Lot Revitalization Purchase Program and other grant funded programs benefitting residents. This department will oversee EPA grant compliance throughout the duration of the project.

The City of Benton Harbor utilizes its engineer of record firm, Abonmarche Consultants, to provide civil engineering expertise and guidance on municipal infrastructure projects, as the city does not employ a staff engineer. Abonmarche has assisted the city for over 25 years and has a strong working relationship with staff and comprehensive understanding of city infrastructure needs. The firm has assisted with multiple projects funded through a variety of sources including federal and state grants and state loans. The City will utilize results from previous Abonmarche water studies and upgrades to identify and complete the citywide lead service line replacement project.

The City has also had initial discussions with Cornwell Engineering Group, a qualified engineering consultant, for the purposes of conducting an Optimization Study for Corrosion Control Treatment. Cornwell Engineering Group was founded in 1985 by Dr. David A. Cornwell, after his successful career as a Professor at Michigan State University. Cornwell Engineering Group utilizes the latest innovations and sound scientific fundamentals in the pursuit of optimizing and designing water facilities.

b. Staff Expertise/Qualifications

Key City staff on the project, representing three FTE workers, include:

Ellis Mitchell, City Manager – Mr. Mitchell has been City Manager since January 2020, after acting as Interim City Manager since July 2019. Mr. Mitchell had previously served as City Manager for Benton Harbor from 1983 to 1987. He brings more than 40 years of comprehensive achievements in public, private and educational sectors to the City of Benton Harbor. He has managed four cities (Benton Harbor, MI, Berkeley, MO, East St. Louis, IL, and East Point, GA) saving two from State Receivership. He has provided management consulting services for cities and private sector companies. He has led planning and implementation of balanced Operating Budgets and 5 Year Capital Improvement Programs in several cities, stabilizing and improving financial management. He has served as Project Manager over major bond issues, developments, and several capital funding projects from planning, negotiating and throughout the construction process. His comprehensive experience will provide strong support throughout the LSL replacement project.

Michael O'Malley, Water Department Superintendent – Mike has over 30 years of experience working in water treatment plants. He has been Benton Harbor Water Department Superintendent since July 2016, additionally holding the position between 2008-2012. He is an F-1 and S-1 licensed Operator in Charge. Mike oversees Water Plant operations and maintenance, water distribution, sewer collections and storm water management for the City of Benton Harbor.

Tracy-Ann Jennings, Community and Economic Development Director – Tracy has over 15 years of experience and understanding as it relates to: Grant Application and Reporting, Employee Management and Supervision, Human Behavior Analysis, Leadership Coaching, Volunteer Management, Youth Development, and Nonprofit Leadership. Her strengths lie in community outreach and engagement, creating and executing major events, developing and sustaining strategic relationships, working with local media, communications and community relations, forecasting and strategic planning. She will act as a key member of the public outreach team and track grant compliance.

Abonmarche Consultants, Inc - Abonmarche Consultants, Inc., is a professional consulting firm specializing in civil engineering, surveying, architecture, marina development, landscape and planning services. The company was established in 1979 and became the Engineer of Record for the City of Benton Harbor in 1994. The City does not employ its own engineering staff and instead utilizes the professional expertise provided by Abonmarche as their Engineer of Record. Abonmarche has assisted the city with multiple projects involving grant or loan funding and is well versed in compliance, procedures and reporting documents. Abonmarche led the FDCVT and Pilot grant projects and will be able to guide the lead service replacement project with a thorough understanding of the City's infrastructure, community and municipal needs.

The project will utilize the following key Abonmarche staff:

Jason Marquardt, PE - Jason is a licensed Professional Engineer with more than 16 years of experience. He is responsible for managing, designing, and providing construction engineering and administration on municipal, local agency and state projects. He currently serves as Group Director of the Construction Division at Abonmarche. He has worked on a variety of civil projects that include infrastructure design, sanitary sewer, storm sewer, and water distribution system construction. He was project manager for the City of Benton Harbor's 2017 and 2018 FDCVT grant projects and the Pilot Grant project. His knowledge of the City of Benton Harbor's water infrastructure will contribute important guidance to the project team.

Corey Kandow, PE - Corey has over 20 years of experience in design and construction administration of municipal and site development infrastructure, street reconstruction, drainage, engineering studies, permitting, waterfront development and recreational facility projects. His responsibilities also include plan preparation, project design, and cost estimating. Corey's projects have utilized multiple federal, state and local grant and loan funding sources including MDOT, MEDC CDBG, USDA Rural Development, SRF/DWRF

loan and DNR Recreation grants and Corey understands the wide range of compliance necessary for each funding source.

In each of his roles, Corey is committed to ensuring that quality projects are built to exceed the client's expectation and remain within budget. Corey has acted as project manager for multiple City of Benton Harbor projects.

Bret Witkowski - Asset Management Program Coordinator - Bret will lead efforts to further develop and complete the infrastructure asset management programs for the City of Benton Harbor. Prior to his position at Abonmarche, Bret served Berrien County as the County Treasurer for 20 years. In addition to his to his position of County Treasurer, Bret served on multiple financial review committees for villages and communities throughout Berrien County. He is Chairman of the Berrien County Land Bank, which received $10 million in grant funding to remove blight in distressed Berrien County communities during his tenure. His experience with funding and conducting public relations and awareness campaigns will greatly assist project efforts.

Joelle Regovich – Grant Administrator – Joelle has over 7 years of experience overseeing grant related efforts for a variety of Abonmarche clients. She seeks out relevant funding sources to support projects, writes grant applications, and performs grant administration on awarded funds. Her experience includes a wide range of federal, state and local grants and funding sources including USDA Rural Development grants and loans, Michigan Economic Development Corporation CDBG and Infrastructure Capacity Enhancement (ICE) grants, Michigan Department of Natural Resources Recreation Grants, Michigan Council for Arts and Cultural Affairs grants, and Michigan State Historic Preservation Office (SHPO) Lighthouse Assistance Program grants. She will work closely with City staff to ensure grant compliance is met throughout the project.

Please see resumes in Project Narrative Attachments – Section F. Biographical Sketches

7. Past Performance. Recent relevant grants received by the City of Benton Harbor in the past three years include two Financially Distressed Cities, Villages and Townships (FDCVT) grants and one Pilot Grant from the Michigan Department of Environmental Quality (DEQ). The City has a long history of completing a variety of grant projects.

2017 FDCVT Grant – Cities, villages and townships experiencing financial struggles were offered grant funds by the Michigan Department of Treasury to help fund special projects, services or strategies that move a city, village or township toward financial stability. In 2017, the City of Benton Harbor received $396,085 for water system enhancements that included water main replacements on Territorial and Sherman Streets and water valve replacements. The City had previously received FDCVT grants in 2015 and 2016, which assisted in the replacement of additional water mains and fire hydrant repairs. As a result of careful oversight and financial management practices, the City was able to request a reallocation of unused 2015 and 2016 funds toward its 2017 project, reducing its cost share of the water main work.

Throughout the grant period, the City complied with grant requirements such as approving resolutions, returning signed agreements, using funds only as authorized by grant scope,

following purchasing and bid requirements set forth by funding agency, providing adequate supporting documentation for expenses i.e. cancelled checks and invoices, following accounting practices to keep grant funds separate from other accounts, communicating with Treasury Department to update any status change or amendment request, and following all local, state, and federal laws. The grant requires completion of the project within five years of the award. The City completed all work in 18 months. Semi-annual progress and financial reports as required by the grant were completed each period on time. Progress reports indicated percentages complete toward stated goals for scope.

2018 FDCVT Grant – In 2018, the City received a grant award of $309,500 to replace 238 water meters that were outdated and obsolete. Project work began in September 2019 and will be completed by May 2021, after experiencing delays due to the COVID-19 pandemic.

During the grant period, the City has complied with grant requirements such as approving resolutions, returning signed agreements, using funds only as authorized by grant scope, following purchasing and bid requirements set forth by funding agency, providing adequate supporting documentation for expenses i.e. cancelled checks and invoices, following accounting practices to keep grant funds separate from other accounts, communicating with Treasury Department to update any status change or amendment request, and following all local, state, and federal laws. Semi-annual progress and financial reports as required by the grant have been completed each period. Progress reports track percentages complete toward stated goals for scope.

2018 MDEQ Pilot Grant – The Michigan Department of Environmental Quality (MDEQ) Drinking Water and Municipal Assistance Division provided a grant award of $284,000 to the City of Benton Harbor as part of a pilot program to improve water supply system infrastructure to help protect water quality and public health. The grant award was used to fund an inventory of the material of service lines, update the city asset management plan, and replace lead water service lines. Ninety-four (94) verifications and 17 replacements were completed between December 2018 and May 2019. Information was recorded in a GIS database.

Grant deliverables included an Asset Management Plan Certificate of Project Completeness which includes the AMP Executive Summary, and a Lead Service Line Replacement Certificate of Project Completeness which verifies that a Notice to Proceed was issued for the project. Both of these requirements were completed and delivered to the DEQ/EGLE within the project period.

8. Reduced Cost Share/Match Waiver Request Letter and QA/QC

a. Please see reduced cost share/match request letter in Project Narrative Attachments.

b. QA/QC – Not Applicable. Environmental Data will not be collected or used in this project.

E. Project Narrative Attachments

1. **Reduced Cost Share/Match Request Letter**
    a. **DWRF Supporting Data Regarding Disadvantaged Status**
    b. **DWRF 2020 Intended Use Plan**
    c. **Match – City Funding Projection Spreadsheet**
2. **Opportunity Zone Map**
3. **Section F – Biographical Sketches**
4. **Section G – Negotiated Indirect Cost Rate Agreement – NOT USED**
5. **Section H – Readiness to Proceed**
6. **Section I – Supporting Documentation of Lead Issue**

BENTON HARBOR
Port of Opportunities

May 29, 2020

Brianna Knoppow
U.S. Environmental Protection Agency (EPA), Office of
Water, Office of Ground Water and Drinking Water

RE: Funding Opportunity EPA-OW-OGWDW-19-01: Reduction in Lead Exposure Via Drinking Water - City of Benton Harbor Reduced Cost Share/Match Waiver Request

Dear Ms. Knoppow,

The City of Benton Harbor is submitting an application in response to the EPA funding opportunity "Reduction in Lead Exposure Via Drinking Water." Applicants are to provide a minimum non-federal 20% cost-share/match of the total project costs unless they request a waiver to reduce the cost-share/match requirement for reasons of affordability. The City of Benton Harbor is seeking funding to assist in National Priority Area One: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements, and respectfully requests a waiver to reduce the non-federal cost-share/match to 10%.

In Michigan, Disadvantaged community status is determined by the Department of Environment, Great Lakes, and Energy (EGLE) as defined in Part 53 of Act 451. The City of Benton Harbor currently meets the state of Michigan's DWSRF disadvantaged community criteria as evaluated by EGLE. Please see attached supporting documentation. If you have any questions or need additional information, please do not hesitate to contact me at 269-927-8457 or via email at emitchell@cityofbentonharbormi.gov.

Sincerely,

Ellis E. Mitchell

Ellis Mitchell
City Manager
City of Benton Harbor

Enclosures:
EGLE May 18, 2020 Email Regarding Qualifying Disadvantaged Status
EGLE DWRF Disadvantaged Status Calculation
DWSRF Intended Use Plan Fiscal Year 2020

From: Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Sent: Monday, May 18, 2020 9:06 AM
To: Sarkipato, Ernest (EGLE); Green, Kelly (EGLE)
Subject: RE: BH grant
Attachments: benton harbor dwrf.xlsx; Application of the Afordability Criteria.docx

Ernie,

Attached is our disadvantaged worksheet for Benton Harbor. The Red Yes indicates they are disadvantaged. I have also attached our criteria. This is a document that explains our procedures and was something Detroit wanted for their EPA grant so this might be useful for Benton Harbor as well.

Bob

Bob Schneider
Financial Analyst
Michigan Department of Environment, Great Lakes, and Energy
517-388-6466 / schneiderr@michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, May 15, 2020 1:59 PM
To: Green, Kelly (EGLE) <GreenK1@michigan.gov>; Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Subject: RE: BH grant

Awesome! The wording below is "provide affordability criteria information for Benton Harbor as a Disadvantaged Community"

From: Green, Kelly (EGLE) <GreenK1@michigan.gov>
Sent: Friday, May 15, 2020 1:54 PM
To: Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Fwd: BH grant

Bob, can you send Ernie a copy of Benton Harbor's disadvantaged worksheet?

Ernie, I think all EPA might need is a memo from the state saying they qualify under the State's criteria. If that's the case Bob can draft a simple email to that effect.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, May 15, 2020 1:44 PM
To: Green, Kelly (EGLE)
Subject: BH grant

Happy Friday Kelly! We have a window of opportunity to support BH in making an application to EPA for grant funding related to lead service line removal. I need your help!
Do we have a document that outlines affordability criteria for Benton Harbor (#3 below)?

Ernie

Application of the Affordability Criteria for the State of Michigan

Household income is an economic measure that can be applied to one household, or aggregated across a large group such as a city or county. It is used by the State of Michigan to describe a household's economic status or to track economic trends.

A household's income can be calculated various ways but the US Census as of 2009 measured it in the following manner: the income of every resident over the age of 15, including wages and salaries, unemployment insurance, disability payments, child support payments received, regular rental receipts, as well as any personal business, investment, or other kinds of income received routinely.

Changes in median income reflect several trends: the aging of the population, changing patterns in work and schooling, and the evolving makeup of the American family, as well as long- and short-term trends in the economy itself. For instance, the retirement of the Baby Boom generation should push down overall median income, as more persons enter lower-income retirement.

Median inflation-adjusted ("real") household income generally increases and decreases with the business cycle. Household income in the United States varies substantially with the age of the person who heads the household. Overall, the median household income increased with the age of householder until retirement age when household income started to decline

The American FactFinder provides data gathered from the American Community Survey which the State of Michigan uses to determine affordability. Since 1996 the State of Michigan has used 4 criteria to determine affordability:

1) More than 50 percent of the geographic area to be served by a proposed project is identified as a poverty area by the U.S. Bureau of the Census. Current poverty areas within Michigan are identified in Appendix B on the Census website. (In order to perform a more systematic review, the state demographer has recommended that using the FactFinder poverty table and a family of 3 or 4, in the Poverty Status in the 12 Months for Families column with a percentage above poverty level of more than 20% +-0% will approximate the 50% of a geographic area)

2) The MAHI for the area to be served by a proposed project is less than the most recently published Federal Poverty Guidelines for a family of four in the 48 contiguous United States. These guidelines are published annually by the Department of Health and Human Services.

3) The MAHI for the area to be served by a proposed project is less than the most recently published statewide MAHI for Michigan, and annual user costs [as defined in 1994 PA 451, Section 5401(B)] for service will exceed 1.0 percent of the MAHI of the area to be served by the proposed project.

4) The MAHI for the area to be served by a proposed project is greater than the statewide MAHI for Michigan, (up to 120 percent) and annual user costs will exceed 3 percent of the MAHI of the area to be served by the proposed project.

For criteria 3 and 4 a detailed spreadsheet has been developed to determine affordability. The spreadsheet has 2 sections where a series of calculations are made and compared. The first set of calculations determine the annual threshold cost for water or wastewater services. The MAHI for a community is identified in the American Community Survey and the Detroit Consumers Price index applied to determine the updated MAHI. This updated MAHI is then multiplied by 1% to arrive at an annual threshold dollar amount. The second set of calculations factor in such variables as number of users, annual debt payments, and annual operating costs to determine the actual annual user costs. If the actual

annual user costs exceed the threshold then the affordability threshold has been exceeded and the community is eligible for subsidized assistance.

Step 1: Enter amount of total debt for project
Step 2: Enter term up to 20 years
Step 3: Enter present target rate of interest (call DEQ)

Step 4: Enter projected annual OM & R after completion
Step 5: Annual debt payment is computed
Step 6: Total annual cost of system is computed

Step 7: Enter total number of system users in service area
Step 8: Annual user cost is computed

Step 9: Updated State Wide MAHI is:
Step 9: Enter 1990 census median annual household income
Step 10: Updated MAHI is calculated on Detroit CPI-U to 1997
Step 11: The percentage of MAHI is computed

Step 12: If the annual user cost exceeds the percentage of MAHI, the community may qualify as a disadvantaged community

Amount of Debt	$5,076,698
Terms	20
Rate	2.00%
OM & R	$1,064,000
New annual debt	$310,474
existing debt	$ 282,000
Total Annual Cost	**$1,656,474**
# of Users	9063
Annual User Cost	$183
Updated MI MAHI	**$51,597**
MAHI - 2010 census	$20,157
Updated MAHI:	$22,475
MAHI Threshold $	$225
Disdavantaged??	**NO**

Benton Harbor	$20,157		
DWRF		51.80%	9.50%
	YES		

State of Michigan

Gretchen Whitmer, Governor

Department of Environment, Great Lakes, and Energy

Liesl Eichler Clark, Director

INTERNET: http://www.michigan.gov/drinkingwaterrevolvingfund

Drinking Water State Revolving Fund Intended Use Plan Fiscal Year 2020

Prepared by:
Water Infrastructure Financing Section
Finance Division

September 2019

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Table of Contents

I. Introduction 3

II. Structure of the Drinking Water State Revolving Fund 4

III. Advantages of the Drinking Water State Revolving Fund 5

IV. Goals 5

V. Allocation of Funds 7

VI. Criteria and Method for Distribution of Funds - Set Asides 8

VII. Criteria and Method for Distribution of Funds - Project Loans. 14

VIII. Disadvantaged Business Enterprise 14

IX. Disadvantaged Community Status 15

X. EPA Automated Clearinghouse Activities 15

XI. Assurances 15

XII. Output/Outcome Measures 16

XIII. Public Review and Comment. 16

XIV. Origination of Documents 17

DWSRF Draft Project Priority List (PPL) for Fiscal Year (FY) 2020
DWSRF Draft PPL Scoring for FY 2020
Estimated Category Costs for FY 2020 Draft PPL
Draft Project Re-evaluation Request

I. INTRODUCTION

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) through the Finance Division administers the Drinking Water State Revolving Fund (DWSRF). The DWSRF program details are set forth in Part 54, Safe Drinking Water Assistance, MCL 324.5401-324.5421, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). In addition, the Michigan Finance Authority (Authority) is charged with administering DWSRF funds through the Shared Credit Rating Act, 1985 PA 227, as amended (Act 227).

The DWSRF provides reduced interest rate loan financing to qualified water suppliers to finance construction of public water systems. Projects may include new wells, new water treatment plants, storage facilities, upgrades or expansions to existing facilities, transmission lines, pumping facilities, and other related waterworks system improvements. Suppliers must meet federal and state program requirements, as well as demonstrate their ability to publicly finance their project and retire project debt. In addition to the loan provided by EGLE, suppliers also have the option to pay for part of their project with cash and other resources. Since 1998, Michigan has awarded over $1 billion in financial assistance to over 295 borrowers. In fiscal year (FY) 2020, the DWSRF Project Priority List (PPL) contains $258 million worth of projects.

This Intended Use Plan (IUP) describes how EGLE and the Authority will jointly administer all available DWSRF funds during FY 2020. An IUP is a required part of the process to request the federal 2019 capitalization grant, which will be matched with 20 percent in state match funds. The 2019 capitalization grant allotment for Michigan is $27,011,000. The Water Infrastructure Financing Section (WIFS) of the Finance Division is charged with carrying out the program administration responsibilities. The Community Water Supply Section (CWSS) of the Drinking Water and Environmental Health Division (DWEHD) will assess project priority, issue the necessary construction permits, and offer technical review and assistance throughout project planning, design, and construction. Financial administration of the program will be handled by the staff of the Authority.

The U.S. Environmental Protection Agency (EPA) Region 5 staff will offer guidance and conduct annual program oversight reviews of the DWSRF. The EPA serves as a helpful partner in creating and maintaining this program.

The relationship between EGLE, the Authority, and the EPA is established in an Operating Agreement signed by authorized signatories from each agency. The Operating Agreement is incorporated into this IUP by reference and is available from EGLE upon request.

The IUP includes details on specific project funding and identifies amounts to be set aside from federal capitalization grants for other uses authorized under the federal Safe Drinking Water Act (SDWA) and Part 54 of Act 451. A public hearing was held on August 21, 2019, at Constitution Hall, located at 525 West Allegan Street, Lansing, Michigan.

EGLE certifies that it is recognized by the EPA as the primary agency for management of the drinking water program. The priority system was developed by EGLE and will be used each fiscal year to determine which projects will have access to DWSRF assistance. The priority system is designed to provide low-interest financing to those projects that will have the greatest impact in facilitating safe drinking water supplies.

FY 2020 Project Funding

The 2019 federal capitalization grant allotment for Michigan is $27,011,000. Congress mandated that 20 percent of this amount be provided as additional subsidy to borrowers. EGLE plans to provide this 20 percent as principal forgiveness. An additional six percent to 35 percent must be provided to disadvantaged communities as principal forgiveness. All DWSRF projects funded in FY

2020 must pay their workers the federal Davis-Bacon wage rates for their job classification and comply with American Iron and Steel requirements.

II. STRUCTURE OF THE DWSRF

Due to a large increase in demand in FY 2020, EGLE will operate the DWSRF as a leveraged program, similar to the Clean Water State Revolving Fund (CWSRF). The state will sell State Revolving Fund revenue bonds that are secured by federal and state assets (i.e., federal capitalization grant, required state match, loan repayments, and interest earnings). State funds can include general fund or state revenue bonds. Bond issuance costs are covered by the bonds sold and, thus, are not identified as direct administrative expenses of the DWSRF. Historically, bond issuance costs are appropriately one percent of the total bond issue. Project costs of the local units of government are reimbursed from the bond issues.

For borrowers who are non-municipal entities, limitations on private activity from tax-exempt issues would require EGLE and the Authority to fund private water suppliers from funds other than tax-exempt revenue bonds. These loans would be made as direct loans with a letter of credit supplied by the private borrower or through a partnership with a private lending institution with the state providing an insurance annuity. There are no private, non-municipal water suppliers on the FY 2020 PPL.

There is a provision for subordinate investment of funds between the DWSRF and the CWSRF. This concept permits the administrators of the two funds to make temporary investments from one fund or the other in the event that monies are needed to service debt on the state's tax-exempt bond issues, cover deficiencies in a fund's reserve accounts, or satisfy other reserve account requirements. Only those funds periodically released from debt service reserve accounts, supplemental reserve accounts, revenue accounts, or any other account of the fund, wherein released monies may be generated, may be used for the purposes of subordinate investment.

At each point that monies are released, EGLE and the Authority will undertake a "snapshot" look at both the SRF and the DWSRF. For each fund, we will first examine whether we need to service debt or satisfy reserve account requirements within the fund from which the released monies originated. Next, we will examine the other fund for the same conditions. Then, if sufficient monies are available to satisfy requirements for each fund, the released money will pass completely through and become available for future commitments to new projects consistent with its source. This provision will not be exercised in FY 2020.

Set-asides in the DWSRF are derived from the capitalization grant awarded to the state by the EPA. Set-asides are designated for specified uses within the DWSRF to address areas of concern included in the reauthorization of the SDWA. Legal provisions included in Act 227 permit the Authority and EGLE to establish accounts and sub-accounts to track revenues and expenditures for the set-asides. The set-asides for program and other activities will be directly administered by the Environmental Health Section (EHS) of the DWEHD, with support from the CWSS. EHS and CWSS staff will also be responsible for the technical assistance activities, except for those funds made available to subsidize loans to disadvantaged communities. The disadvantaged community loans will be managed by WIFS.

The following is a list of potential set-asides identified in Section 1452 of the federal SDWA. The percentages noted affect the federal capitalization grant amount available to fund projects.

DWSRF Administration - 4 percent

Technical Assistance - 2 percent

Program Set-asides - 10 percent
•Public Water System Supervision

Other Activities - 15 percent, not to exceed 10 percent for any one activity
•Local Assistance for Capacity Development
•Wellhead Protection

III. ADVANTAGES OF THE DWSRF

The primary advantage for Michigan water suppliers is their ability to borrow funds at interest rates below market. The DWSRF interest rate is established prior to each new fiscal year. As identified in Part 54 of Act 451, determination of the interest rates is based on loan demand, market conditions, program costs, and future needs.

In setting the interest rates for FY 2020, EGLE examines a widely used market index for general obligation municipal bonds to identify current market conditions existing at the time the draft IUP is prepared. Then, to establish a rate of interest for municipal borrowers, EGLE considers present and future demand for DWSRF assistance and the costs to comply with program requirements.

Once the interest rate is determined for municipal borrowers, the resulting interest subsidy to municipalities will be used for private borrowers. If a private borrower chose to obtain a letter of credit and receives a direct DWSRF loan from the Authority, the interest rate would be determined by using the U.S. T-bill rate as the base and applying an identical percentage reduction of interest as municipalities receive. For those private borrowers who chose to obtain financing through a financial institution, the interest rate would be the lending institution's rate, reduced by an identical percentage as a municipality would receive.

The interest rate for municipal borrowers in FY 2020 is 2.0 percent for both 20-year and 30-year loans.

Apart from the low-interest rate, suppliers also benefit from the DWSRF in that they can finance all eligible waterworks system costs. The major benefit results from the fact that water supply financing in the past has always been left to the local units of government or private entities. Historically, there has been no significant state financial assistance available to local officials in meeting water supply needs. Recently, EGLE provided $9.5 million to 18 communities for the Pilot Drinking Water Community Water Supply Grant program. The grant program is funded by a state appropriation. The pilot will provide lessons learned for full lead service line replacement and asset management.

IV. GOALS

Michigan's DWSRF establishes a funding source designed to protect and preserve public health within the state's boundaries. Michigan's geographical identity as a "Great Lakes" state affords its residents with an abundant and high-quality water resource from which to draw its drinking water. Unlike many states, Michigan has plentiful supplies of fresh water with few periods of restricted use. The great challenge for water suppliers lies in protecting the high quality of the resource, as well as ensuring that adequate volume and pressure exist to deliver potable water to the customer.

To this end, Michigan's DWSRF has the following long-term goals:

Goal: *Provide low-cost financing for waterworks system improvements or upgrades while maintaining the perpetuity of the DWSRF.*
The Authority uses a financial advisor to guide decisions on funding levels, interest rates, and other financing terms. Michigan looks to balance the goals of meeting the capitalization grant requirements (i.e., additional subsidies, Davis-Bacon, signage, American Iron and Steel) while maintaining the DWSRF in perpetuity.

Goal: *Continue effective partnerships with other federal and state financing sources to promote efficiency in environmental review procedures and coordination of funding.*
Given the limitations on pooled capital, EGLE continues to work together with various federal and state agencies, such as the U.S. Department of Agriculture - Rural Development, Rural Community Assistance Program, the Michigan Department of Health and Human Services, Michigan Economic Development Corporation and the Michigan Department of Transportation, so that we may collectively fund qualifying projects and maximize use of our capital pool to achieve stated goals. Such partnerships ultimately benefit everyone. Industry, tourism, and day-to-day quality of life are strengthened when our most valuable natural asset is preserved and made available for use and enjoyment.

Goal: *Maintain statewide compliance with all applicable state and federal drinking water laws, rules, and standards while protecting the public health and environmental quality of our state.*
EGLE will use DWSRF set-aside funding to: maintain source water assessment, wellhead protection, and source water protection programs; assist economically disadvantaged communities in meeting drinking water standards; and apply a capacity assessment program for all new and existing community and nontransient, noncommunity water supplies.

Goal: *Continue use of the DWSRF program.*
EGLE will continue to use effective outreach methods such as: direct mail, electronic media, newsletter publication, and informational meetings and conferences to publicize and encourage the use of the DWSRF to meet the infrastructure needs of communities.

In order to accomplish the long-term goals, we must also focus on more immediate objectives. Therefore, our short-term goals in FY 2020 are:

Goal: *Secure Michigan's full share of federal funding and to expeditiously obligate these monies, along with the state contribution.*
EGLE has prepared and identified on the FY 2020 PPL all projects that are willing and able to progress to loan closing consistent with a project milestone schedule for the construction of eligible facilities. All projects receiving DWSRF funds in FY 2020 will issue a Notice to Proceed within 60 days of the loan closing.

Goal: *Ensure that the additional requirements of the 2019 capitalization grant is met, including those that are imposed on local borrowers.*
Congress mandated that 20 percent of the 2019 capitalization grant be provided as additional subsidy to borrowers and an additional six to 35 percent be provided as principal forgiveness for disadvantaged communities. As EGLE recognizes the challenges imposed by the new Michigan Lead and Copper Rule, the 20 percent mandated subsidy will be divided between disadvantaged communities and communities undertaking lead service line replacement.

EGLE will also provide 15 percent of the required disadvantaged community subsidy resulting in just over 30 percent of the capitalization grant awarded as principal forgiveness to disadvantaged communities. Congress requires all DWSRF projects funded in FY 2020 to pay their workers the federal Davis-Bacon wage rates for their job classification and comply with the American Iron and Steel and EPA signage requirements.

Goal: *Fund more projects, assist communities in completing full-length lead service line replacement projects.*
The WIFS provides financial assistance to communities addressing the private property portion of lead service line replacement projects. The signing of the Michigan Lead and Copper Rule will likely result in communities undertaking more lead service line replacement projects.

V. ALLOCATION OF FUNDS

The establishment of a fundable range for any given fiscal year entails a series of steps that culminate in a determination of how much fund resources could support. Using a series of assumptions (DWSRF loan rate, return on investment rates, and level of capitalization) the process for FY 2020 is outlined below:

1. EGLE reviewed the total amount of loans committed through September 30, 2019.

Total loan commitments through 9/30/2019	$1,074,135,000

2. EGLE assumes that the new federal capitalization grant and the appropriated state match will remain constant until 2020. However, it should be noted that EGLE has **no assurance** of state general fund monies to match federal funds beyond the 2019 capitalization grant. Five million dollars of general funds is available for use in FY 2020 to match the 2019 capitalization grants. Remaining state match needed will come from carry over funds from past years. Michigan was appropriated $27,011,000 in DWSRF federal capitalization grant funds for use in FY 2020.

2019 capitalization grant for loans (total grant is $27,011,000)	$18,637,590
General fund match	$5,000,000
Carry forward match	$402,200

3. EGLE then looked at how much the DWSRF could support using a five-year financial forecast at varying capitalization levels and interest rates.

   The PPL has 40 projects, totaling $530 million. Twenty-three projects, totaling $258 million, would like to proceed with construction in FY 2020. Sixteen projects, totaling $272 million, will be considered for funding future years.

   The provision of additional subsidy is a requirement of the capitalization grant and Safe Drinking Water Act. The FY 2019 capitalization grant requires 20 percent of the capitalization grant be provided as additional subsidization. An additional six to 35 percent of subsidization is required to be provided to disadvantaged communities per the Safe Drinking Water Act. The total additional subsidy will not exceed $9,710,000 in FY 2020 and will be awarded as principal forgiveness. The additional subsidy will be provided to projects with disadvantaged community status and to applicants undertaking lead service line replacement work. When principal forgiveness is provided from available loan proceeds to projects, it reduces the amount of the assets returning to the DWSRF as loan repayments, which could be used to make future loans. Total principal forgiveness awarded in FY2020 is approximately 50 percent greater than total principal forgiveness awarded in FY2019.

   Fifteen percent of the required 20 percent additional subsidy plus, approximately fifteen percent of required subsidy for disadvantaged communities, for a total of $8,321,400 in principal forgiveness, will be provided to disadvantaged communities. The amount

allocated to each disadvantaged community will be approximately nine percent of estimated project costs as follows:

Table 1

Disadvantaged Communities		
Community	Estimated Loan Amount	Principal Forgiveness
Detroit (DWSD)	$57,500,000*	$5,175,000
Highland Park	$18,460,000	$1,661,400
Benton Harbor	$4,465,000	$401,850
Muskegon	$6,095,000	$548,550
South Haven	$780,000	$70,200
Owosso	$5,160,000	$464,400
Total	**$92,460,000**	**$8,321,400**

***** Total of project numbers of 7460-01 and 7483-01

Approximately five percent of the required 20 percent subsidy, for a total of $1,387,952 will be provided to communities undertaking full length lead service line replacement as follows:

Table 2

Lead Service Line Replacement (LSLR)		
Community	Estimated LSLR Construction Cost	Principal Forgiveness
Kalamazoo	$12,652,350	$1,265,235
Lake Orion	$443,000	$44,300
Marquette	$389,173	$38,917
St. Joseph	$75,000	$7,500
White Pigeon	$185,000	$18,500
Rochester	$135,000	$13,500
Total	**$13,879,523**	**$1,387,952**

Each state may transfer 33 percent of available funds between the CWSRF and the DWSRF programs. Michigan does not propose to transfer funds between the CWSRF and DWSRF programs in FY 2020.

VI. CRITERIA AND METHOD FOR DISTRIBUTION OF FUNDS - SET-ASIDES

EGLE has established the set-asides and requests funding for each set-aside based on what is needed to effectively administer the public drinking water programs, to enhance public health protection, and the protection of surface and ground waters through additional non-regulatory programs, projects, and activities. In recent years, EGLE has become more dependent on the funding provided by the set-asides to fund the staff needed to effectively administer the programs because the federal Public Water Supply Supervision grant awards have not increased to cover the costs of additional work required to implement several new federal drinking water regulations nor for inflation.

In FY 2019, the DWEHD workload continued to increase. This is due to activities such as our response to the statewide Per- and Polyfluoroalkyl Substances (PFAS) sampling effort, and preparation and education to implement the new Michigan Lead and Copper Rule. The

DWEHD continues to need additional staff resources to adequately oversee water system compliance and be involved with the development of information technology projects, with the mission of protecting public health.

Each year Michigan is required to submit detailed work plans to the EPA for approval describing how each set-aside fund will be expended or the amount to be reserved. Work plans for the FY 2020 set-asides will be submitted to the EPA in late summer-early fall 2019.

Administration

Up to 4 percent of the federal capitalization grant can be used to administer the fund. Michigan intends to utilize the full 4 percent from the 2019 grant which is $1,080,440. Any funds not utilized in FY 2020 will be retained on account for administration costs in future years.

Small Systems Technical Assistance

EGLE is requesting two percent of the 2019 grant, or approximately $540,220 for small system technical assistance. These funds will support staff that provide technical assistance to small public water systems. This work includes, but is not limited to:

- Provide technical assistance to local health department (LHD) staff responsible for implementation of the Noncommunity Water Supply (NCWS) program in Michigan.
- Assist LHD staff in providing direct technical assistance to NCWS owners and operators, registered well drillers, and pump installers.
- Oversee the work conducted by the LHDs to implement the NCWS program throughout Michigan.
- Assist small nontransient, noncommunity public water supplies, formerly on an arsenic bottled water agreement, gain compliance with the arsenic maximum contaminant level by installing water treatment systems or using some other compliance option.
- Review engineering plans and issue permits for treatment systems at NCWSs. Provide direct assistance to small public water supplies that are exploring treatment options for PFAS.
- Provide direct assistance to small public water systems that employ treatment to comply with drinking water standards, primarily those that treat for arsenic and for nitrates.
- Provide direct assistance to facilities that are exploring or have installed secondary treatment for public health purposes therefore becoming a small public water supply.
- Conduct one-on-one or group technical training for LHD staff, NCWS owners and operators, and other stakeholders involved in the operation and maintenance of small systems. This technical training typically focuses on:

    - Sampling and monitoring practices;
    - Completing the preliminary Distribution System Materials Inventory (DSMI) under the Michigan Lead and Copper Rule.
    - Performing Revised Total Coliform Rule Level 1 assessments and Seasonal Start Up Procedures;
    - Compliance with NCWS regulations or Michigan's well construction code;
    - Investigatory techniques used to identify a problem with a NCWS or well and remedies to correct a given problem;
    - Cross connection control, including proper use and maintenance of control devices; and
    - Properly completing and submitting all required documentation or certifications, such as monthly operation reports.

- Assist LHD, NCWS, and consultants involved with the development and operation of small systems with understanding rule and code requirements to improve compliance rates.
- Draft technical guidance documents, fact sheets, brochures, or forms that can be used by the LHDs or distributed to NCWSs, well drillers, and pump installers to help improve or maintain compliance with applicable regulations.
- Administer Michigan's NCWS database, WaterTrack.
- Provide clerical, managerial, and administrative support to the scientific and engineering staff performing the activities listed above.

In addition, the funds in this set-aside will be used in FY 2020 for the following program activities:

- Training for the LHD staff responsible for implementation of the NCWS program in Michigan.
- Ongoing maintenance of the database system, WaterTrack, which houses all the NCWS program data.

Program Set-Asides

EGLE is requesting funds for one state program management set-aside in the 2019 grant, the Public Water System Supervision Program. The following is a breakdown of the projected amount:

Public Water System Supervision

EGLE requests $2,701,100, or 10 percent of the 2019 grant, to support staff and the existing scope of the CWSS Public Water System Supervision Program. This work includes, but is not limited to:

- Maintain an inventory of public water supplies in Michigan.
- Provide compliance assistance to public water supplies.
- Implement a centralized approach to the oversight of surface water treatment of public water supplies.
- Conduct sanitary surveys and surveillance visits at public water supplies.
- Issue permits for new construction or for modifications.
- Assess public water supply compliance with the federal SDWA, the National Primary Drinking Water Standards, Michigan's Safe Drinking Water Act, 1976 Public Act 399, as amended (Act 399), and the Administrative Rules.
- Initiate escalated enforcement actions, when indicated, to compel a public water supply to comply with applicable federal and state drinking water regulations.
- Maintain program data and submit reports to the EPA as required.
- Maintain a drinking water operator training and certification program.
- Draft Michigan's Annual Capacity Development Report and the Triennial Capacity Development Report to the Governor.
- Provide clerical, managerial, and administrative support to the scientific and engineering staff performing the activities listed above.

The funds in this set aside will be used to support local health departments with noncommunity water supply compliance assistance program work.

Wellhead Protection (Section 1452(k))

EGLE is requesting $1,350,550 for the Wellhead Protection set-aside from the 2019 grant, approximately 5 percent of the 2019 grant. The amount requested will be used to support staff responsible for the following work:

- Prioritize efforts relative to emerging issues such as PFAS in groundwater to ensure a more robust dataset for decision making and public health protection.
- Update and distribute technical guidance related to PFAS contamination in drinking water from groundwater supplies, including fact sheets, information for distribution to stakeholders and the public, including communication routes like the MI Environment Web site.
- Provide training and oversight to Michigan Geological Survey in their work (contracted using state funds) to enter well construction records into Wellogic. Begin developing a durable and ongoing process for quality control and quality assurance of information entered into Wellogic.
- Manage and maintain Wellogic, Michigan's on-line water well data system.
- Update the Source Water Assessments (SWA) for Community Water Supplies and Noncommunity Water Supplies. Provide education and outreach on wellhead protection, including providing delineations of wellhead protection areas to community water supplies and nontransient noncommunity water supplies. This will utilize management and other tools as they become available.
- Review and process SWAs submitted by the LHDs. DWEHD technical staff will track the updates and determine if the nontransient NCWSs qualify for substantial implementation of source water protection activities.
- Attend ongoing training, tools and trends in areas of groundwater protection and source evaluations, including new GIS technologies.
- Review and approve traditional wellhead delineations submitted by community water supplies.
- Administer the wellhead protection matching grant program to local communities.
- Register well drillers and pump installers to ensure they are qualified to construct wells or install well equipment, according to Michigan's well construction code requirements.
- Ensure wells are constructed to code, initiate enforcement for compliance, or revoke registrations from a well driller or pump installer when necessary.
- Administer the Abandoned Well Management Program.
- Collaborate on issues, training, and projects identified by members of the Director's WaterWell Advisory Committee formed in 2015.
- Provide technical training and assistance to public water supplies, LHD’s, well drillers, pump installers, and septage waste haulers.
- Provide clerical, managerial, and administrative support to the scientific and engineering staff performing the activities listed above.
- Administer the On-site Wastewater Program, including evaluating each LHD’s on-site wastewater program for consistency and assurance that minimum program requirements are met.
- Promote the need for a statewide sanitary code and assist with efforts to promulgate one.
- Review construction plans and issuance of permits for on-site wastewater installations or modifications at campgrounds to ensure site suitability, installation and operation.
- Evaluate and approve the use of new technologies for treatment of on-site wastewater.
- Administer the Septage Waste Program, including the licensing of septage waste haulers and permitting land application sites.

In addition, the funds in this set-aside will be used for the following program activities:

- Implementation of wellhead protection activities.
- Maintenance of the Wellogic database software.
- Subscription to EQuIS, an electronic data management system and decision support system. EQuIS is currently the solution for EGLE to gather, handle, and store PFAS drinking water data collected from public water supplies.
- Grants to local communities to increase source water protection efforts and initiatives. EGLE plans to utilize approximately $400,000 from the 2019 Wellhead Protection Set-Aside to provide the state funding for these 50/50 match grants.
- Water well construction technical training for LHD staff.
- Onsite wastewater technical training for LHD staff.
- DWEHD is partnering with American Water Works Association, Michigan State University Institute of Water Research, and Michigan Rural Water Association to host a Source Water Protection Conference on October 29-30, 2019. This conference will provide opportunities to learn about management options for source water protection and steps public water supplies can take to develop or enhance an existing program. Designed for communities and public water supplies, attendees will learn about a variety of important topics that include ground and surface water protection issues, wellhead protection, risk communication, funding initiatives, emerging contaminants and state program updates. Participants will have the opportunity to identify the challenges and opportunities that communities are facing as they work to update existing source water protection programs and implement new and innovative concepts, strategies and technologies. This conference is intended for community water supply personnel, local officials, community representatives, local, state and federal partners, consultants, service providers, and those with an interest in source water protection.

Local Assistance for Capacity Development (Section 1452(k))

EGLE is requesting approximately $2,701,100 or 10 percent of the 2019 grant, for the Local Assistance for Capacity Development Set-Aside for staff and other source water protection activities. The staff funded by this set-aside are responsible for providing direct technical assistance to public water supplies to enhance and maintain their technical, managerial and financial capabilities. Specific duties include:

- Assist public water supplies in acquiring and maintaining capacity as outlined in Michigan's Capacity Development Strategy for Existing Water Systems, dated August 1, 2000.
- Educate public water supplies about the Surface Water Intake Grant Program and provide assistance to surface water systems in the development and implementation of a Surface Water Intake Protection Program Plan.
- Continue and expand the implementation of source water select cyanotoxin screening and source water assessment methodology for surface water sources. Surface water sources utilized will be sampled at least once per month from July through October 2019. State of Michigan Renew Michigan Funding will be utilized for sample collection and analysis. Raw and finished water samples will be collected. The samples will be analyzed for microcystins and nodularins, cylindrospermopsin, and anatoxin-a. The set-aside funds will be utilized to provide technical assistance to supplies, including prompt assistance if any cyanotoxins are detected in the raw or finished tap. Water data will be reviewed as it becomes available with public health protection as the primary objective. In FY 2020, when the sampling effort concludes, the complete data set of this voluntary sampling effort will be reviewed for successes, improvements, and lessons learned in an effort to continue to receive support for this sampling.

- Provide technical guidance related to PFAS detections in surface water systems. The State of Michigan is funding sampling of all that utilize surface water for PFAS at least once per month from May through October 2019. Raw and finished water samples will be collected. Data will be reviewed as it becomes available with public health protection as the primary objective. In FY 2020, when the sampling effort concludes, the complete data set from this voluntary sampling effort will be reviewed for successes, improvements, and lessons learned to help public water systems determine next steps.
- Assist public water supplies vulnerable to PFAS, including providing information on treatment technologies, alternate sources, additional sampling, education, and communication.
- Coordinate with other departmental programs and state and federal agencies in the development and integration of drinking water protection strategies. In particular this includes EGLE Water Resources Division, EGLE Remediation and Redevelopment Division, and Department of Health and Human Services on lead, PFAS and HABs. This coordinated approach benefits both the public water supplies and the public.
- Provide extensive training for new and existing staff, including continuation of the successful "Rule School" series to provide an in-depth review of the Act 399 Rules; a rolling six-week series of new analyst training; and an extensive training series on engineering topics in both classroom and hands-on settings. These trainings, in addition to outside training for staff, are positively impacting the consistency and technical expertise available to the regulated community.
- Educate water supplies and operators on the new Michigan Lead and Copper Rule requirements, including inventory, sampling, corrosion control optimization and lead service line removal.
- Receive and review monitoring data and make associated compliance determinations in a consistent and coordinated manner. Educate water supplies about proper sampling methodologies and the timely and complete submittal of data to ensure that any exceedances are addressed.
- Provide guidance to assist supplies in preparing required reports to ensure that they meet regulations.
- Conduct sanitary surveys within the required timeframes.
- Conduct plan reviews for source changes and water supply improvements.
- Perform source water assessments at CWSs.
- Provide one-on-one technical assistance and consultation with water supply personnel to assist in the understanding of, and compliance with, state and federal requirements.
- Review asset management plans, general plans, reliability studies, and engineering studies to assure regulatory compliance and optimum performance.
- Provide cross connection control guidance and training and continue to assist CWS with the development of residential cross connection programs.
- Continue staff involvement in operator training classes to enhance the Operator Certification and Training Program.
- Explore innovative methods to reach water supply owners and operators to promote greater long-term compliance, including the use of one-minute videos on YouTube.
- Provide reminder letters for compliance activities.
- Provide emergency response training to internal staff, with subsequent follow-up to water supplies.

In addition, the funds in this set-aside will be used for the following program activities:

- Continue the surface water intake protection program.
- Determine if new community water supplies meet the financial adequacy requirements of the capacity development program.
- Reimburse LHDs for updating source water assessments at nontransient NCWSs.

- Reimburse LHDs for performing capacity assessments at new or existing nontransient NCWSs.
- Reimburse LHDs for performing annual site visits in situations where the noncommunity public water supply provides treatment for public health purposes.
- Purchase Field Analysis Equipment and Technical Assistance Reference Materials. These will be available to district staff for technical assistance and training to public water supplies.

VII. CRITERIA AND METHOD FOR DISTRIBUTION OF FUNDS - PROJECT LOANS

Michigan's DWSRF will commit loans for qualified projects based on project plans that were submitted to WIFS by May 1, 2019. Plans were reviewed by EGLE staff to ensure compliance with Section 5405 of Act 451, before being placed on the PPL for FY 2020. The DWSRF, to the maximum extent practicable, must give priority to projects that:

- address the most serious risks to human health;
- are necessary to ensure compliance with the requirements of the federal SDWA; and
- assist systems most in need according to the state's affordability requirements.

Michigan's priority system takes these factors into account in the assignment of priority points. Acute violations receive a larger number of points than any other category. In fact, standard compliance offers over 41 percent of a project's total possible points. All factors point to the need for the project to comply with federal drinking water requirements. Affordability is addressed by the award of additional points for disadvantaged community status and is the ultimate tiebreaker. Michigan's priority point system is detailed in Section 5406 of Act 451.

The FY 2020 draft DWSRF PPL is included as part of the IUP and was presented as part of the public hearing on August 21, 2019.

Section 1452(a)(2) of the federal SDWA requires the state to first make available 15 percent of all funds annually credited to the DWSRF for financial assistance to water suppliers serving fewer than 10,000 persons. For the 2019 capitalization grant, Michigan must reach or exceed $4,051,650 to satisfy this requirement.

All projects are reviewed and scored based upon the priority point system outlined in Part 54 of Act 451. Funds are made available for commitment based on the priority ranking and projects will only be funded out of order to satisfy requirements for small community assistance.

Employing the criteria found in Section 5415 of Act 451, the EGLE Director has set the interest rate at 2.0 percent for FY 2020. The term of the loans will run up to 20 years for most projects. Those suppliers meeting disadvantaged community criteria will, however, be able to extend their terms up to 30 years, if desired.

Part 54 of Act 451 also permits suppliers serving less than 10,000 persons to receive reimbursement of project planning costs upon delivery of an approvable project plan to EGLE. Legislation has been passed to provide a funding mechanism for this reimbursement. Interim planning loans first became an option for DWSRF applicants in FY 2001.

VIII. DISADVANTAGED BUSINESS ENTERPRISE

Beginning October 1, 2009, EGLE implemented the EPA's Disadvantaged Business Enterprise (DBE) Rule (40 CRF Part 33). The DBE rule applies specifically to ANY procurement made utilizing EPA financial assistance. The EPA financial assistance includes DWSRF funding. The DBE rule changed substantially from the prior Minority Business Enterprise (MBE) and Women's Business Enterprises (WBE) rule. The DBE rule requires that MBE and WBE firms be certified. Certification

applies to enterprises that are at least 51 percent owned and/or controlled by socially and economically disadvantaged individuals who are of good character, are citizens of the United States, and have an initial and continued personal net worth of less than $750,000.

DBE requirements apply to EGLE, DWSRF loan recipients, and the loan recipient's prime contractors. Additional information regarding the DBE requirements is available on EGLE's DWSRF website (http://www.michigan.gov/drinkingwaterrevolvingfund).

IX. DISADVANTAGED COMMUNITY STATUS

Disadvantaged community status is determined by EGLE based on information submitted with a water supplier's project plan. To qualify, an applicant must first meet the definition of "municipality" found in Part 54 of Act 451. Next, the updated median annual household income (MAHI) of the area to be served must be less than 120 percent of the state's updated MAHI. Finally, the costs of the project must be borne by the customers in the service area. If costs are spread over a larger area, then that area must demonstrate that it meets the poverty or affordability criteria.

Once these conditions are met, a community will be awarded the disadvantaged community status if one of the following is true:

- More than 50 percent of the area to be served by the proposed project is identified as a poverty area by the U.S. Census Bureau.
- The updated MAHI of the area to be served is less than the most recently published federal poverty guidelines for a family of four in the contiguous United States.
- The updated MAHI is less than the updated statewide MAHI and the annual user costs for water supply exceed 1 percent of the service area's MAHI.
- The updated MAHI is more than the updated statewide MAHI and the annual user costs for water supply exceed 3 percent of the service area's MAHI.

The major benefits for qualified communities include 50 additional priority points, extension of loan terms to 30 years principal forgiveness and assistance to help defray the costs of preparing project plans if the population is less than 10,000.

A complete discussion of the disadvantaged community status may be found in a guidance document prepared by EGLE to explain how a supplier can achieve the status and benefit from it. WIFS staff encourages all applicants to supply the pertinent data to allow EGLE to perform a disadvantaged community status analysis.

X. EPA AUTOMATED CLEARINGHOUSE ACTIVITIES

The EPA employs an Automated Standard Application for Payments (ASAP) system to make disbursements of federal funds. Michigan will comply with this system's requirements and deposit funds drawn from it into appropriate accounts set up for the DWSRF.

Beginning in the 1st quarter of FY 2020, Michigan anticipates drawing capitalization grant funds from the ASAP system. Michigan will draw 100 percent state funds first followed by the federal funds.

XI. ASSURANCES

The final guidelines from the EPA set forth provisions that the state must provide certain assurances in order to qualify for capitalization grant funding. Such assurances are incorporated into the Operating Agreement and are included here by reference. EGLE has a Quality Management Plan that guides our selection of qualified staff, and that the relevant staff is in place to work on DWSRF projects. DWSRF project information will continue to be provided to the EPA via the Drinking Water Project & Benefits Reporting (PBR) and the National Information Management

System (NIMS). All projects funded in FY 2020 will meet the equivalency requirements for crosscutter review and Federal Funding Accountability & Transparency Act (FFATA).

XII. OUTPUT/OUTCOME MEASURES

To comply with the EPA requirements on Environmental Benefits of the DWSRF, Michigan estimates that the following outputs could result from project loans in FY 2020 (including any projects noted as future on the PPL):

A. Output: Michigan could fund approximately 34 drinking water transmission/ distribution loans to construct/rehabilitate/upgrade drinking water transmission and distribution systems across the state. The dollar amounts of these applications total approximately $479 million.

   Outcome: The funding of these projects could result in more people receiving improved drinking water from existing treatment systems in Michigan.

B. Output: Michigan could fund approximately ten drinking water treatment projects to construct and/or rehabilitate drinking water treatment facilities across the state. The dollar amount of these application total approximately $22 million.

   Outcome: The funding of these projects could result in improved drinking water for thousands of people in Michigan and upon completion of the project, facilities that meet all applicable permits and SDWA requirements.

C. Output: Michigan could fund approximately two drinking water storage projects to construct and/or rehabilitate drinking water storage facilities across the state. The dollar amount of the application totals approximately $1.6 million.

   Outcome: The funding of this project could result in the improved drinking water and storage facilities that meet all applicable permits and SDWA requirements.

D. Output: Michigan could fund one drinking water source project to construct and/or rehabilitate drinking water source facilities across the state. The dollar amount of the application totals approximately $745,285.

   Outcome: The funding of this project could result in more people receiving improved drinking water from a new or rehabilitated water source that meets all applicable permits and SDWA requirements.

Please note that the number of applications will not agree with the number of loans on the PPL, as many of the project loans include work in more than one category (i.e., transmission/distribution, treatment, storage, and source).

XIII. PUBLIC REVIEW AND COMMENT

In order to satisfy public participation requirements, EGLE held a public hearing to discuss the DWSRF draft IUP on August 21, 2019. The hearing was publicly noticed in the *Detroit Legal News,* the *Lansing State Journal,* and the *Marquette Mining Journal;* posted on the EGLE calendar of events; mailed to all persons and engineering firms on our mailing list; and individually noticed to each water supplier on the FY 2020 draft PPL. These sources promote the hearing to ensure maximum public input from those interested in the DWSRF. The hearing affords stakeholders and other interested parties an opportunity to hear and comment on how EGLE plans to disburse the DWSRF loan funds.

Questions about the DWSRF IUP may be directed to:

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Finance Division
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Other contacts for the DWSRF are:

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Drinking Water and Environmental Health Division Department
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Ms. Deborah M. Roberts, Executive Director Michigan
Finance Authority
Michigan Department of Treasury
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XIV. ORIGINATION OF DOCUMENTS

EGLE is responsible for issuing the DWSRF IUP and its accompanying information.

Department of Environment, Great Lakes and Energy

Current PPL

DWRF

Rank	Project #	Project Name, Location and Description			Population	Total Points	Binding Com Date	Binding Com Amount
PROJECTS WITH PRIOR YEAR SEGMENTS								
1	7473-99	City of Highland Park	Wayne County	Future wm repl phases, lslr	11,398	465	Future	$81,525,000
2	7461-02	GLWA	Oakland County	14 Mile Rd Trans Main Loop, Ph 2	3,600,000	400	Future	$46,000,000
3	7445-02	GLWA	Wayne County	Northeast Trans Main, Phase 2	3,600,000	375	08/07/2020	$92,030,000
3	7445-03	GLWA	Wayne County	Northeast Trans Main, Phase 3	3,600,000	375	Future	$50,320,000
PROJECTS WITHOUT PRIOR YEAR SEGMENTS								
4	7464-01	City of Benton Harbor	Berrien County	wm repl,lslr, elev strg imp	10,020	615	05/19/2020	$4,465,000
5	7482-01	City of Kalamazoo	Kalamazoo County	wm repl & ext, lead sl repl	144,500	525	02/28/2020	$22,700,000
6	7458-01	City of Owosso	Shiawassee County	wm replac, lslr	14,539	515	Future	$12,975,000
7	7457-01	City of Owosso	Shiawassee County	elev strg imp, WTP imp, wm repl	14,539	490	02/28/2020	$3,500,000
8	7473-01	City of Highland Park	Wayne County	wm replac, lslr phase 1	11,398	465	05/19/2020	$14,020,000
9	7418-01	City of Muskegon Heights	Muskegon County	Watermain & meter replacement	10,800	465	Future	$5,735,000
10	7436-01	City of St. Joseph	Berrien County	Wm replac, lslr	33,000	465	02/28/2020	$1,750,000
11	7470-01	City of Howell	Livingston County	W. Grand River watermain repl	9,203	430	Future	$2,675,000
12	7469-01	City of Howell	Livingston County	Clinton St. watermain repl	9,203	430	Future	$1,400,000
13	7462-01	City of Howell	Livingston County	WTP & well improv, wm repl	9,203	430	05/19/2020	$975,000
14	7480-01	Spring Arbor Township	Jackson County	New wellfield, wm ext	2,100	420	02/28/2020	$3,370,000
15	7426-01	City of Rochester	Oakland County	Watermain replacement & transm	13,660	415	02/28/2020	$5,950,000
16	7466-01	City of Muskegon	Muskegon County	WFP impr, PS impr, wm & lsl repl	38,500	415	08/07/2020	$6,095,000
17	7468-01	City of Muskegon	Muskegon County	WFP chem feed, wm & lsl repl	38,500	415	Future	$4,130,000
18	7467-01	City of Muskegon	Muskegon County	WFP impr, wm & lsl repl	38,500	415	Future	$3,035,000
19	7442-01	East Lansing	Ingham County	WTP filt add & controls	79,585	400	Future	$2,900,000
20	7441-01	East Lansing	Ingham County	HVAC upgrd	79,585	400	05/19/2020	$1,135,000
21	7461-01	GLWA	Oakland County	14 Mile Rd Trans Main Loop, Ph 1	3,600,000	400	05/19/2020	$8,400,000
22	7430-01	Village of Lake Orion	Oakland County	Watermain replacement Ph 3 & 4	3,032	395	05/19/2020	$4,390,000
23	7460-01	DWSD/GLWA	City of Detroit, Wayne County	Wm replac, lslr	650,000	375	05/19/2020	$32,635,000
24	7483-01	DWSD/GLWA	City of Detroit, Wayne County	wm replac, lslr	650,000	375	05/19/2020	$24,865,000
25	7463-01	City of South Haven	Van Buren County	Wm replac, lslr	11,650	340	11/15/2019	$1,210,000
26	7452-01	Livonia	Wayne County	WM repl (Project Area #1-3)	96,942	325	05/19/2020	$10,525,000

Project Type: DWRF Loan Fiscal Year: 2020 Include 4th Quarter From Previous FY: No

27	7434-01	City of Dearborn	Wayne County	Watermain replacement Area 1 20	100,000	325	Future	$8,000,000
28	7453-01	Livonia	Wayne County	WM repl (Project Area #4-6)	94,060	325	Future	$5,300,000
29	7454-01	Livonia	Wayne County	WM repl (Project Area #7-9)	94,060	325	Future	$4,815,000
30	7433-01	City of Dearborn	Wayne County	Watermain replacement area 1	100,000	325	Future	$4,500,000
31	7435-01	City of Dearborn	Wayne County	Watermain replacement area 2	100,000	325	Future	$3,500,000
32	7472-01	City of Ann Arbor	Washtenaw County	UV disinf	125,000	325	11/15/2019	$3,100,000
33	7437-01	City of St. Joseph	Berrien County	WTP improvement, watermain repla	33,000	315	Future	$35,565,000
34	7459-01	Charter Township of Port Huron	St. Clair County	wm replac	10,654	315	08/07/2020	$6,215,000
35	7425-01	City of Fraser	Macomb County	Watermain repl, PRVs	14,084	315	02/28/2020	$3,800,000
36	7479-01	Charter Township of White Lake	Oakland County	Iron filtration	6,000	305	08/07/2020	$3,615,000
37	7465-01	Village of White Pigeon	St Joseph County	Wm replac, lsl replac	1,530	295	05/19/2020	$1,665,000
38	7481-01	City of Marquette	Marquette County	wm replac	24,500	240	05/19/2020	$1,995,000
Total 39 Projects								**$530,780,000**

Department of Environment, Great Lakes and Energy

Drinking Water Revolving Loan Fund PPL Scoring

Category Description	Points	7418-01	7425-01	7426-01	7430-01	7433-01	7434-01	7435-01	7436-01	7437-01	7439-01	7441-01	7442-01	7445-02	7445-03	7452-01
Drinking Water System Compliance Total	**450 (max)**	150	150	150	150	150	150	150	150	150	0	150	150	150	150	150
Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**250**															
Non-Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**200**															
Facility Upgrade to Maintain Compliance	**150**	■	■	■	■	■	■	■	■	■		■	■	■	■	■
Aesthetic Upgrades to Maintain Compliance	**25**															
Infrastructure Improvements/Upgrades - Total	**350 (max)**	125	25	125	125	25	25	25	175	25	0	100	100	75	75	25
Source/Treatment with Connecting Mains	**125 (max)**	125	0	0	0	0	0	0	125	0	0	100	100	0	0	0
Meet Minimum Capacity	**100**	■							■							
Relliability	**75**	■							■			■	■			
Other Upgrades	**25**	■							■			■	■			
Enforcement Action	**25**															
Source Water Protection	**50**															
Transmission/Distribution Mains	**125 (max)**	0	25	125	125	25	25	25	25	25	0	0	0	75	75	25
Meet Minimum Capacity	**100**			■	■											
Relliability	**75**													■	■	
Other Upgrades	**25**		■	■	■	■	■	■	■	■						■
Enforcement Action	**25**															
Storage Facilities/Pumping Stations	**125 (max)**	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
Meet Minimum Capacity	**100**															
Relliability	**75**															
Other Upgrades	**25**								■							
Enforcement Action	**25**															
Population - Total	**50 (max)**	40	40	40	20	50	50	50	40	40	0	50	50	50	50	50
0 - 500	**10**										■					
501 - 3,300	**20**				■											
3,301 - 10,000	**30**															
10,001 - 50,000	**40**	■	■	■					■	■						
> 50,000	**50**					■	■	■				■	■	■	■	■
Disadvantaged Community - Total	**50 (max)**	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Granted	**50**	■														
Consolidation - Total	**100 (max)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achieve Compliance	**100**															
Correct Deficiencies	**60**															
Other	**40**															
Comp. Wellhead/Source Water Protect Plans - Total	**100 (max)**	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100
Granted	**100**	■	■	■	■	■	■	■	■	■		■	■	■	■	■
Total Priority Points Assigned	**1000 (max)**	465	315	415	395	325	325	325	465	315	0	400	400	375	375	325

Fiscal Year: 2020

Friday, September 20, 2019 4:04 PM

Department of Environment, Great Lakes and Energy

Drinking Water Revolving Loan Fund PPL Scoring

Category Description	Points	7453-01	7454-01	7457-01	7458-01	7459-01	7460-01	7461-01	7461-02	7462-01	7463-01	7464-01	7465-01	7466-01	7467-01	7468-01
Drinking Water System Compliance Total	**450 (max)**	150	150	150	150	150	150	150	150	150	150	350	150	150	150	150
Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**250**															
Non-Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**200**											■				
Facility Upgrade to Maintain Compliance	**150**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Aesthetic Upgrades to Maintain Compliance	**25**															
Infrastructure Improvements/Upgrades - Total	**350 (max)**	25	25	200	225	125	25	100	100	150	100	175	125	75	75	75
Source/Treatment with Connecting Mains	**125 (max)**	0	0	75	75	0	0	0	0	25	0	0	0	25	25	25
Meet Minimum Capacity	**100**															
Relliability	**75**			■												
Other Upgrades	**25**				■					■				■	■	■
Enforcement Action	**25**															
Source Water Protection	**50**				■											
Transmission/Distribution Mains	**125 (max)**	25	25	125	125	125	25	100	100	125	100	125	125	25	25	25
Meet Minimum Capacity	**100**			■	■	■				■		■	■			
Relliability	**75**			■	■			■	■		■					
Other Upgrades	**25**	■	■	■		■	■	■	■	■	■		■	■	■	■
Enforcement Action	**25**											■				
Storage Facilities/Pumping Stations	**125 (max)**	0	0	0	25	0	0	0	0	0	0	50	0	25	25	25
Meet Minimum Capacity	**100**															
Relliability	**75**															
Other Upgrades	**25**				■							■		■	■	■
Enforcement Action	**25**											■				
Population - Total	**50 (max)**	50	50	40	40	40	50	50	50	30	40	40	20	40	40	40
0 - 500	**10**															
501 - 3,300	**20**												■			
3,301 - 10,000	**30**									■						
10,001 - 50,000	**40**			■	■	■					■	■		■	■	■
> 50,000	**50**	■	■				■	■	■							
Disadvantaged Community - Total	**50 (max)**	0	0	0	0	0	50	0	0	0	50	50	0	50	50	50
Granted	**50**						■				■	■		■	■	■
Consolidation - Total	**100 (max)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achieve Compliance	**100**															
Correct Deficiencies	**60**															
Other	**40**															
Comp. Wellhead/Source Water Protect Plans - Total	**100 (max)**	100	100	100	100	0	100	100	100	100	0	0	0	100	100	100
Granted	**100**	■	■	■	■		■	■	■	■				■	■	■
Total Priority Points Assigned	**1000 (max)**	325	325	490	515	315	375	400	400	430	340	615	295	415	415	415

Department of Environment, Great Lakes and Energy

Drinking Water Revolving Loan Fund PPL Scoring

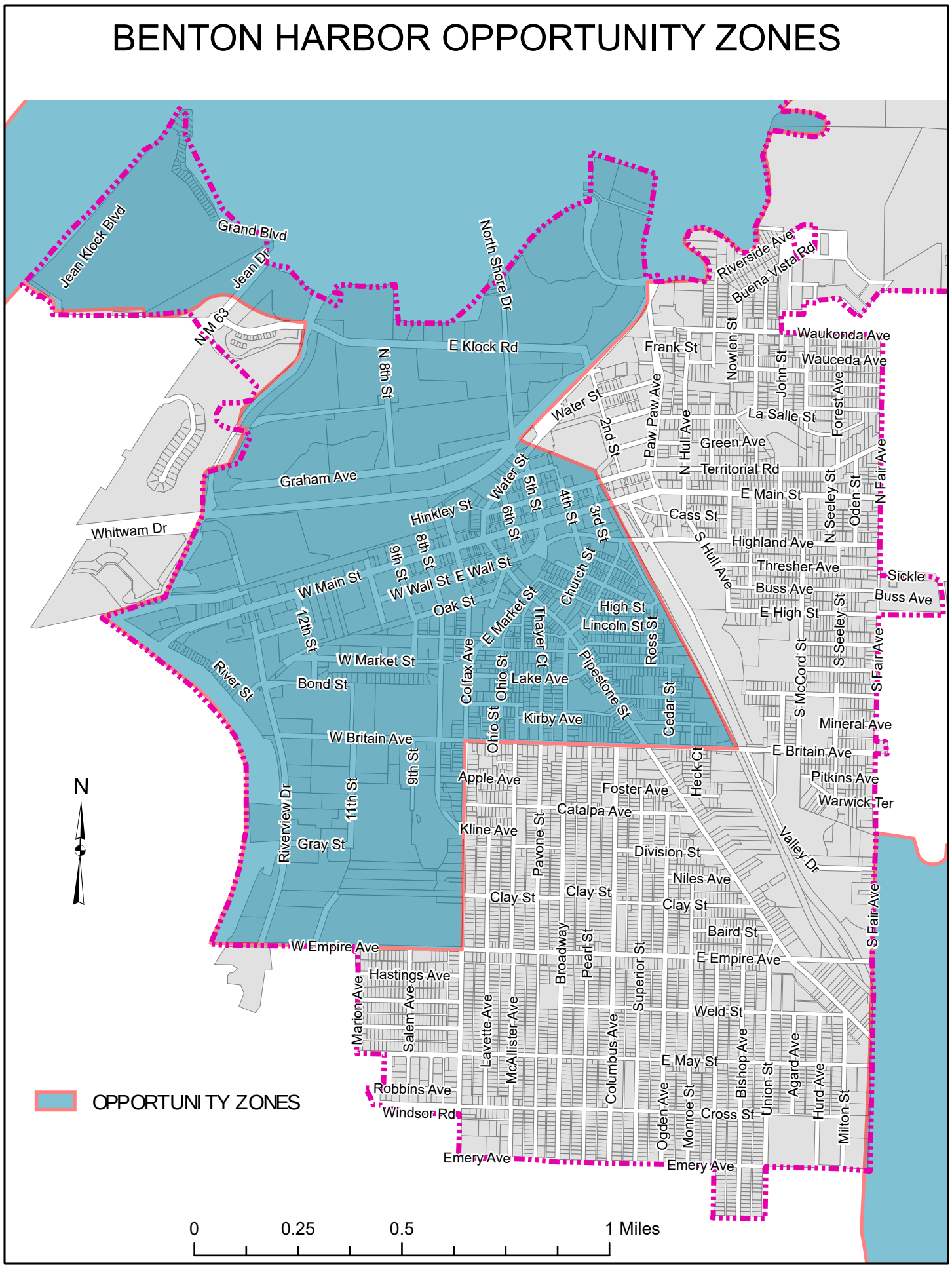
Category Description	Points	7469-01	7470-01	7472-01	7473-01	7473-99	7479-01	7480-01	7481-01	7482-01	7483-01
Drinking Water System Compliance Total	**450 (max)**	150	150	150	150	150	175	150	150	350	150
Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**250**										
Non-Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**200**									■	
Facility Upgrade to Maintain Compliance	**150**	■	■	■	■	■	■	■	■	■	■
Aesthetic Upgrades to Maintain Compliance	**25**						■				
Infrastructure Improvements/Upgrades - Total	**350 (max)**	150	150	25	125	125	0	250	50	125	25
Source/Treatment with Connecting Mains	**125 (max)**	25	25	25	0	0	0	125	0	0	0
Meet Minimum Capacity	**100**							■			
Relliability	**75**										
Other Upgrades	**25**	■	■	■				■			
Enforcement Action	**25**										
Source Water Protection	**50**										
Transmission/Distribution Mains	**125 (max)**	125	125	0	125	125	0	125	25	125	25
Meet Minimum Capacity	**100**	■	■					■		■	
Relliability	**75**				■	■				■	
Other Upgrades	**25**	■	■		■	■		■	■		■
Enforcement Action	**25**				■	■					
Storage Facilities/Pumping Stations	**125 (max)**	0	0	0	0	0	0	0	25	0	0
Meet Minimum Capacity	**100**										
Relliability	**75**										
Other Upgrades	**25**								■		
Enforcement Action	**25**										
Population - Total	**50 (max)**	30	30	50	40	40	30	20	40	50	50
0 - 500	**10**										
501 - 3,300	**20**							■			
3,301 - 10,000	**30**	■	■				■				
10,001 - 50,000	**40**				■	■			■		
> 50,000	**50**			■						■	■
Disadvantaged Community - Total	**50 (max)**	0	0	0	50	50	0	0	0	0	50
Granted	**50**				■	■					■
Consolidation - Total	**100 (max)**	0	0	0	0	0	0	0	0	0	0
Achieve Compliance	**100**										
Correct Deficiencies	**60**										
Other	**40**										
Comp. Wellhead/Source Water Protect Plans - Total	**100 (max)**	100	100	100	100	100	100	0	0	0	100
Granted	**100**	■	■	■	■	■	■				■
Total Priority Points Assigned	**1000 (max)**	430	430	325	465	465	305	420	240	525	375

CITY OF BENTON HARBOR

Summary of Funding Needed for Sewer/Water Projects to be completed from 2020-2022

	2020	2021	2022	2023	2024	2025	Notes
FUNDING SUMMARY							
Utility Budget Shortfall	$ (900,000)	$ (932,613)	$ (937,934)	$ (250,472)	$ 35,558	$ 345,133	Gets Sewer/Water Fund self supportive
New Debt	$ -	$ (108,474)	$ (213,006)	$ (212,343)	$ (211,681)	$ (211,018)	
Transfer In from General Fund & Road Fund	$ 300,000	$ -	$ -	$ -	$ -	$ -	To-Date
Refund Transfer from General & Road Funds	$ (300,000)	$ -	$ -	$ -	$ -	$ -	
Transfer In from Income Tax	$ 900,000	$ 645,000	$ 740,000	$ 32,000	$ -	$ -	To Refund Transfers and Balance Budget/Expenses
Transfer In from PPI	$ -	$ 200,000	$ 200,000	$ 200,000	$ 25,000	$ -	For Water Tower
Rate Adjustments	$ -	$ 237,000	$ 259,000	$ 280,000	$ 308,000	$ 335,000	
NET FUNDS	**$ -**	**$ 40,913**	**$ 48,060**	**$ 49,185**	**$ 156,877**	**$ 469,115**	
PPI Fund							
PPI Fund Balance	$ 238,500	$ 188,500	$ 138,500	$ 88,500	$ 38,500	$ 163,500	
Receipts	$ -	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	No Increase (budgeted $168k in 2020)
Expenses Committed	$ (50,000)	$ -	$ -	$ -	$ -	$ -	DPW Work
Transfers Out to Utility Fund	**$ -**	**$ (200,000)**	**$ (200,000)**	**$ (200,000)**	**$ (25,000)**	**$ -**	For Water Tower Construction
New Balance	$ 188,500	$ 138,500	$ 88,500	$ 38,500	$ 163,500	$ 313,500	Good for other expenditures By 2024
Income Tax Fund							
Income Tax Fund Balance	$ 2,400,000	$ 1,100,000	$ 855,000	$ 965,000	$ 2,033,000	$ 3,133,000	
Less Reserves	$ (400,000)	$ (600,000)	$ (400,000)	$ (400,000)	$ (400,000)	$ (400,000)	Higher Reserves in 2021 due to COVID
Receipts	$ -	$ 1,000,000	$ 1,250,000	$ 1,500,000	$ 1,500,000	$ 1,500,000	Lower Receipts in 2021/22 due to COVID
Transfers Out to Utility Fund	**$ (900,000)**	**$ (645,000)**	**$ (740,000)**	**$ (32,000)**	**$ -**	**$ -**	
New Balance	$ 1,100,000	$ 855,000	$ 965,000	$ 2,033,000	$ 3,133,000	$ 4,233,000	Good for other road work by 2023
Rate Adjustments							
Water Rate Increase		9.95%	9.95%	9.95%	9.95%	9.95%	
Cost per Service/month		$ 5.00	$ 5.50	$ 6.00	$ 6.67	$ 7.33	
Funds Raised		$ 150,000	$ 165,000	$ 180,000	$ 200,000	$ 220,000	
Sewer Rate Increase		7%	7%	7%	7%	7%	
Cost per Service/month		$ 2.90	$ 3.13	$ 3.33	$ 3.60	$ 3.83	
Funds Raised		$ 87,000	$ 94,000	$ 100,000	$ 108,000	$ 115,000	
Street Fund							
Street Fund Balance	$ 1,493,000	$ 1,493,000	$ 491,000	$ 575,000	$ 515,000	$ 410,000	
Less Normal Expenditures for Maintenance	$ -	$ (875,000)	$ (875,000)	$ (875,000)	$ (875,000)	$ (875,000)	
Empire Avenue		$ (622,000)	$ 339,000	$ 45,000			Advance Construct - Reimbursement
Receipts	$ -	$ 875,000	$ 1,000,000	$ 1,150,000	$ 1,150,000	$ 1,150,000	Plan for a reduction the first couple years (50% in year 1)
Transfers Out for Debt on Loan Ineligible Costs - Storm/Roads	**$ -**	**$ (380,000)**	**$ (380,000)**	**$ (380,000)**	**$ (380,000)**	**$ (380,000)**	
New Balance	$ 1,493,000	$ 491,000	$ 575,000	$ 515,000	$ 410,000	$ 305,000	Will remain relatively healthy

E. 2. Opportunity Zone Map



F. Biographical Sketches

1. **City of Benton Harbor**
    a. **Ellis Mitchell – City Manager**
    b. **Mike O'Malley – Benton Harbor Water Superintendent**
    c. **Tracy-Ann Jennings – Community and Economic Development Department Director**
2. **Abonmarche Consultants, Inc**
    a. **Jason Marquardt, PE – Project Manager**
    b. **Corey Kandow, PE – Project Manager**
    c. **Bret Witkowski – Asset Management Program Director**
    d. **Joelle Regovich – Grant Administrator**

Ellis E. Mitchell

567 East Main Street, Unit #1, Benton Harbor, Michigan 49022
Phone: (314) 413-6776 ▪ E-mail: eammitch999@gmail.com

September 26, 2019

Honorable Mayor Muhammad and
Honorable Members of the City Commission
200 East Wall Street
Benton Harbor, MI 49022

RE: City Manager Recruitment – Benton Harbor, Michigan

Dear Mayor Muhammad and City Commission Members:

Pleasc accept this comprehensive employment package as my application for the position of City Manager for the City of Benton Harbor, Michigan. I have served as your Interim City Manager for the past two months, and the credentials presented in this package along with my body of work over this period serve as proof that I am the best candidate for the position of City Manager for the City of Benton Harbor.

Experience Matters!
As many of you already know, I have served as City Manager of Benton Harbors in years past, and some of you might know my history as the City Manager who saved this City from State receivership during that tour of duty.

Under my leadership, we were **ACTION-DRIVEN ...** creating opportunities and strengthening the status of our residents, businesses, staff team, and overall growth of the City.

I left the City of Benton Harbor, through my own will, to accept another challenging position closer to my family, whom I had been apart from during my four year tour here. I left the City with trained staff members, a balanced budget, and a stronger sense of unity in the community, where citizens, city businesses, partners, and the staff having a respect for this governing body.

I bring to the City of Benton Harbor a mature, seasoned, energetic, and visionary leader, with experienced executive management skills, including managing five cities; directing major departments in several others; as a business owner, providing management consulting services for several other organizations and businesses;

I know that was years ago, and some of you might have wondered, "What can he do for us now???" My body of work over the past two months should have answered that question, and hopefully we are ready to move forward. But know this; what you have seen is just the tip of the iceberg ... the beginning of the process of full recovery that began with stabilization. I submit that we are close enough to stable and planning for the future has already begun and almost ready for its unveiling.

I propose that the education, skills, background, and history I bring combined with the innovative and technologically sound, futuristic operational and financial management, leadership, strategic planning, team-building, and the execution and implementation of approved plans will keep Benton Harbor an alive

and fully functional and respected member in the Twin Cities business of Government operations community ... a fully functional and participatory city meeting the needs of its residents, fulfilling its leadership role in Southwest Michigan and within the State of Michigan.

In summary, I bring extensive experience in local, State, and Federal Government operations; relevant experience in non-profit, private, educational sectors; and military experience as a Vietnam War Veteran to the organization. This experience is supported by a Bachelor's Degree in Business Administration, a Master's Degree in Public Administration, a Certificate in Senior Executive Management, and many hours of formal continuing education, personal development, and training. Further, my education and experience, my management style, and personal traits are congruent with those required of your next City Manager.

My 40 year-plus employment history is highlighted by the following:

- Building and maintaining close working relationships with elected and appointed Councils/Commissions and Boards, staff and operating team leaderships, residential and business stakeholders, and with my fellow City/County Managers.
- Daily management, oversight, leadership, and accountability for all assigned areas within the organization, its financial, human, and physical resources.
- Strong, strategic planning and managing the annual operating and capital budget processes.
- Experienced team builder, leader, negotiator, mediator, communicator, and listener.
- Experienced in the core competencies of education, business, housing, economic and organizational development, public safety and services, and all other departmental functions and using technology as "the thread that binds".
- Strong advocate and practitioner of internal and external partnerships and intergovernmental relations.

These duties have required building intergovernmental and legislative relationships with County, State, and Federal legislative bodies and staff officials, neighboring jurisdictions, and all internal operations over the years. They have been performed while managing complex organizations in dynamic and fast-paced environments and jurisdictions:

- Ranging in size from 5,000 to over a 1,000,000 people;
- Budgets ranging from $10M to in excess of $1B;
- Number of employees ranging from 80 to over 12,000 ... in racially, ethnically, socially, and economically diverse communities, and in several sections of the Country.

My quality management and my highly developed interpersonal and communication skills have been honed by my many years of diversified experiences. These skills helped me:

- Save two cities from state receivership (Benton Harbor, Michigan and East St. Louis, IL).
- Improve planning, intra and intergovernmental relations, debt stabilization, income generation and service delivery in several others (Most recently, City of East Point Georgia).
- Serve as the first City Manager ever in one city and the first in four years in another.

The key to my success has been my dedication to working with and building strong internal teams with elected Councils, staffs, community residents, business owners, and religious and educational leaders.

I believe this extensive and diversified, professional background makes me an ideal candidate for this position. Therefore, I enthusiastically welcome the opportunity to personally discuss the attributes I bring to the organization, to you, the Mayor and Commission, to the Management Team and staff, and the contributions I can make to help further the organizations goals for its major stakeholders and the City as a whole.

Thank you in advance for this opportunity to present myself and my qualifications on paper for your considerations. My salary preferences are negotiable. If you have any questions or require further information, I can be reached at (314) 413-6776.

Sincerely,

[Please accept as signed]

Ellis E. Mitchell

Enclosures

Ellis E. Mitchell
567 East Main Street, Unit 1, Benton Harbor, MI 49022
Primary Phone: (314) 413-6776 ▪ E-mail: eammitch999@gmail.com

POSITION SOUGHT: CITY MANAGER - BENTON HARBOR, MICHIGAN

Performance-driven Senior Executive offering more than 40+ years of comprehensive achievements in public, private, and educational sectors; managed five cities, saving two from State Receivership; directed major departments in several others; provided management consulting services for cities and private sector companies; recognized for organizational and economic development skills that demand strong team building and focused and strategic planning, benefiting employees and community; MPA/BS in Management, Finance, Organizational Development, Marketing.

EXECUTIVE LEADERSHIP & OPERATION COMPETENCIES

• Executive Level Public Sector Management	• Building/embracing Intergovernmental Relations
• Budgeting, Finance, and Cost Controls	• Planning / Community/ Economic Development
• Long-Term Strategic Planning & Growth	• Staff Training / Development / Management
• Negotiation / Mediation, Labor / other Contracts	• Dynamic Team Building and Team Membership
• Building Partnerships with Supervisors / those Supervised • All facets of the Administrative / Management Process	• Capital Planning and Improvement • Thinking / Listening / Strategic Planning / Problem Solving • Required education and Experience
• Embracing Community Diversity • Facilities Planning and Management	• Excellent Oral / Written Presentations • Transportation Planning and Management

TRACK RECORD OF SUCCESS

Proven, consistent, and improved application of the above skills led to these accomplishments, to name a few:

- Managed five cities using planning techniques that saved two from state receivership; provided $9.1M funding for a major capital development for one; and provided contracted leadership and turnaround planning to stabilize and improve financial management, daily operations, team building, intergovernmental relations, and overall good government to the others.
- Led planning and implementation of balanced Operating Budgets and 5 Year Capital Improvement Programs in several cities stabilizing and improving financial management.
- Managed major departments, including Parks and Recreation, Public Works, Economic Development, Facilities & Grounds, and leading each back to prominence in the organization.
- Served as Project Manager over major bond issues, developments, and several capital funding projects from planning, negotiating, and throughout the construction process.
- Planned / implemented a utility improvement plan that increased collections from 51% to 92% and more than $1M.
- Led the Task Force that planned, created, and implemented legislation that brought law and order to a multi-million dollar Street Vending Program that went from paying no taxes to contributing its fair share to revenue collections.

EXPERIENCE – PUBLIC SECTOR

07/2019 – Present **Interim City Manager, City of Benton Harbor, MI**
Hired by the City Commission to oversee and manage the daily affairs of the City.

11/2017 – 07/2019 **Mobility Manager, Twins City Area Transportation Authority (TCATA), Benton Harbor, MI.**
Hired by Executive Director to oversee and manage the Mobility Management approach to optimizing all public transportation in Southwest Michigan toward improving specialized transportation for older adults, people with disabilities, people with lower incomes, and, thereby, those with limited to no personal means of mobility … where public transportation is the only option.

11/2013 - 12/2014 **Interim City Manager, City of East Point, GA**
The Robert Bobb Group was awarded the Management Contract to provide turn-around management services for the City; Mitchell was selected and appointed by the Mayor and City Council to direct the administrative and operational services of around 549 employees, leading all City Departments in developing a $127M Budget, population of 35,000, managing the daily affairs, strategic planning, team building, economic and community development, and building strong intergovernmental relations within the county, state and federal governments. Performance highlights including:

- Developing an Operating Budget within the first 15 days on the job
- Assuring the development of the Comprehensive Annual Financial Report (CAFR)
- Bringing stability to the management and administrative staff teams
- Improving Intergovernmental relations by making sure the City was back at the table at cross- jurisdictional meetings
- Building more effective and efficient Council/Manager relationships

10/2009 - 09/2010 **City Manager, Berkeley, MO**
Appointed by Mayor and City Council to direct the administrative and operational services of around 160 employees, all City Departments in developing a $21M budget, population of 11,000, management of daily affairs, strategic planning, team building, economic and community development, and building strong intergovernmental relations within the county, state and federal governments. Performance highlight including:

- Planning and implementing a 5-Year Plan that streamline operations, improving internal and Intergovernmental relations, service delivery, budget planning and development, strategic team building, staff training, and overall better government.
- Responsible for City Bond rating increasing to A and overall City rating increasing to A+ as prerequisite to receiving $9.1M Bond award to build new Municipal Complex ... catalyst for Downtown improvement / development / and redevelopment.

01/1992 – 10/1993 **City Manager, East St. Louis, IL**
Brought in to direct the administrative and operational services of 300 employees,, Departments in developing a $25M budget, population of 44,000, strategic planning, management of daily affairs, and working with the State appointed financial oversight Board. Performance highlights including:

- Planning and implementing a 5-Year Plan that streamlined operations, preparing the first balanced Operating budget, improving internal and intergovernmental relations, service delivery, revenue to debt ratios,

strategic team building, staff training, overall better government.
- Orchestrating turnaround that actually saved the City from State receivership.

01/1983 – 02/1987 **City Manager, Benton Harbor, MI**

Recruited to direct the administrative and operational services of 200 employees, all City Departments in developing a $12M budget, population of 16,000 strategic planning, working with the State appointed financial agent, serving on various boards and commissions including Airport, Wastewater Treatment, Solid Waste, and Economic Development boards, and the Planning Commission; worked closely with the Library Board, Transit Commission, Housing Commission, the Chamber of Commerce. Performance highlights including:

- Planning, implementing, and managing a 5-Year Comprehensive Plan that streamlined operations, preparing the first balanced operating budget, improving internal and intergovernmental relations, service delivery, and revenue to debt ratios, strategic team building, staff training and overall better government.
- Updating much needed water meter reading program, staff services, and revenue collection program that led to increased collections for 51% to 92% and more than $1M.
- Orchestrating improvements that led City from receivership.

01/1977 – 10/1977 **Assistant City Manager, Emeryville, CA**

Brought in as first Assistant City Manager to assist the first City Manager in performing administrative and managerial oversight of the City's daily affairs in this full service city of over in 4,500 night population and 15,000 day population; $7M total operating budget; 163 employees; worked closely in budget development and administration, personnel administration, economic and community development, finance and projects management and operations. Performance highlights including:

- Building viable working departmental teams under a new government structure.
- Recruiting and hiring first Senior Center Program Director who built a model program.

10/1998 – 02/2002 **Special Assistant to City Manager & Manager & Municipal Buildings Services Division, Public Works Agency - Oakland, CA.**

Brought in to oversee and coordinate City Manager's special and most challenging projects and managing City's most difficult operating Division of 120 employees, $18M budget, over 350 buildings/facilities, population of 400,000. Performance highlights including:

- Planning and coordinating development of 3 major Initiatives: Banishing Bureaucracy, Community Oriented Government, and Public Safety Strategy and rolling-out legislative initiatives for City Council approval to implement.
- Planning and implementing major city projects including: 1) Fleet Week which lead to the city's participation in a major, Bay Area-wide week of military simulated warfare activities, a major tourism attraction; 2) Golf course development which included negotiations for the proper closing of a landfill and the selection, approvals, and coordination of the building of a first class golf course; the planning and construction of a police substation in the toughest part of town.
- Developing, implementing, and overseeing the first comprehensive planning, design, construction, maintenance, repair, and custodial services programs for the City's over 350 buildings / facilities (more than 3,000,000 square feet) and their related equipment; initiating

aggressive team building concepts, leading to and sustaining effective and productive staff improvements.

- Coordinating team efforts toward selection of vendor to provide an integrated public safety computer system within the police department and between police and fire departments.
- Heading City's Golf Course Development Team from planning, to contract negotiation, to construction and project management.

12/1995 – 03/1997 **Director, Parks, Recreation, & Neighborhood Services Department, San Jose, CA**

Hired to manage the daily affairs of this Department; $65M Department Operating and Capital Budgets, 850 employees, population of almost 1M A Neighborhood Parks System of over 135 developed parks, 3000 acres of undeveloped land, and 50 civic grounds and regional areas, and one municipal golf course; A Recreation and Community Services Program of over 20 community, senior, and therapeutic centers; an aquatics program, and youth and adult sports leagues; A Youth Services Program that included youth employment services, child care, after school and homework activities, teen centers, and gang prevention and intervention programs; A Human Services Program funded by the HUD CDBG Program to address community development needs; and A Neighborhood Services Program which teamed with community-based organizations, neighborhood associations, and individual residents to improve neighborhoods. Performance highlights including:

- Initiating aggressive team building concepts that improved staff morale goals each year.
- Clearly establishing department as the reliable social services Center within the City and as a major player in the local government decision-making process.
- Leading and participating in inter-departmental teams to meet department and City goals.

04/1981 - 01/1983 **Assistant Director, Office of Business and Economic Development District of Columbia, Washington, DC**

Recruited to serve as principal liaison between the Office and the DC business community and to assist in planning, development, implementation, maintenance, performance and impact monitoring of the District's massive multi-million dollar economic development plan including responsibility for business planning, retention, attraction, development, and expansion and job creation. Performance highlights including:

- Playing integral role in the planning, economic recovery, revitalization, of our Nation's Capital.
- Leading the Street Vending Task Force that planned, created, and implemented legislation that brought law and order to a very viable Vending business that went from paying no taxes to contributing its fair share to revenue collections.

08/1978 - 08/1980 **Special Assistant, Intergovernmental Affair, U.S. Department of Commerce, Office of Science and Technology, Washington, DC**

Recruited from CA to DC to serve as a non-political liaison to assure the application of science, technology and innovation to the needs of state and local governments, while simultaneously working to promote a public / private partnership in these technical areas. Performance highlights including:

- Planning and implementing partnership projects in 10 targeted cities, one in each region.

- Serving as member on a Presidential panel on Science and Technology

09/1970 - 01/1977

10/1977 - 07/1978 **Assistant to City Manager/Administrative Assistant/Administrative Trainee**
Model Cities Program, Richmond, CA

Hired and promoted to provide administrative and managerial services aiding professional staff, Board, and Council assistance; assist the Assistant City Manager for Housing and Community Development and City Manager in performing administrative and managerial oversight of the City's daily affairs of its 80,000population; 900 employees; and $123M operating budget. Performance highlights including:

- Completing City's Overall Economic Development Plan 4 years in a row that become the standard in years since.
- Hiring and training the Student Intern who later went on to become and retire as City Manager.
- Hiring the City's first and only Washington, DC Representative in 1973, who still represents the City in DC.
- Being part of two-man team that planned, prepared, competed, and won award of one of, only, six major housing development grants awarded nationally.

EXPERIENCE – EDUCATION SECTOR

10/2010 - 09/2012 **Director of Facilities, Riverview Gardens School District - St. Louis, MO.**

Appointed by Superintendent of Schools to oversee the daily operations of over 80 employees; $21M department budget, in a "lapsed" district of over 6,000 students, building an effective and involved staff team to plan and implement improvements, maintenance, preventative maintenance, and custodial services for a compliment of 29 buildings and grounds. Performance highlights including:

- Managing all approved projects under a $15M Bond Issue.
- Leading team planning and participation in the development of a 5 Year Capital Improvement Plan.
- Addressing daily physical plan emergencies caused by years of neglect.
- Improving the culture of and actual service delivery throughout the School District.
- Creating and implementing continuous staff improvement plans.
- Working as member of the Executive Cabinet in planning and implementing district-wide Accountability Plan as the roadmap to re-accreditation.
- Oversaw bus planning, operations, and services for the school district

EXPERIENCE – PRIVATE/NON-PROFIT SECTORS

02/1987 - 01/192 **Business Owner/Independent Contractor/Consultant, Washington, DC / San Jose, CA / Winston Salem, NC / Richmond, VA**

02/2002 - Present Contracted to perform independent consulting services, to recruit, train, and supervise teams of inside operations managers and outside sales executives. Performance highlights including:

- Providing Notary Public and loan signing services, life insurance, real estate, and mortgage loan services, as CA Licensed Notary Public, Life Agent, and Real Estate Agent, respectively.

- Providing business start-up, management, marketing, loans, financial, procurement, organizational development, community/economic development, and community organizing consulting services
  training, and supervising team representatives to execute customer service models in the insurance, commercial & residential mortgage loans, real estate areas, and transportation services.

EDUCATION

07/1984 **Harvard University** **Boston, MA** Graduate – Kennedy School of Government, Senior Executives in State and Local; Government Management

12/1975 **California State University Hayward, CA** Graduate - Master of Public Administration, Urban Management, Organizational Development

08/1973 **University of California** **Berkeley, CA** Graduate - Bachelor of Science - Business Administration, Finance, and Marketing

PROFESSIONAL ORGANIZATIONS

Missouri School Plant Managers Association
International City Management Association (ICMA)
- Served as Co-Chair, Strategic Planning Committee;
- Member, Diversity Committee

American Management Association (AMA)
The National Honor Society for Public Affairs and Administration (Pi Alpha Alpha)
National Forum for Black Public Administrators (NFBPA)
Real Estate Associations: National Association of Realtors (NAR); California Association of Realtors (CAR)
Recreation and Parks Associations: National and California Recreation and Parks Association (NRPA) and (CARPA)

HONORS AND RECOGNITIONS

Honorary Member National Honor Society
Key to the City, Benton Harbor, Michigan
Certificate of Appreciation for Service, District of Columbia Government
Certificate of Appreciation for Service, City of Emeryville, CA
Certificate of Appreciation for Service, City of Richmond, CA
Air Force Accommodation Medal, While Serving in Vietnam
Salutatorian of High School Graduating Class

REFERENCES

Cooke, Wilce	Former Mayor	Benton Harbor, MI	269-519- 2890-m
Gardiner, Fredrick	City Manager	East Point, GA	678-739-8357-m fgardiner@eastpointcity.org
Moore, Charlotte	City Treasurer/- Retired	East St. Louis, IL	618-406-2260-m Charlotte.moore@cesl.us

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Watson, Kyra.	Former Mayor	Berkeley, MO	314-524-4311 314-922-5972-m Mayorwatson@hotmail.com
Woolridge, Charlette	County Manager	Brunswick County, VA	804-646-5456-o

Cwoolridge@brunswickco.com

CONSULTING CLIENT LIST

Ellis Mitchell, President/CEO Mitchell Diversified Business Solutions (MDBS)

First Merchants Financial Services, Winston Salem, NC; Served double duty as St. Louis Area Manager and Director of Operations for First Merchants, providing loans and other financial assistance and consultation to small businesses throughout the U.S.

HC Investments, San Jose, CA; **H&J Properties, Inc.** Huntsville, AL; **Greater Richmond Interfaith Program,** Richmond, CA; **Rivkin Group, Inc., AtHome Consulting Group, Inc., Primerica Financial Services, Inc.,** respectively, San Jose, CA – **Mortgage Loan and Real Estate Agent** and **Financial Services Representative** and **Property Management Services**– Providing management consulting, outreach, and assisting customers in planning their financial futures and providing financial resources and products to help reach these goals.

Economic & Social Opportunities, Inc. (ESO), San Jose, CA – **Vice President for Program Operations** - Responsible for planning, budgets, daily operations, staff, and future development for this Non-Profit, Community Action Agency's programs including Family Health, Education & Training, Housing & Energy departments and a satellite South County Operation.

Community Services Association of California and Nevada, San Jose, CA - **Interim Director** - planned and oversaw daily affairs of this Non-profit Association of Community Action Agencies designed to provide improved service delivery to poor and low income of both California and Nevada housed at Economic & Social Opportunities, Inc.; was a major player in Welfare Reform planning.

Commonwealth of Virginia Government, Department of Housing & Community Development, State-wide Lead-Based Paint Abatement Program – Interim Director - Planned, implemented, and managed $5.4 M. State-wide program.

Commonwealth of Virginia Government, Department of Labor & Industry - Interim Planning and Policy Director – Planned/restructured Department's State-wide service delivery process for businesses and employees.

City of Richmond, Virginia Government, City Manager's Office – Project Consultant - Planned, trained staff and Board, lead community organizing and coordination, and implemented Model Neighborhood Revitalization Strategy, **"The East District Initiative."**

Lawrence Township, NJ Neighborhood Service Center - Interim Executive Director- managed Center's daily affairs, oversaw recruitment process to hire Executive Director, and completed a Management Study to improve operations and neighborhood program service delivery.

Lawrence Township, Public Works Department – Interim Public Works Director - managed department's daily affairs, oversaw recruitment process to hire permanent Director.

Lawrence Township, City Manager's Office – Project Consultant -Developed a Management Study improving internal operations and service delivery.

Private Sector Company, Washington, DC- Assisted a local minority-owned firm through business merger, completed initial organizational development, and managed the company's affairs as **Interim General Manager**.

Houston, TX City Government – Project Consultant - Subcontracted with another firm to develop City's 5 Year Financial Management Plan.

Private Sector Company, Benton Harbor, MI – Project Manager - Represented company, and consulted on staffing, facility, and operations planning and new product development.

Michael O'Malley 5/26/2020
Resume

Education:
High School: Lake Michigan Catholic HS, St. Joseph, MI. Graduate 1975
College: Ferris State College, Big Rapids, MI. Graduate May 1980
A.A.S Ornamental Horticulture
A.A.A. General Education, Major in Business
Lake Michigan community college & Southwest Michigan Community College: Several years of course work toward an Engineering Degree; I did not receive a diploma.

Employment:

City of Bento Harbor Water Superintendent's position July 1, 2016 to present. Became the Benton Harbor Water Department's F-1 and S-1 licensed Operator in Charge. The tasks included: Water Plant Operations and Maintenance; Water Distribution leader, of Maintenance, planning, trouble shooting and customer service; Sewer Collections leader for maintenance, care, problem solutions, and planning; & Storm Water Management maintenance and care, planning and reporting. All tasks also involved a massive re-construction of equipment documentation and record keeping.

Severn Trent North America Water Contract Operations
December 2012 to June 2016.
Assigned to the Technical Solutions Group, in South Bend IN.
Initially, Drinking Water Treatment Surface Water Specialist, trouble shoot and assist Water Plants across a wide range of Treatment Plants. Near the end, assigned to a 3 man team for New Severn Trent project development and bidding, and officially as Projects start up team and problem solver.

City of Benton Harbor, MI
December 15, 2008 to June 25, 2012: - Water Superintendent.
Supervision over the activities of the Water Plant, Water Distribution System, Sanitary Sewer Collection and Lift Station pumping, and the Storm Water collection system.

City of St. Joseph, MI.
March 9, 1981 to December 15, 1984 – Parks Department Laborer
December 15, 1984 to May 1, 1993 – Water Treatment Plant Operator
May 1, 1993 to December 5, 2008 – Water Plant Superintendent

City of Benton Harbor, MI.
December 1, 1993 to June 1, 1995 – Acting Water Plant Superintendent, Part-time, to assist the Water Plant in meeting the MDEQ F-1 certification requirement.
June 9, 2008 to December 5, 2008 Operator in Charge Water Plant/Utility Services.
Again to assist the City's Utility Services department meets its MDEQ F-1 requirement.

Owner and Operator: Irish Green Landscaping, Self Employed; Part-time

Michael O'Malley, Employment Cover Letter and Resume

December 1980 to September 1993

Licenses Held:
Michigan F-1 received June 1990; the F-1 license is a MI. complete water treatment plant Certification at the top level.
Michigan S-1 received December 2008; the S-1 license is the MI Water Distribution Certification at the top level.
Michigan Industrial Storm Water Treatment Operator, received July, 2010

Organizations:
Michigan Section AWWA member since 1985
Member of Education Committee and the Source Water Protection Committee
Chairman, Treasurer and Trustee West Michigan Water Works Association
Elected Employee Representative to the Board of Directors: St. Joseph Employees Retirement System 1994 to 2007

Additional Skills: Somewhat computer proficient; very capable on Microsoft Excel and Word; very capable on most any Windows based programs and programs that run under Windows, particularly Windows explorer. I enjoy digital photography.

References:
Mr. Gary Wozniak, District Engineer Water Div. MDEQ, Kalamazoo (269) 567-3613
Mrs. Lianne Shekter Smith, Chief Resource Management Division, MDEQ, Lansing, MI. (517) 373-9523
Mr. Timothy Lynch, Director of the BH-SJ Joint Wastewater Treatment Plant (269) 983-7719
Mr. William Sinclair, Retired St. Joseph City Manager, (269) 983-2817
Mr. Ray Mak, BH-SJ Joint Wastewater Treatment Plant Board Chairman, (269) 429-7730

Personal:
Born: September 26, 1957, Chicago IL. Age: 54 I have lived in St. Joseph area 51 years.
Married: Lisa Schadler in 1976.
Children: I have 1 daughter, married and living in St. Joseph, Cortney (Ian) Septoski and 1 grandson, Quinn Septoski.
Outside Interests: Coached Jr. HS. Football for Lake Michigan Catholic and several summer youth baseball teams in St. Joseph.
Active in the Lake Michigan Catholic Blue Tide Athletic Support program, I am the announcer at home football games.
I also like to help friends with landscaping projects, things like patios, retaining walls, planting around the home and such.
Member of the St. John & Bernard Catholic Church in Benton Harbor, MI.

Tracy-Ann N. Jennings

tracyann.cleveland@gmail.com • (269)849-9116

PROFILE

A results driven, goal oriented, passionate and analytical professional that is well organized and innovative with over 15 years experience and understanding as it relates to: Grant Application and Reporting, Employee Management and Supervision, Human Behavior Analysis, Leadership Coaching, Volunteer Management, Youth Development, and Nonprofit Leadership. My strengths lie in community outreach and engagement, creating and executing major events, developing and sustaining strategic relationships, working with local media, communications and community relations, forecasting and strategic planning.

Relevant knowledge, skills and abilities include:

Strategic Alignment
Program Prioritization
Strategic Project Execution
Communication & Change Management
Stakeholder Management
Budget Forecasting and Building
Team Development
Group Facilitation
Special Event Organizing & Executing
Staff Training, Evaluation & Development
Grant Writing, Evaluating & Reporting
Strategic Relationship Development & Sustaining
Community Relationship Building
Public Speaking & Presentation

SELECTED ACCOMPLISHMENTS

Non-Profit Leadership/Management

- Recruited, Hired, Supervised and Evaluated Leadership and Case Management Staff
- Partnered with Service Corps of Retired Executives (SCORE) to assess and implement Board of Directors Development
- Partnered with Listen to Your Mother Southwest MI, to bring Monologue-based Performance to Benton Harbor/St. Joseph, MI, which increased Agency visibility in Southwest Michigan and produced a $800 charitable donation to Emergency Shelter Services

Project Based Work – Project/Program Development and Management

- Reinstated Planned Parenthood Peer Educator Program in Benton Harbor after a four-year hiatus. Interviewed, Hired, and Trained 20 Peer Educators during 2011/2012 and 2012/2013 School Year.
- Exceeded Projected Department Goals for Youth Programming by 20% FY 2012 & FY 2013
- Berrien Community Foundation Grantee FY 2013
- Secured Cooperative Agreement to Benefit Homeless Individuals (CABHI Grant) through MI Department of Health & Human Services, a 3-year capacity grant adding $435,000 in operating funds to Emergency Shelter Services
- Conducted Key Informant Interviews and Compiled Community Resource Inventory for Pregnant and Parenting Teens Program
- Exceeded Projected Program Goals for MI-APPP Program Enrollees FY 2014 & FY 2015
- U.S. Department of Health & Human Services Office of Adolescent Health June 2015 Feature
- Michigan Department of Community Health MI-APPP Learning Collaborative Group Facilitator (2014)
- Increased HUD CDBG Timeliness from 3.75 to 1.5 during FY 20118/2019

Leadership/Community Engagement

- Berrien Community Foundation Golden Acorn Grantee Award for Lifelong Learning Recipient (2013)
- Michigan Department of Community Health PREP Institute PREP Talk Presenter (2013)
- Cornerstone Chamber of Commerce Young Business Leader Award Nominee 2017
- Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Program Participant 2017
- Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Program Coach 2018
- Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Program Coach 2019
- Redevelopment Ready Community Certified 2019

WORK EXPERIENCE

May 2016	-	*Current*	**5D Leadership Coach, Human Behavior Analyst, and Consultant**	
Nov 2017	-	*Current*	**Strategy and Capacity Building Consultant**	D3 Cerebral Palsy Foundation
Nov 2018	-	*Current*	**Director, Community and Economic Development**	City of Benton Harbor, MI
Sept 2016	-	*May 2017*	**Master of Social Work Intern**	City of Benton Harbor, MI
			My Brothers Keeper	
Oct 2015	-	*Aug 2017*	**Executive Director**	Emergency Shelter Services, Inc
Feb 2014	-	*Oct 2015*	**MI-APPP Program Coordinator**	Berrien County Health Department
Jan 2013	-	*June 2013*	**Development and Marketing Contractor**	Brookview Montessori School
Jan 2011	-	*Feb 2014*	**Community Outreach Educator**	Planned Parenthood Mid and South Michigan

EDUCATION

2020 *Western Michigan University*, Master of Social Work
2009 *University of Michigan Ann Arbor*, Bachelors of Arts

PROFESSIONAL DEVELOPMENT:

Grant Writing for Non-Profit Professionals | Volunteer Management and Recruitment | Technology of Participation (TOP) Facilitation Methods | Great Lakes Institute for Community Health Educators (GLICHE) | Authentic Institute 5D Coaching
Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Class of 2017 | Redevelopment Ready Communities Certification 2019

ABONMARCHE

JASON W. MARQUARDT, PE, LEED AP

SENIOR PROJECT ENGINEER

Jason is a licensed Professional Engineer with more than 16 years of experience. He has worked on a variety of civil projects that include infrastructure design, sanitary sewer, storm sewer, and water distribution system construction. He is also responsible for the design and administration of street and roadway construction projects.

Jason's specialties include infrastructure design on MDOT local agency projects and municipal projects that include water mains, storm sewer, sanitary sewer, and roadway design. He is also experienced in environmental permitting and is an Accredited Professional in Leadership in Energy and Environmental Design (LEED AP).

EDUCATION
Michigan State University
Bachelor of Science,
Civil Engineering

REGISTRATION
Professional Engineer
Licensed:
Michigan

LEED Accredited Professional

PROFESSIONAL AFFILIATIONS
American Society of Civil Engineers (ASCE)

CERTIFICATIONS
Certified Storm Water Operator (MDEQ)

Part 91, SESC Certification

AREAS OF EXPERTISE:

MUNICIPAL ENGINEERING

Jason's experience in municipal engineering includes design and construction administration in roadways, water main, sanitary and storm sewer construction projects. He has worked on numerous combined sewer overflow (CSO) construction projects to eliminate combined sewers across the state. Jason successfully administered the construction process and mediated between contractor, municipality, residents and business owners during construction on many of the projects listed below.

- Botham Avenue Reconstruction, St. Joseph, MI
- Williams Street Reconstruction, South Haven, MI
- 2016 Local Streets Resurfacing, Portage, MI

PROJECT MANAGEMENT

As project manager, Jason's priority is understanding the client's goals and managing the project's schedule, budget, and Abonmarche staff in such a way that the client's goals are achieved efficiently, on time, and on budget. Communication between the client and members of the team is key as is understanding what it takes to accomplish a successful project.

- Silver Beach, St. Joseph, MI
- Elkenburg Park, South Haven, MI
- Rizzo Drain, Berrien County Drain Commission, Berrien County, MI

SITE DEVELOPMENT

Jason has planned, designed, and permitted for various types of residential site developments and commercial projects throughout his career. These projects include water distribution system design, storm sewer design, sanitary sewer design, site grading, and roadway design. Jason has designed rain gardens and other sustainable features for incorporation into site design.

- The Fairways at Harbor Shores, Residential Development, St. Joseph, MI
- Trailside at Harbor Shores, Residential Development, Benton Harbor, MI
- Whirlpool, Inc., Whirlpool Downtown Campus, Benton Harbor, MI

CONSTRUCTION ENGINEERING

Jason has performed administrative inspection and testing services on a number of projects with the Michigan Department of Technology. He has served as engineer-in-charge on construction phase services for many bridge and roadway projects, and he manages Abonmarche's construction and inspection staff.

- MDOT Coloma TSC as-needed
- Park Street Rehabilitation, St. Joseph, MI
- I-94 Bridge Rehabilitation Project, Van Buren and Berrien Counties, MI

ABONMARCHE

COREY A. KANDOW, PE

SENIOR PROJECT ENGINEER

Corey has over 20 years of experience in design and construction administration of municipal and site development infrastructure, street reconstruction, drainage, engineering studies, permitting, waterfront development and recreational facility projects.

Corey is responsible for designing and administering construction of municipal and private development projects including roadway reconstruction, widening and rehabilitation, drainage, sanitary sewer, water system, and traffic signal projects. His responsibilities also include plan preparation, project design, and cost estimating. He served as Office Director at Abonmarche's Manistee Division as well as the Engineer of Record for the City of Manistee from 2013 to 2014. In each of his roles, Corey is committed to ensuring that quality projects are built to exceed the client's expectation and remain within budget.

AREAS OF EXPERTISE:

MUNICIPAL

Corey's municipal design experience includes roadways, water main, sanitary and storm sewer, alignment and pavement design, and grading, as well as water system modeling. He successfully mediates between the demands of an efficient schedule and the needs of residents and business owners. MDOT Local Agency Funds were used for several of these projects.

- City of Benton Harbor, MI
  - E. Klock Road Construction
  - Ravine Interceptor Replacement
  - Arts District Reconstruction
  - Pipestone Street Resurfacing
- City of St. Joseph, MI
  - Lake Street Reconstruction
  - Napier Avenue Resurfacing
  - 2012/2013 CSO Projects
  - SRF/SWQIF Project Plan Update
  - Sanitary Sewer Evaluation Study (SSES)
  - South State Area CSO Separation
  - Michigan Area CSO Separation
  - Napier Avenue/Lakeland Hospital Entrance Safety Project
  - SRF Project Plan
  - Ship and State Street Reconstruction
  - Morton and Highland Avenue Reconstruction
  - Lake Boulevard Reconstruction
  - Midway Avenue Reconstruction
  - Old Lakeshore Road Reconstruction
  - Cleveland and Lakeshore Drive Intersection Realignment
  - Broad and Main Street Intersection Improvements
  - Lions Park Drive CSO Separation
  - Pearl Street CSO Separation
  - Niles Avenue CSO Separation
  - Ravine Interceptor Replacement
  - Michigan and Harrison CSO Replacement
  - Lakeview Avenue Reconstruction
  - Ship Street Resurfacing
  - Wayne Street CSO Separation

EDUCATION

Michigan Technological University
Bachelor of Science,
Civil Engineering (Transportation Engineering)

REGISTRATION

Professional Engineer
Licensed:
Michigan, Indiana

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers (NSPE)

Michigan Society of Professional Engineers (MSPE)

President, Blossomland Chapter of MSPE (2006-2012)

American Society of Civil Engineers (ASCE)

Transportation and Development Institute (T&DI)
Order Of the Engineer (OOE)

CERTIFICATIONS

Certified Storm Water Operator (MDEQ)

    - Church Street CSO Separation
    - Court Street CSO Separation
- Other Selected Municipal Projects
    - Woodmere Avenue Reconstruction, Traverse City, MI
    - Valves Replacement, Buchanan, MI
    - SEBCLA Watermain, Buchanan Township, MI
    - Oakland Drive Reconstruction, Portage, MI
    - Front Street Improvements, Buchanan, MI
    - Water Reliability Study, Village of Paw Paw, MI
    - Downtown Fennville Streetscape Improvements, Fennville, MI
    - East Milham Boulevard Reconstruction, Portage, MI

SITE DEVELOPMENT

Corey has designed infrastructure improvements for several significant commercial and residential site development projects, including those listed below, totaling just over 50,000 feet of sewer, storm, water piping and other services. He has experience with sedimentation pools, bank protection, supporting walkout basements, minimizing environmental impact to critical dunes, and system pressure calibration.

- Northshore Drain Enclosure Project, Harbor Shores Community Redevelopment
- Edgewater Dunes Phase IV, Edgewater Development Company
- Palisades Park Water System Improvements, Palisades Park Country Club
- Caretel Village, Lakeline Associates/Caretel Inns of America
- Berrien Hills Estates, St. Joseph Township, MI
- Harbortown Development, Benton Harbor, MI
- Boulder Creek, Phase 3 and 4, East China Township, MI
- Island Pointe Marina Development, St. Joseph, MI

MARINA/WATERFRONT

Corey's designs for floating docks and fixed docks for new waterfront developments and marina renovation projects have serviced boats ranging in size from 25 feet to 240 feet in length. Design elements have featured ADA accessibility, utility design, composite decking, and layouts to maximize overall slip mix and count.

- N. Stevens Street Kayak Launch, Benton Harbor, MI
- Gateway Harbor, Chicago, IL
- 31st Street Harbor, Chicago, IL
- The River Club at Harbor Shores Marina, St. Joseph, MI
- West Basin Marina, St. Joseph, MI
- Island Pointe Marina, St. Joseph, MI
- Michigan City Port Authority, Municipal Boat Launch
- South Haven Maintenance Dredging, South Haven, MI
- Berrien Hills Estate Maintenance Dredging, St. Joseph, MI
- Belle Maer Harbor Maintenance Dredging, Harrison Township, MI

RECREATIONAL

Corey has played a key role in the design and development of several recreational trail projects around the state. Being an avid outdoorsman, he takes great care to help ensure facilities are available to encourage the public to get out and enjoy the great outdoors.

- N. Stevens Street Kayak Launch, Benton Harbor, MI
- Historic Trailside Park, Metz Township, MI
- Kiwanis Park Improvements, St. Joseph, MI
- Howard Family Trail, St. Joseph, MI
- TART Trail Connection, Traverse City, MI
- Portage Creek Restoration, Portage, MI

ABONMARCHE

BRET WITKOWSKI

ASSET PROGRAM MANAGER

Bret leads efforts to develop and complete asset management programs for Abonmarche clients. Bret understands the importance of data collection, planning and implementation procedures as a path to strong financial health and sustainability for any organization.

Prior to his position at Abonmarche, Bret served Berrien County as the County Treasurer for 20 years. He applies this vast knowledge of funding, public relations and awareness campaigns to clients and projects.

Bret also served as Manager for the community of Stevensville and is able to apply his governing experience, working with business owners and the public to the big picture needs of a project.

EDUCATION

Ball State University
Bachelor of Business, Finance and Insurance

PROFESSIONAL AFFILIATIONS

Michigan Association of County Treasurers

Michigan Association of Counties

St. Joseph Lions Club

AREAS OF EXPERTISE:

BERRIEN COUNTY TREASURER—COUNTY COMMISSIONER CHAIRPERSON

Bret served as Berrien County as Elected County Treasurer and Elected County Commissioner for 20 years, including as Chairman of the Board. Highlights of his experience include:

- Elected to Treasurer position from Chairman of the Board in January 2005 to manage $55 million in investments, lead entire Treasurers Department comprised of 8+ employees, collaborate with The State of Michigan on City of Benton Harbor delinquent property tax program, partner with County Commissioners on $110 million annual budget, and conduct public relations campaigns utilizing various media outlets to enhance public awareness.
- Responsible for foreclosure process, developed automated monthly payment program that has saved over 1,000 properties from foreclosure process the last few years
- Developed homestead audit program that has generated extra $35,000,000 for public education in Berrien County
- Responsible for all public relations for the Treasurer's office.
- Worked with Parks Department to assist them with selling of annual passes, thus increasing cash flow during slow months.
- Chairman of the Berrien County Land Bank. As Chairman of the Board, served as commission lead in effort to assist with county responsibilities related to economic development, personnel, facilities, juvenile justice, and jail overcrowding. Spearhead local and state states of emergencies when necessary. Assist with setting policies and procedures. Key county representative responsible for public relations and negotiations.

STEVENSVILLE VILLAGE MANAGER

As Village Manager for Stevensville, Bret increased grant development efforts, Village promotion endeavors, and contract negotiation activities related to fire, police, and real estate construction and renovation. He collaborated with local, state, and federal officials regarding grant availability and revenue-sharing programs. His partnership with other government agencies and contacts led to the improvement of Stevensville's overall economy.

ABONMARCHE

EDUCATION
University of Notre Dame
Bachelor of Arts, English

COMMUNITY INVOLVEMENT
Southshore Concert Band,
Board Vice President

Southwest Michigan Symphony Orchestra—Education Programs Coordinator

JOELLE REGOVICH

GRANT ADMINISTRATOR

Joelle performs work related to grant seeking, grant writing, and grant administration. She helps to identify the grant funding needs of our clients and then actively researches and identifies funding opportunities. Joelle coordinates with the client to gather the required information to write a compelling grant. Once the grant has been received, Joelle assists with the administration of the grant. Joelle understands the impact that grants can have on a project and works diligently and tirelessly to find funding opportunities for our clients.

AREAS OF EXPERTISE:

USDA RURAL BUSINESS DEVELOPMENT GRANT

Joelle has worked with various communities to prepare, submit, and help administer rural business development grants.

- Fennville, MI
- Allegan, MI
- South Haven, MI
- Three Oaks, MI

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Joelle has assisted various municipalities in seeking funds from MDNR. Many of her grant applications have been subsequently funded. Additionally, she has provided grant administrative support once the grant has been received.

- Waterways Grant Programs
- Land and Water Conservation Fund
- Michigan Natural Resources Trust Fund
- Recreation Passport

MICHIGAN COUNCIL FOR ARTS AND CULTURAL AFFAIRS

Joelle has prepared a variety of awarded grants for different MCACA programs. She also served as a grant reviewer for the Capital Improvement Program.

- Calhoun County - Project Support Program
- City of Allegan - Capital Improvement Program
- Liberty Hyde Bailey Museum - Capital Improvement Program

MICHIGAN ECONOMIC DEVELOPMENT CORPORATION

Joelle has worked with various MEDC grant funding programs for several communities.

- City of Allegan - Core Community Fund
- City of Allegan - PlacePlan Implementation Mini-grant
- City of South Haven - Community Development Block Grant (CDBG)
- City of Grand Haven - Infrastructure Capacity Enhancement (ICE) Grant

MICHIGAN STATE HISTORICE PRESERVATION OFFICE

Joelle has prepared and received grant funding to restore lighthouses through the Michigan Lighthouse Assistance Program.

- South Haven Lighthouse—Exterior paint project
- Grand Haven Lighthouse—Window replacement project

G. Negotiated Indirect Cost Rate Agreement

NOT USED

H. Supporting Documentation – Readiness to Proceed

1. **Example Owner/Tenant Agreements to Access Private Property**
2. **Example Door Notice to Residents – Previously Used for Pilot Grant**
3. **Map of Zone Areas for Water Service Line Replacement**

BENTON HARBOR
Port of Opportunities

WATER SERVICE LINE REPLACEMENT AGREEMENT

PURPOSE. The purpose of this Agreement is to set forth the terms and conditions pursuant to which the City of Benton Harbor (the "City") will provide a new water service line to the undersigned owner's property located at _____, tax parcel number _____. The existing lead private water service line will be disconnected and replaced with a new water service line to accomplish a non-lead service line replacement from the water meter to the water main.

This Agreement anticipates that a contract will be awarded by the City for the work to be performed under this Agreement.

CONSIDERATION. Each party agrees that the promises made by the other party and the benefits to be derived from their execution are full and sufficient consideration for entering into this Agreement.

THE CITY'S OBLIGATIONS.

1. Do a pre-inspection of the water service line as it enters inside the building and connects to the meter to determine if the meter setting is correct, if the meter should be replaced, and if the service line needs to be replaced. If necessary, either or both of these items will be corrected/replaced at no cost to the undersigned owner of the property (the "Owner");

2. Have a new non-lead private water service line constructed at City expense, from the curb box in the public right-of-way to the water meter on the Owner's property including the meter setting and any necessary connections to reset the water meter. The existing service line will be disconnected and capped off;

3. Restore the Owner's property disturbed by construction, including seeding of grass areas on the property and restore the interior portions of the building on the property disturbed by such work;

4. Require the contractor doing the work to provide adequate insurance to protect the Owner against any loss that may result from damage caused by negligent construction operations on the Owner's property, and require the contractor to provide the City with proof of such coverage; and

5. Guarantee to the Owner that any work done shall be free from defects in material and workmanship for a period of one year from its completion.

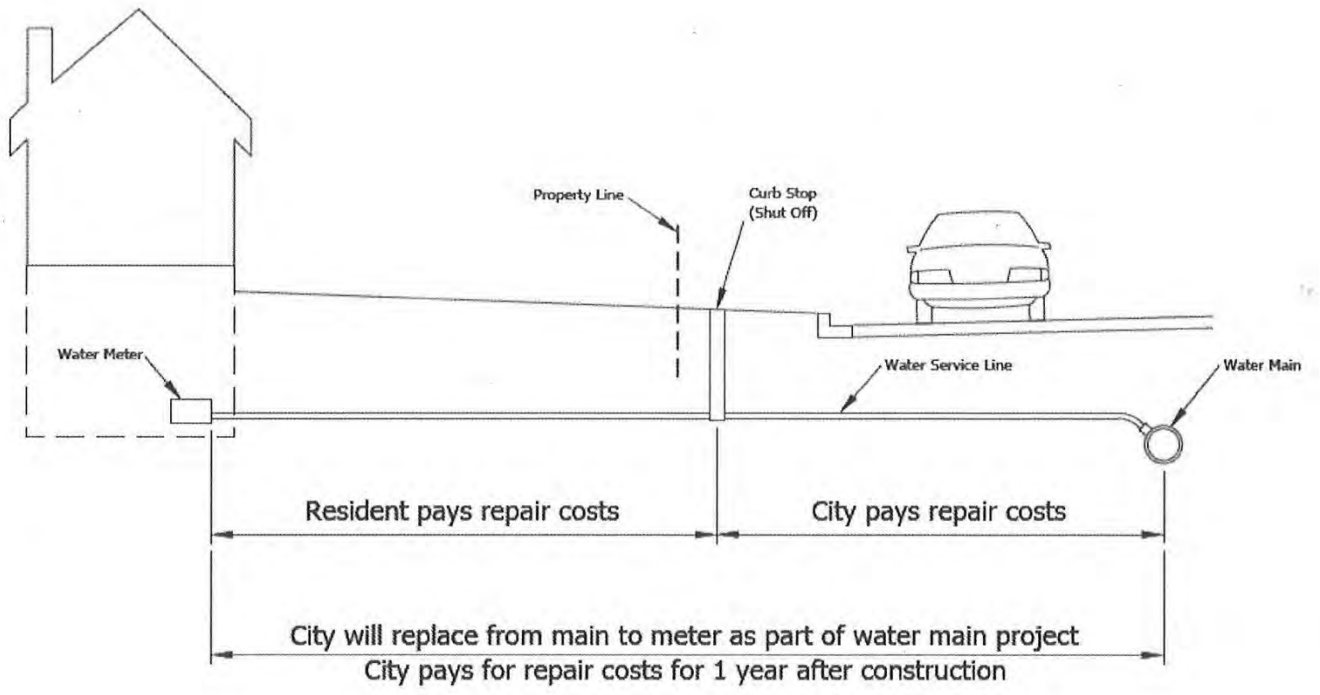
THE PROPERTY OWNER'S/OWNERS' OBLIGATIONS.

1. Confirm that the Owner(s) is/are the only owner/owners of the above referenced property and provide adequate proof thereof;

2. Permit temporary access and right of entry to and upon the above-referenced property to the City and the City's designated contractor(s) to perform a pre-inspection as described above, to enable construction and testing of the new private water service line and to enable any needed adjustments, maintenance, or repairs during the guarantee period;

3. Assume full responsibility for the maintenance, repair, and replacement of the private part of the water service line, located on the above-referenced property, after expiration of the guarantee period. After the end of the guarantee period of one year, the responsibility of each party (City and the Owner) shall be as shown on the diagram below; and

4. Hold the City harmless and free from any claim or liability from any lawsuits, claims, injuries or damage done in performance of the water service line replacement work.



MISCELLANEOUS TERMS.

1. The responsibility of the maintenance, repair and the replacement of the water service located in the public right-of-way will be pursuant to City of Benton Harbor Water System Rules and Regulations.

2. This Agreement is a legally binding document and your signature will commit you to its terms. You acknowledge that you have been advised to discuss all aspects of this Agreement with an attorney, that you have carefully read and fully understand all of the provisions of this Agreement, and that you are voluntarily entering into this Agreement.

☐ Adequate proof of ownership provided and on file.

Signed by Owner(s) the _____day of _____, 20_____.

_____ _____
Owner – Signature Owner - Signature

_____ _____
Owner – Print Name Owner – Print Name

_____
Land Contract Holder(s)

Signed by City this _____day of _____, 20_____.

_____
City Manager or Designee - Signature

_____
Print Name / Title

TENANT WATER SERVICE LINE REPLACEMENT ACKNOWLEDGEMENT

In consideration of the City of Benton Harbor Water Sewerage Department's ("BHWSD") efforts to remove lead water services, the owner has given permission per the attached signed agreement to BHWSD and/or its officials, employees, or contractors to excavate, investigate, and replace non-copper water services on the property described below:

> This property is described as Tax Parcel No. _____,
> and the street address is _____
> _____.

The Tenant will permit temporary access and right of entry to and upon the above-referenced property to BHWSD and BHWSD's designated contractor(s) to perform a pre-inspection, to enable construction and testing of the new private water service line and to enable any needed adjustments, maintenance, or repairs during the guarantee period.

This Agreement is subject to the following provisions:

1. Where investigation indicates that lead water service materials are present, they will be replaced with non-lead water service materials.

2. All property disturbed by construction will be restored, including seeding of grass areas on the property and interior portions of the building on the property disturbed by such work.

3. Piping inside buildings beyond the water meter will not be replaced.

4. BHWSD guarantees that any work done shall be free from defects in material and workmanship for a period of one year from its completion.

5. The cost of replacing lead water service materials will be the City's responsibility.

6. The Tenant agrees to hold BHWSD and its contractors harmless for any damage in performance of the water service line replacement work described in the attached Water Service Line Replacement Agreement.

_____ _____

Printed Name of Tenant 1 Signature of Tenant 1

Date: _____ Phone: _____

_____ _____

Printed Name of Tenant 2 (if joint) Signature of Tenant 2

Date: _____ Phone: _____

_____

Land Contract Holder(s)

_____ _____

Owner Address (if different from property) Owner phone number

Signed by City this _____day of _____, 20_____.

_____

City Manager or Designee - Signature

_____

Print Name / Title

DECLINATION OF PARTICIPATION IN THE WATER AND SEWERAGE DEPARTMENT'S PHASE I LEAD WATER SERVICE LINE REPLACEMENT PROGRAM

The City of Benton Harbor's Water and Sewerage Department (the "BHWSD) is in the process of making repairs to the water service in my area and has recommended that I participate in its Phase I Lead Water Service Line Replacement Program that allows for the potential replacement of my lead water service line. I understand that the BHWSD will replace my lead service line from the water main to my property line and the BHWSD is offering to replace my lead service line on private property at no charge.

I acknowledge that I am aware of the following facts:

- Partial lead service line is associated with elevated drinking water lead levels for some period of time after replacement. Elevated lead-in water can continue for months following a partial lead service line replacement.
- If present, elevated levels of lead can cause serious health and development problems, especially for pregnant women and young children. In adults, long-term lead exposure can result in increased blood pressure and hypertension and coronary heart disease.
- That the state of Michigan is in the process of revising its Lead and Copper Rule and it is possible that the final version of the Lead and Copper Rule will require all lead service lines in the City of Benton Harbor to be replaced within the next 20 years. Therefore, if I

decline to participate at this time, it may be up to 20 years before the BHWSD will be able to replace my lead water service line and cost assistance may not be available at that time.

- That at some future date I may be required to replace my lead water service at my own cost.

Despite these facts, I am choosing to decline participation in the Phase I program for the following reasons: _____

_____

I have read and fully understand the information on this declination form.

Signature: _____ Date: _____

Name (print): _____

Signature: _____ Date: _____

Name (print): _____

Property Address: _____

Property Tax I.D. Number: _____

ABONMARCHE
Confidence By Design

CONSTRUCTION NOTICE

Lead Water Service Replacement - City of Benton Harbor

Contractors will be verifying/reviewing your existing water service materials.

The City has been awarded a Pilot Grant by the State of Michigan to update their water service inventory and to replace existing lead services. Your address has been selected to recieve a new water service from the existing water main to your water meter.

Contractors will be looking at your water service to provide pricing for replacement. Please contact John Nelson at the contact number below to set up a time to review the replacement work and agreements needed.

The project is expected to commence in December 2018 and be completed by May 2019.

If you have an issue or any questions, please call the Project Engineer at:
Abonmarche
John Nelson
(269) 487-9652

ABONMARCHE
Confidence By Design

CONSTRUCTION NOTICE

Lead Water Service Replacement - City of Benton Harbor

Contractors will be verifying/reviewing your existing water service materials.

The City has been awarded a Pilot Grant by the State of Michigan to update their water service inventory and to replace existing lead services. Your address has been selected to recieve a new water service from the existing water main to your water meter.

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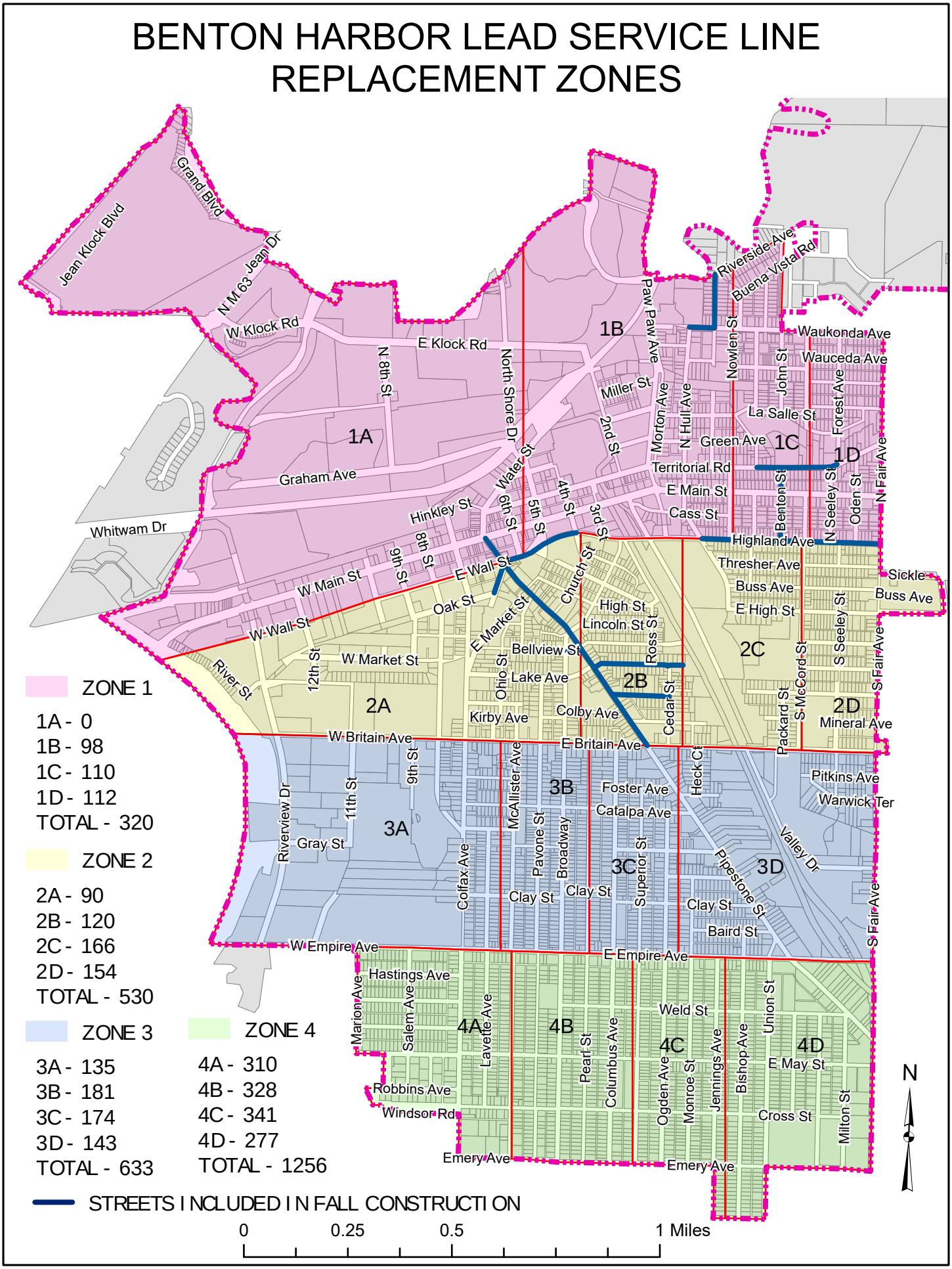
The project is expected to commence in December 2018 and be completed by May 2019.

If you have an issue or any questions, please call the Project Engineer at:
Abonmarche
John Nelson
(269) 487-9652

H. 3. Map of Zone Area

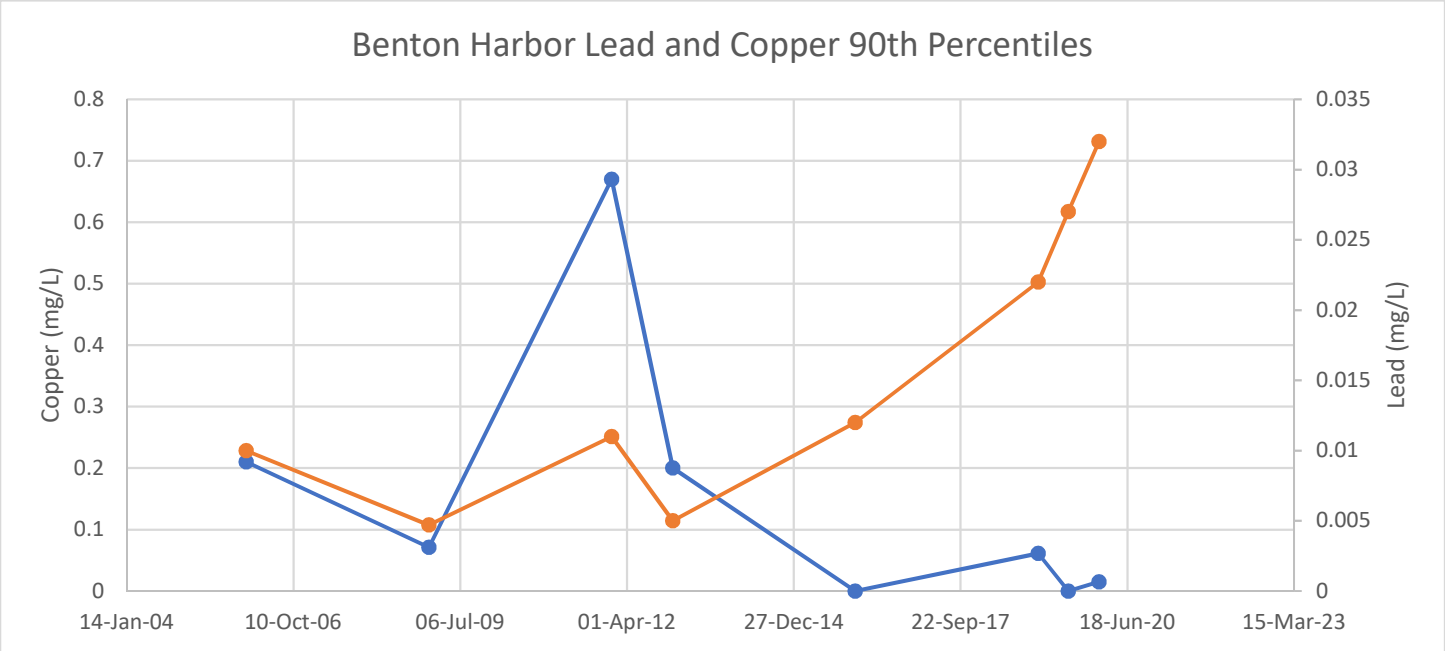


I. Supporting Documentation of Lead Issue

1. **Benton Harbor Lead/Copper Data Report**
2. **Lead Results 2015 - January 26, 2016 DEQ Lead Monitoring Notice Letter**
3. **Lead Results 2018**
    a. **October 22, 2018 DEQ Action Level Exceedance Letter**
4. **Lead Results 2019**
    a. **July 24, 2019 EGLE Action Level Exceedance Letter**
    b. **January 16, 2020 EGLE Action Level Exceedance Letter**
5. **Notifications to Public of Lead Issue**
    a. **City of Benton Harbor Website Page**
    b. **Benton Harbor August 2019 Public Notice Mailer**
    c. **Benton Harbor February 2020 Public Notice Mailer**
    d. **Michigan Radio Notice**
    e. **Berrien County Health Department Timeline Flyer**
    f. **Berrien County Health Department Lead ALE Notice**
    g. **October 24, 2018 Herald Palladium Newspaper Article**
6. **February 13, 2020 EGLE Water Corrosion Treatment Letter**

I. 1. Benton Harbor Lead/Copper Data Report

WSSN	Begin	End	Analyte	Collected	90th Percentile (mg/L)
00600	01-Jan-03	31-Dec-05	CU90	40	0.21
00600	01-Jan-06	31-Dec-08	CU90	33	0.071
00600	01-Jan-09	31-Dec-11	CU90	23	0.67
00600	01-Jan-12	31-Dec-12	CU90	30	0.2
00600	01-Jan-13	31-Dec-15	CU90	30	0
00600	01-Jan-16	31-Dec-18	CU90	30	0.061
00600	01-Jan-19	30-Jun-19	CU90	46	0
00600	01-Jul-19	31-Dec-19	CU90	39	0.015
00600	01-Jan-03	31-Dec-05	PB90	40	0.01
00600	01-Jan-06	31-Dec-08	PB90	33	0.0047
00600	01-Jan-09	31-Dec-11	PB90	23	0.011
00600	01-Jan-12	31-Dec-12	PB90	30	0.005
00600	01-Jan-13	31-Dec-15	PB90	30	0.012
00600	01-Jan-16	31-Dec-18	PB90	30	0.022
00600	01-Jan-19	30-Jun-19	PB90	46	0.027
00600	01-Jul-19	31-Dec-19	PB90	39	0.032



STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
KALAMAZOO DISTRICT OFFICE

RICK SNYDER
GOVERNOR

KEITH CREAGH
DIRECTOR

January 26, 2016

Mr. Darwin Watson
City of Benton Harbor
200 Wall St.
Benton Harbor, MI 49022

WSSN: 0600
City of Benton Harbor

Dear Mr. Watson:

Subject: City of Benton Harbor WSSN 0600, Lead and Copper Monitoring of Drinking Water Taps

We received your report for the monitoring period June 1, 2015, through September 30, 2015. This letter has been revised from the one sent December 17, 2015, as we discovered a typographical error that referenced a different water supply. We apologize for any confusion this may cause.

Action Levels	Results this monitoring period		Next monitoring period	
	90th Percentile	# of Samples Above Action Level	# of Samples Required	Take Samples Within These Dates
Lead 15 parts per billion (ppb)	12 ppb	2	30	06/01/2018, and 09/30/2018 Submit results to this office by October 10, 2018
Copper 1300 parts per billion (ppb)	0 ppb	0		

Ninety percent of the sites you tested are within action levels under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. These results must be reported on your 2015 Consumer Confidence Report (CCR), which is due to our office, your customers, and the local health department by July 1, 2016. Also, include the following statement in the CCR, regardless of the lead and copper levels:

> *If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at http://water.epa.gov/drink/info/lead.*

The Lead and Copper Rule requires you to provide individual lead tap results, within 30 days of learning of results, to people who receive water from sites that were sampled, even if lead was not detected. You must also send us a certification that you met all the delivery requirements, along with a sample copy of your customer notice. We are in receipt of the required sample results and accompanying forms regarding 2015 sampling requirements.

Samples due during the next period will be a continuation of your triennial monitoring. Please make every attempt to select the same sites used in the previous monitoring period, giving Tier 1 sites first priority. If original sites are unavailable, select replacement sites based on the Tier 1, 2, and 3 criteria. This office strongly encourages you to sample early in the monitoring period.

Bottles will NOT be mailed automatically. If you use the DEQ laboratory, order your bottles by calling 517-335-8184, or download the form EQP 2301 *Requisition for Water Sample Units* from http://michigan.gov/deq. Click on Key Topics, Laboratory Services, Drinking Water, Obtaining the Necessary Sampling Units, and test list.

If you have any questions, please contact me at the telephone number below, or by e-mail at bishoph@michigan.gov.

Sincerely,

Heather Bishop
Environmental Quality Analyst
Kalamazoo District Office
269-330-9153

HB:NE

cc: James Ouzts, F&V Operations

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 24, 2019

VIA E-MAIL AND U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from January 1, 2019, through June 30, 2019, Benton Harbor community water supply's ninetieth percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	27 ppb	12	0 ppb – 59 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements, along with a sample copy of your consumer notice, 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format, visit Michigan.gov/LCR. Select the appropriate report form based on whether you are or are not collecting samples from sites with lead services lines.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and information about the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material, along with a PE distribution certification form, must be submitted to EGLE no later than ten days after the PE is due.

Conduct WQP Monitoring
As part of installing corrosion control treatment, you have been requested to collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your second AL exceedance. You recently installed corrosion control treatment using a phosphate product to reduce corrosion. As part of this installation, a coupon study was to be performed. Results from this study should be used to help identify the dosage necessary to sufficiently reduce corrosion rates in the distribution system. EGLE looks forward to receiving the study results and the recommendations based off those results.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between July 1 and December 31, 2019, and again between January 1 and June 30, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1, or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first liter and fifth liter sample from each sampling location.

Within 30 days of learning of results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks (Starting July 1st)	Collect WQP samples. (Entry Point)	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
August 29, 2019	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2019	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
September 28, 2019	For the January through June 2019 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2020	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
March 31, 2020	For the July through December 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
September 29, 2020	For the January through June 2020 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc: Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Ernie Sarkipato, Surface Water Specialist, EGLE
Mr. Jeremy Klein, District Analyst, EGLE
cc/enc: Mr. Mike O'Malley, City of Benton Harbor

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

January 16, 2020

VIA E-MAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from July 1, 2019, through December 31, 2019, Benton Harbor community water supply's 90th percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	32 ppb	10	0 ppb – 72 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. As previously mentioned, it is your intent to develop and distribute the PE materials within three business days to fulfill both the PA and PE requirements simultaneously.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement timely. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your third AL exceedance. A letter regarding changes to your current corrosion control treatment will be sent under separate cover from Mr. Ernie Sarkipato, Surface Water Engineer, Engineering Unit, Environmental Health Section, Drinking Water and Environmental Health

Division (DWEHD); and Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, DWEHD.

Lead and Copper Monitoring
You have already increased your lead and copper monitoring. Please continue to collect samples from 60 sites between January 1 and June 30, 2020, and again between July 1 and December 31, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of the results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Every two weeks	Collect WQP samples. (Entry Point)	Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap). Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
February 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 10, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between January 1 and June 30, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 29, 2020	For the January through June 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2021	For the July through December 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

1. 5 a. Benton Harbor Website Page

BENTON HARBOR PUBLIC WORKS

Benton Harbor Public Works, Water Plant and Distribution, Sanitary Sewer, and Storm Water

Mike O'Malley, Director
(269) 927-8471, then press 2.
If no answer and for immediate assistance, dial (269) 927-8400, press 2.
Hours: 6:30 a.m. to 3 p.m.

City of Benton Harbor Water Department and Public Works Important Notices:

February 26, 2020 – Benton Harbor Public Education for Web and Mailer

Make Convenient Payments

(https://www.accessmygov.com/OnlinePayment/OnlinePaymentSearch?PaymentApplicationType=10&uid=971)

Save gas and stamps by using our convenient online services to pay your taxes or utility bills (water and trash

(https://bhcity.us/wp-content/uploads/2020/03/Benton-Harbor-Public-Education-for-Web-and-Mailer.pdf) Download (https://bhcity.us/wp-content/uploads/2020/03/Benton-Harbor-Public-Education-for-Web-and-Mailer.pdf)

- January 29, 2020 – Preliminary Distribution System Materials Inventory Notification Memo (https://bhcity.us/wp-content/uploads/2018/03/BH-Water-System-potential-Lead-Tap-Inventory-for-Web-site.pdf)
- January 21, 2020 – Public Advisory for Drinking Water Customers (https://bhcity.us/wp-content/uploads/2018/03/Press-Release-Public-Advisory-ALE-07-26-2019-MO-dist.pdf)
- *Important Information to the (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf)*

Landlord Packet (https://bhcity.us/wp-content/uploads/2019/12/Landlord-Packet.pdf) Download (https://bhcity.us/wp-content/uploads/2019/12/Landlord-Packet.pdf)

City of Benton Harbor Leak Policy (https://bhcity.us/wp-content/uploads/2019/10/City-of-Benton-Harbor-Leak-Policy-10.11.19.pdf) Download (https://bhcity.us/wp-content/uploads/2019/10/City-of-Benton-Harbor-Leak-Policy-10.11.19.pdf)

Benton Harbor Lead Public Education – August 2019 (https://bhcity.us/wp-content/uploads/2019/08/Benton-Harbor-Lead-Public-Education-August-2019.pdf) Download (https://bhcity.us/wp-content/uploads/2019/08/Benton-Harbor-Lead-Public-Education-August-2019.pdf)

Public Education Document for Lead and Copper (https://bhcity.us/wp-content/uploads/2018/03/Public-Education-Document-for-Lead-and-Copper-for-web.pdf) Download (https://bhcity.us/wp-content/uploads/2018/03/Public-Education-Document-for-Lead-and-Copper-for-web.pdf)

services). (https://www.accessmygov.com/OnlinePayment/OnlinePaymentSearch?PaymentApplicationType=10&uid=971) If you have questions about your trash services, or to arrange for the pickup of large items, call We-Cycle Industrial Sanitation direct at (269) 926-6360.

Helpful Tips to Protect Our Systems

Hundreds of us perform tasks in our daily routines that may negatively impact the water and sewer systems that we rely on. Just by following a few simple strategies, we can greatly reduce harmful effects. Take a few minutes to read about how you can contribute to safe water in Benton Harbor.

If you fertilize, please follow directions and use sparingly.

Benton Harbor Lead Results June 2019 (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Results-Sorted-for-web.pdf) Download (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Results-Sorted-for-web.pdf)

Consumers Confidence Report Announcement (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf) Download (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf)

Consumers Confidence Report for 2018 (CCR 2018) (/forms/water-ccr-2018.pdf)

For more information please view these documents:
Lead Poisoning Prevention BCHD (https://bhcity.us/wp-content/uploads/2018/03/Lead-Poisoning-Prevention-BCHD-updated.pdf)
Lead In Drinking Water (EPA) (https://bhcity.us/wp-content/uploads/2018/03/Lead-In-Drinking-Water-EPA.pdf)
Cleaning Your Aerators (https://bhcity.us/wp-content/uploads/2018/03/Cleaning-Your-Aerators.pdf)

- *Drinking Water Customers of the City of Benton Harbor* (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf)
- COBH Public Advisory 2018 (https://bhcity.us/wp-content/uploads/2018/03/COBH-Public-Advisory-102318-Final.pdf)

- BH Lead results for 2018 (https://bhcity.us/wp-content/uploads/2019/01/BH-Lead-and-Copper-Results-for-2018.pdf)
- Consumers Confidence Report for 2018 (CCR 2018) (https://bhcity.us/forms/water-ccr-2018.pdf)

(https://bhcity.us/wp-content/uploads/2018/03/Lawn-Care-1.pdf)

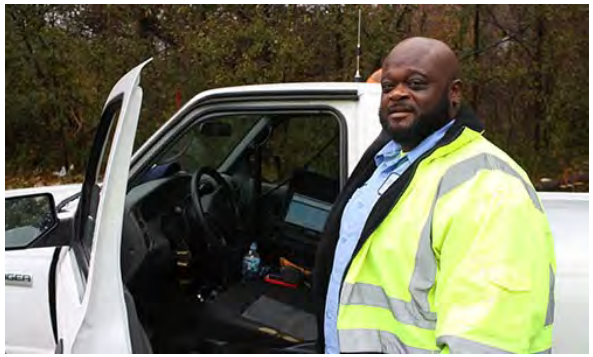
Do you know what your fertilizer may be doing to our water? Read more about the effects of lawn care (https://bhcity.us/wp-content/uploads/2018/03/Lawn-Care-1.pdf) and visit the Southwest Michigan Water Coalition (http://www.swmpc.org/water.asp) website for even more information.

Grease, fat and oil can clog sewer lines, causing sewage back-ups and flooding.

- REVISED: Consumers Confidence Report for 2017 (CCR 2017) (https://bhcity.us/wp-content/uploads/2018/03/Revised-Benton-Harbor-Water-CCR2017-Ready-for-Web-Site.pdf)
- Consumers Confidence Report for 2017 (CCR 2017) (https://bhcity.us/wp-content/uploads/pdf-large/consumers-confidence-report-2017.pdf)
- City of Benton Harbor Water Filtration Plant Annual Report for 2017 (https://bhcity.us/wp-content/uploads/2018/06/scan-of-2017-MOR-Report-for-2017-CCR.pdf)

Mike O'Malley, Director of the Water Plant, is often called "The Benton Harbor Water Guy." He and his team are responsible for the water distribution system, the sanitary sewer collection system, and storm water collection and discharge.

Benton Harbor Public Works and Water Sewer Supervisors



Benton Harbor Meter Reader

(https://bhcity.us/wp-content/uploads/2018/03/Sewer-Grease-pdf.pdf)

Did you know that grease from cooking is one of the major causes of residential sewer main clogs resulting in sewer backups? Too often, grease is washed into the plumbing system, usually through the kitchen sink. Grease sticks to the inside of sewer pipes (both on your property and in the streets). Over time, the grease can build and block the entire pipe. Read more here: Sewer Grease (https://bhcity.us/wp-content/uploads/2018/03/Sewer-Grease-pdf.pdf)

Do not pour anything down the drain – it may flow directly to inland lakes, streams or Lake

Benton Harbor Water Dist and Sanitary Sewer Crew

Benton Harbor Water Plant Operators

Your Renovated Water Plant

Benton Harbor Water Plant

The Benton Harbor Water Plant is located in the southwest corner of Benton Harbor's beautiful Jean Klock Park. The Water Plant was constructed in the 1950's as a complete treatment plant that includes chemical addition for disinfection and particulate removal; mixing and settling chambers; filters; a storage reservoir;

Michigan!

(https://bhcity.us/wp-content/uploads/2018/03/Storm-Drains.pdf)

Polluted stormwater runoff can harm plants, fish, animals, people, and it can even pollute our drinking water sources. Be sure to do your part to protect water quality. Read more about Storm Drains (https://bhcity.us/wp-content/uploads/2018/03/Storm-Drains.pdf) and visit the Southwest Michigan Water Coalition (http://www.swmpc.org/water.asp) website for even more information.

and high lift pumps to distribute the water to the City of Benton Harbor.

The water plant was aging and had experienced some failures, so a renovation project at a cost of slightly over $12 million was developed. Funding was acquired through the State of Michigan's Drinking Water Revolving Loan Funds, which feature low interest loans to Michigan Water projects. Additional funding was obtained from the federal government through the American Resources and Recovery Act, which will reduce the loan amount by 40%.

The project took two years to complete. The principal contractor, Davis Construction, along with several sub-contractors remodeled the existing plant and equipment and built the new treatment addition shown in the photograph. The Water Plant now has an anticipated life span in excess of 50 years and can properly treat up to 12 million gallons per day.

Consumer Confidence Reports

The Environmental Protection Agency (EPA) requires community water systems to deliver a Consumer Confidence Report (CCR), also known as an annual drinking water quality report, to their customers each year by July 1.

- Consumers Confidence Report for 2018 (CCR 2018) (https://bhcity.us/forms/water-ccr-2018.pdf)
- REVISED: City of Benton Harbor Utility Services Department's 2017 (https://bhcity.us/wp-content/uploads/2018/03/Revised-Benton-Harbor-Water-CCR2017-Ready-for-Web-Site.pdf)

- Consumers Confidence Report (https://bhcity.us/wp-content/uploads/2018/03/Revised-Benton-Harbor-Water-CCR2017-Ready-for-Web-Site.pdf)
- Benton Harbor 2017 CCR (https://bhcity.us/wp-content/uploads/pdf-

large/consumers-confidence-report-2017.pdf)

- Benton Harbor 2016 CCR (https://bhcity.us/wp-content/uploads/2018/03/Benton-Harbor-2016-CCR.pdf)
- Benton Harbor 2015 CCR (https://bhcity.us/wp-content/uploads/2018/03/Consumer-Confidence-Report-water-2015.pdf)
- Benton Harbor 2014 CCR (https://bhcity.us/wp-content/uploads/2018/03/Benton-Harbor-2014-CCR.pdf)

This report provides customers with information about their water quality, including the water source, a risk contamination summary, the regulated contaminates found and any potential health effects, an accounting of efforts to restore safe water, and other educational information. For more information about your CCR, read the Centers for Disease Control and Prevention's Guide to Understanding Your CCR (https://www.cdc.gov/healthywater/drinking/public/understanding_ccr.html).

I. 5. b. August 2019 Public Notice

Benton Harbor Water Plant
200 E. Wall Street
Benton Harbor, MI. 49022

PRSRT STD
ECRWSS
U.S.POSTAGE PAID
EDDM Retail

PLEASE READ
Important Lead
Information inside

**********ECRWSS**********

Local
Postal Customer
Benton Harbor, MI. 49022

This picture of a water connection to homes in Benton Harbor is where all the lead comes in the City System. Public Education Flyer for City Residents "**Protect yourselves from this**!"

This is what we have all over the City. This is a dig up of a Water Service Line going into a Residential Home. These are all over in Benton Harbor.
Most of All of our records (like this one) tell us where the tap and service is located. Some times it will say something about the materials; but usually not.
That is why we do not know until we dig a hole about 4-feet deep.
This line was installed to this home in September 1948.
This kind of water service is the majior reason for lead in you tap water, there could be other sources of Lead, but this leads to the BIG #'s

This is the City Side and it is made of lead piping.

This is the water shut off valve. It is made of brass mostly.

This is the Home Owner's side. The pipe is usually Galvanized. Like this one.

I. 5. c. February 2020 Public Notice

Benton Harbor Water Plant
200 E. Wall Street
Benton Harbor, MI. 49022

PRSRT STD
ECRWSS
U.S.POSTAGE PAID
EDDM Retail

**********ECRWSS**********

Important Information from the Benton Harbor Water Department
Please open and read, consider sharing it with your Neighbors & Friends

Local
Postal Customer
Benton Harbor, MI. 49022

IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER

THE BENTON HARBOR WATER DEPARTMENT HAS EXCEEDED THE ACTION LEVEL FOR LEAD. Lead can cause serious health and development problems, especially for pregnant women and young children. Please read this information closely to see what you can do to reduce lead in your drinking water.

This notice is brought to you by the Benton Harbor Water Department.
Water Supply Serial Number: 00600 Distribution Date: [February 26, 2020]

Health Effects of Lead
Lead can cause serious health and development problems. It can cause damage to the brain and kidneys, and can interfere with the production of red blood cells that carry oxygen to all parts of your body. The greatest risk of lead exposure is to infants, young children, and pregnant women. Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults. Lead is stored in the bones, and it can be released later in life. During pregnancy, the child receives lead from the mother's bones, which may affect brain development. Although other sources of lead exposure exist, such as lead paint, and lead contaminated dust, the Benton Harbor Water Department is contacting you to reduce your risk of exposure to lead in drinking water. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

The Water System in Benton Harbor has many water service lines that contain some portion of Lead piping. The City just completed a Preliminary Distribution System Materials Inventory that contain up to 750 homes that may have lead. When we complete the final Distribution Systems Materials Inventory, we believe that number will rise to about 2,000.

BENTON HARBOR
PORT OF OPPORTUNITIES

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Sources of Lead

Lead is a common metal found in the environment. Drinking water is one possible source of lead exposure due to the widespread use of lead in plumbing materials. EPA estimates that drinking water can make up 20 percent or more of a person's potential exposure to lead. Infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water.

The action level is 15 parts per billion (ppb) for lead and 1.3 parts per million (ppm) for copper. The action level is a measure of corrosion control effectiveness. It is not a health-based standard. To meet the requirements of the Lead and Copper Rule, 90 percent of the samples collected must be below the action level. The following table summarizes the lead and copper data collected during the most recent monitoring period:

Most Recent Sampling Information. We only managed 39 locations of the 60 mandated by the State. If your house was sampled in the October to December sampling and want to continue participation that is Great! Let us know. If you have not been involved in our Lead & Copper Sampling program and you want to participate, that would be good, and we are asking you to contact us.

Most Recent Sampling Information: October to December 2019:

Action Levels	90th Percentile Value	Range of results (minimum-maximum)	# of samples used for 90th Percentile The 1st and 5th each house.
Lead 15 parts per billion (ppb)	**32 ppb**	0 ppb – 72 ppb	78
Copper 1.3 parts per million (ppm)	**0 ppm**	0 ppm – 0.1 ppm	78

Lead can enter drinking water when pipes, solder, home/building interior plumbing, fittings and fixtures that contain lead corrode. Corrosion is the dissolving, or wearing away, of metal caused by a chemical reaction between water and your plumbing. Several factors affect the amount of lead that enters the water, including the water quality characteristics (acidity and alkalinity), the amount of lead in the pipes, plumbing and/or fixtures, and the frequency of water use in the home.

Some plumbing products such as service lines, pipes and fixtures may contain lead. The infographic below demonstrates where sources of lead in drinking water could be in your home. Older homes may have more lead unless the service line and/or plumbing has been replaced. Homes built…

- **Before the 1960s** are more likely to have lead service lines, lead pipes, fixtures, and/or solder that contain lead.
- **Before 1988** are likely to have fixtures and/or solder that contains lead.
- **Between 1996 and 2014** are likely to have fixtures that contain up to eight percent lead but were labelled "lead-free."
- **In 2014 or later** still have potential lead exposure. "Lead free" was redefined to reduce lead content to a maximum of 0.25 percent lead in fixtures and fittings. Fixtures that are certified to meet NSF Standard 61 meet this more restrictive definition of "lead free."

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Leaded solder and leaded fittings and fixtures are still available in stores to use for non-drinking water applications. Be careful to select the appropriate products for repairing or replacing drinking water plumbing in your home.

Galvanized plumbing can be a potential source of lead. Galvanized plumbing can absorb lead from upstream sources like a lead service line. Even after the lead service line has been removed, galvanized plumbing can continue to release lead into drinking water over time. Homes that are served by a lead service line should consider replacing galvanized plumbing inside the home.

Drinking water is only one source of lead exposure. Other common sources of lead exposure are lead-based paint, and lead-contaminated dust or soil. Because lead can be carried on hands, clothing, and/or shoes, sources of exposure to lead can include the workplace and certain hobbies. Wash your children's hands and toys often as they can come in contact with dirt and dust containing lead. In addition, lead can be found in certain types of pottery, pewter, food, and cosmetics. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

Particulate Lead
Lead results can vary between tests. A single test result is not a reliable indicator of drinking water safety. Two different types of lead can be present in drinking water, soluble lead and particulate lead. Soluble lead is lead that dissolves because of a chemical reaction between water and plumbing that contains lead. Particulate lead is dislodged scale and sediment released into the water from the sides of the plumbing and can vary greatly between samples. Disturbances, such as replacing a water meter, construction and excavation activities, or home plumbing repairs can cause particulates to shake free from inside pipes and plumbing. Particulate lead is a concern because the lead content can be very high. Lead particulate could be present in a single glass of water, but not present in water sampled just before or after. During construction, monthly aerator cleaning and using a filter certified to reduce lead are recommended to reduce particulate lead exposure.

Check whether your home has a lead service line.
Homes with lead service lines have an increased risk of having high lead levels in drinking water. Please contact the Benton Harbor Water Department for more information about your home's service line.

Steps You Can Take to Reduce Your Exposure to Lead in Your Water

1. ***Run your water to flush out lead.*** The more time water has been sitting in your home's pipes, the more lead it may contain. Therefore, if your water has not been used for several hours, run the water before using it for drinking or cooking. This flushes lead-containing water from the pipes.

- If you **do not** have a lead service line, run the water for 30 seconds to two minutes, or until it becomes cold or reaches a steady temperature.
- If you **do** have a lead service line, run the water for at least five minutes to flush water from both the interior building plumbing and the lead service line.

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Benton Harbor, Michigan 49022

Additional flushing may be required for homes that have been vacant or have a longer service line. Your water utility can help you determine if longer flushing times are needed.

2. ***Use cold water for drinking and cooking.*** Do not cook with or drink water from the hot water tap; lead dissolves more easily into hot water.

3. ***Use cold water for preparing baby formula.*** Do not use water from the hot water tap to make baby formula. If you have a lead service line, consider using bottled water or a filter certified to reduce lead to prepare baby formula.

4. ***Do not boil water to remove lead.*** Boiling water will not reduce lead levels.

5. **Consider *using a filter to reduce lead in drinking water.*** Public health recommends that any household with a child or pregnant woman use a certified lead filter to remove lead from their drinking water. Look for filters that are tested and certified to NSF/ANSI Standard 53 for lead reduction.

Some filter options include a pour-through pitcher or faucet-mount systems. If the label does not specifically mention lead reduction, check the Performance Data Sheet included with the device. Be sure to maintain and replace the filter device in accordance with the manufacturer's instructions to protect water quality.

If you are not able to afford the cost of a lead filter, please contact the Berrien County Health Department at 800-815-5485.

6. Consider purchasing bottled water. The Food and Drug Administration (FDA) regulates bottled water. The bottled water standard for lead is 5 ppb.

7. ***Get your child tested.*** Contact your local health department, the Berrien County Health Department at 800-815-5485, or healthcare provider to find out how you can get your child tested for lead if you are concerned about exposure.

8. ***Identify older plumbing fixtures that likely contain lead.*** Older faucets, fittings, and valves sold before 2014 may contain higher levels of lead, even if marked "lead-free." Faucets, fittings, and valves sold after January 2014 are required to meet a more restrictive "lead-free" definition but may still contain up to 0.25 percent lead. When purchasing new plumbing materials, it is important to look for materials that are certified to meet NSF standard 61. The EPA prepared a brochure that explains the various markings that can indicate that materials meet the new "lead free" definition: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.txt.

9. ***Clean your aerator.*** The aerator on the end of your faucet is a screen that will catch debris. This debris could include particulate lead. The aerator should be removed at least every six months to rinse out any debris.

10. ***Test your water for lead.***

BENTON · HARBOR
PORT · OF · OPPORTUNITIES

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Since we have not been successful collecting the State Mandated required number, we encourage you to join in our Lead and Copper testing program that is required between the months of January to July and again during the months of July to December 2020.

11. **What Happened? What is Being Done?**The Benton Harbor Water Department had elevated lead levels in their 2018 and 2019 lead and copper sampling. We have sent educational materials to residents and offered free testing in 2018,

The Berrien County Health Department has provided free filters and replacement filters to anyone who wanted to participate.

Between July and December 2019, we made every effort to collected samples from 60 homes. We are still looking for more homes with lead service lines to volunteer to have their water tested. During this round of sampling, there were 10 homes out of 39 that had lead results higher than the 15ppb Action Level (AL). When the sample results were reported to the MDEQ, the action level was exceeded for Lead at 32 ppb.

The Benton Harbor Water Department does not have lead in its water mains. However, lead can enter drinking water when it is in contact with service lines, pipes, solder, home/building interior plumbing, fittings and fixtures that contain lead. Based on recent excavation and verification of service line materials, approximately 30% of the lines in the City are made of lead.
The graphics on the last page are a good way to understand where the Lead comes from:

In March 2018, the Benton Harbor Water Department has installed corrosion control treatment to reduce lead leaching. However, it can take up to 12 to 18 months to develop the protective coating on the pipes to reduce the amount of lead leaching into the drinking water.

If you are a Benton Harbor Water Department customer and would like your service line inspected or would like to have your drinking water tested for lead, contact the Benton Harbor Water Department phone number, 269 927-8471, press 2, or contact Mr. Mike O'Malley, momalley@cityofbentonharbor.gov. City resources are limited to complete these tasks, but efforts are still in place, please understand and be patient. See Item 10 above.

For More Information

Contact the Berrien County Health Department at 800-815-5485, *the Benton Harbor Water Department at, 269-927-8471, press 2, or visit our website at* ***www.bhcity.us*** *or* www.michigan.gov/deqleadpublicadvisory. *For more information on reducing lead exposure around your home/building and the health effects of lead, visit EPA's Web site at* ***www.epa.gov/lead****, call the National Lead Information Center at 800-424-LEAD, or contact your healthcare provider.*

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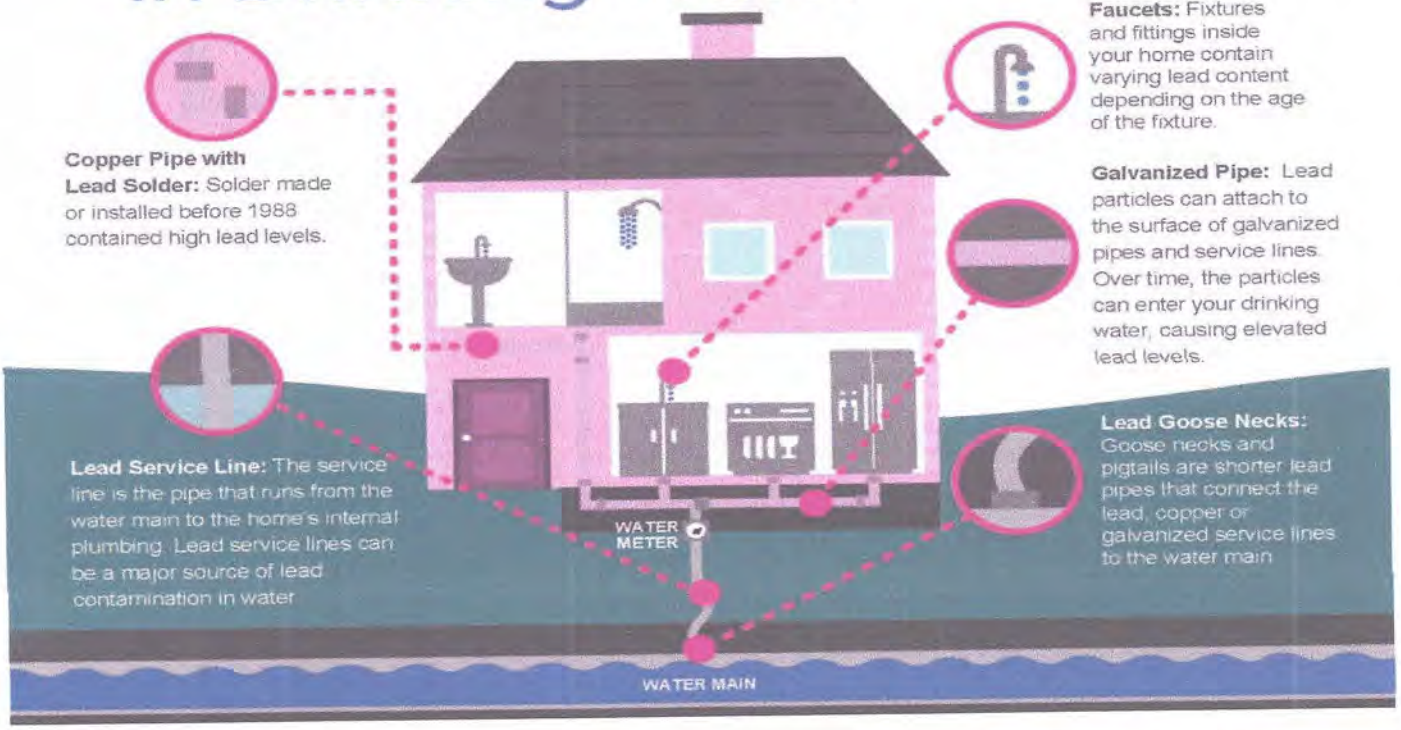
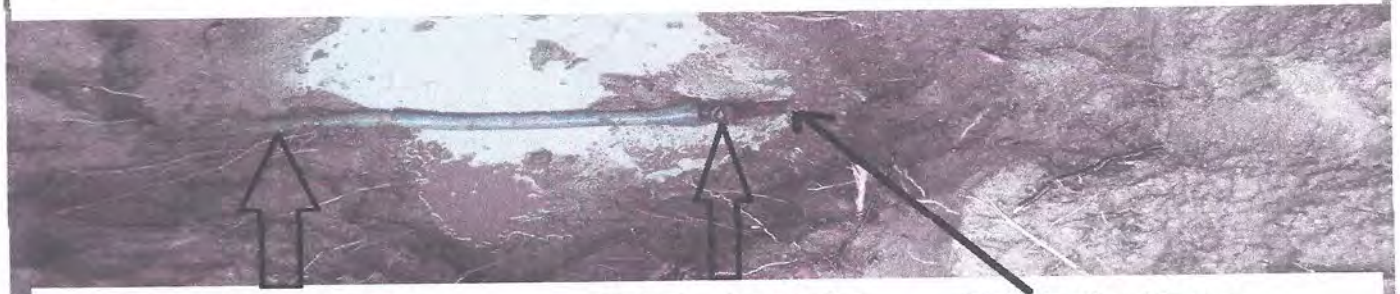
200 East Wall Street
Benton Harbor, Michigan 49022

CONCERNED ABOUT LEAD IN YOUR DRINKING WATER?

Sources of **LEAD** in Drinking Water



This is what we have all over the City. This is a dig up of a Water Service Line going into a Residential Home. These are all over in Benton Harbor.
Most of All of our records (like this one) tell us where the tap and service is located. Some times it will say something about the materials; but usually not.
That is why we do not know until we dig a hole about 4-feet deep.
This line was installed to this home in September 1948.
This kind of water service is the majior reason for lead in you tap water, there could be other sources of Lead, but this leads to the BIG #'s



This is the City Side and it is made of lead piping.

This is the water shut off valve. It is made of brass mostly.

This is the Home Owner's side. The pipe is usually Galvanized. Like this one.

IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER

THE BENTON HARBOR WATER DEPARTMENT HAS EXCEEDED THE ACTION LEVEL FOR LEAD. Lead can cause serious health and development problems, especially for pregnant women and young children. Please read this information closely to see what you can do to reduce lead in your drinking water.

This notice is brought to you by the Benton Harbor Water Department.
Water Supply Serial Number: 00600
Distribution Date: Friday, August 23, 2019

Health Effects of Lead

Lead can cause serious health and development problems. It can cause damage to the brain and kidneys, and can interfere with the production of red blood cells that carry oxygen to all parts of your body. The greatest risk of lead exposure is to infants, young children, and pregnant women. Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults. Lead is stored in the bones, and it can be released later in life. During pregnancy, the child receives lead from the mother's bones, which may affect brain development. Although other sources of lead exposure exist, such as lead paint, and lead contaminated dust, the Benton Harbor Water Department is contacting you to reduce your risk of exposure to lead in drinking water. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

Sources of Lead

Lead is a common metal found in the environment. Drinking water is one possible source of lead exposure due to the widespread use of lead in plumbing materials. EPA estimates that drinking water can make up 20 percent or more of a person's potential exposure to lead. Infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water.

The action level is 15 parts per billion (ppb) for lead and 1.3 parts per million (ppm) for copper. The action level is a measure of corrosion control effectiveness. It is not a health-based standard. To meet the requirements of the Lead and Copper Rule, 90 percent of the samples collected must be below the action level. The following table summarizes the lead and copper data collected during the most recent monitoring period:

Most Recent Sampling Information

Action Levels	90th Percentile Value	Range of results (minimum-maximum)	# of samples used for 90th Percentile
Lead 15 parts per billion (ppb)	**27 ppb**	0 ppb – 59 ppb	92
Copper 1.3 parts per million (ppm)	**0 ppm**	0 ppm – 0.1 ppm	92

Lead can enter drinking water when pipes, solder, home/building interior plumbing, fittings and fixtures that contain lead corrode. Corrosion is the dissolving, or wearing away, of metal caused by a chemical reaction between water and your plumbing. Several factors affect the amount of lead that enters the water, including the water quality characteristics (acidity and alkalinity), the amount of lead in the pipes, plumbing and/or fixtures, and the frequency of water use in the home.

Some plumbing products such as service lines, pipes and fixtures may contain lead. The infographic below demonstrates where sources of lead in drinking water could be in your home. Older homes may have more lead unless the service line and/or plumbing has been replaced.

Homes built…

* **Before the 1960s** are more likely to have lead service lines, lead pipes, fixtures, and/or solder that contain lead.
* **Before 1988** are likely to have fixtures and/or solder that contains lead.
* **Between 1996 and 2014** are likely to have fixtures that contain up to eight percent lead but were labelled "lead-free."
* **In 2014 or later** still have potential lead exposure. "Lead free" was redefined to reduce lead content to a maximum of 0.25 percent lead in fixtures and fittings. Fixtures that are certified to meet NSF Standard 61 meet this more restrictive definition of "lead free."

Leaded solder and leaded fittings and fixtures are still available in stores to use for non-drinking water applications. Be careful to select the appropriate products for repairing or replacing drinking water plumbing in your home.

Galvanized plumbing can be a potential source of lead. Galvanized plumbing can absorb lead from upstream sources like a lead service line. Even after the lead service line has been removed, galvanized plumbing can continue to release lead into drinking water over time. Homes that are served by a lead service line should consider replacing galvanized plumbing inside the home.

Drinking water is only one source of lead exposure. Other common sources of lead exposure are lead-based paint, and lead-contaminated dust or soil. Because lead can be carried on hands, clothing, and/or shoes, sources of exposure to lead can include the workplace and certain hobbies. Wash your children's hands and toys often as they can come in contact with dirt and dust containing lead. In addition, lead can be found in certain types of pottery, pewter, food, and cosmetics. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

Particulate Lead

Lead results can vary between tests. A single test result is not a reliable indicator of drinking water safety. Two different types of lead can be present in drinking water, soluble lead and particulate lead. Soluble lead is lead that dissolves because of a chemical reaction between water and plumbing that contains lead. Particulate lead is dislodged scale and sediment released into the water from the sides of the plumbing and can vary greatly between samples. Disturbances, such as replacing a water meter, construction and excavation activities, or home plumbing repairs can cause particulates to shake free from inside pipes and plumbing. Particulate lead is a concern because the lead content can be very high. Lead particulate could be present in a single glass of water, but not present in water sampled just before or after. During construction, monthly aerator cleaning and using a filter certified to reduce lead are recommended to reduce particulate lead exposure.

Check whether your home has a lead service line.

Homes with lead service lines have an increased risk of having high lead levels in drinking water. Please contact the Benton Harbor Water Department for more information about your home's service line.

For More Information

Contact the Berrien County Health Department at 800-815-5485, *the Benton Harbor Water Department at, 269-927-8471, press 2, or visit our website at* ***www.bhcity.us*** *or* *www.michigan.gov/deqleadpublicadvisory*. *For more information on reducing lead exposure around your home/building and the health effects of lead, visit EPA's Web site at* ***www.epa.gov/lead*****,** *call the National Lead Information Center at 800-424-LEAD, or contact your healthcare provider.*

Berrien County Printing

BENTON HARBOR
Port of Opportunities

Benton Harbor extends advisory for lead in the water supply

By DUSTIN DWYER (/PEOPLE/DUSTIN-DWYER) • JUL 30, 2019

Share (http://facebook.com/sharer.php?u=http%3A%2F%2Ftinyurl.com%2Fy5jvjhn7&t=Benton%20Harbor%20extends%20advisory%20for%20lead%20in%20the%20water%20supp

(//www.michiganradio.org/sites/michigan/files/styles/x_large/public/201209/benton_harbor_city_hall.jpg)

LINDSEY SMITH / MICHIGAN RADIO

The city of Benton Harbor says lead continues to be problem in the city water supply.

The city says 12 of 47 homes tested since January of this year were above the federal action level for lead in the water.

Benton Harbor first announced the higher lead levels in the water in October of last year. Since then, the city says it has started using corrosion controls in the water supply, and it's begun replacing lead service lines. Still, in tests from January through June of 2019, lead continued to show up in the water.

"The City is committed to continuing to take all corrective actions necessary to educate residents, improve the community water supply, and replace lead service lines with the goal of eliminating lead exposure in drinking water for residents," the city said in an advisory posted online (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Public-Advisory-Notification.pdf).

[For more information on how to reduce lead exposure, or how to pick up a free filter in Berrien County, go here (http://www.bchdmi.org/1568/Lead-Drinking-Water).]

The Berrien County Health Department says it has handed out nearly 2,000 free water filters to residents.

Overall, there's been no uptick in the number of children who show elevated levels of lead in their blood. The county says blood tests actually show a decline in the number of kids with elevated blood lead levels.

Out of the homes that tested high for lead in the water, there have been two children who tested for elevated levels of lead in their blood, according to Gillian Conrad, a spokesperson for the Berrien County Health Department.

But, Conrad says, it's not clear that the two children were exposed to lead through the water supply.

"Lead-based paint continues to be the primary source for lead exposure for children all over Berrien County, including Benton Harbor," Conrad says.

And Benton Harbor is not alone among Michigan cities and towns that have had high levels of lead in the water.

Last year, Benton Harbor was one of four municipalities in Michigan that tested above the federal action level for lead in the water. Earlier this month, the city of Highland Park said it tested above the federal level.

The federal action level for lead in the water supply is set at 15 parts per billion. According to the federal lead and copper rule, cities can have some test results come in at above that level without triggering a system-wide advisory. The advisory kicks in after a complicated calculation to find the 90th percentile of test results. If the 90th percentile result is above 15 parts per billion, the water supplier is required to issue an advisory and take steps to fix the problem.

Following the Flint Water Crisis, Michigan Radio calculated (https://www.michiganradio.org/post/video-how-dropping-two-flints-lead-test-numbers-changed-things-state) the 90th percentile for Flint's tests should have been at 18.8 ppb.

Four of the five municipalities in Michigan that have had lead advisories in the past year were above that level. Hamtramck was at 28 ppb. The village of Lawrence was at 24 ppb. Highland Park was 57 ppb (https://www.michiganradio.org/post/elevated-lead-levels-found-highland-park-tap-water) and Benton Harbor's latest results came in at 27 ppb (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Public-Advisory-Notification.pdf).

And Gillian Conrad with the Berrien County Health Department says expects even more cities to find high lead results in the coming years.

“So it is definitely going to be a lot of communities that will be going through this process of understanding where lead might be present in their communities,” she says. “And I think it’s something that’s important for all of us to understand for public health.”

Conrad says the county will continue to provide free filters for anyone concerned about lead in their water. Information on where to get the filters, and how to reduce exposure to lead, is available on the health department’s website (http://www.bchdmi.org/1568/Lead-Drinking-Water).

TAGS: ELEVATED LEAD LEVELS (/TERM/ELEVATED-LEAD-LEVELS) BENTON HARBOR (/TERM/BENTON-HARBOR)

Share (http://facebook.com/sharer.php?u=http%3A%2F%2Ftinyurl.com%2Fy5jvjhn7&t=Benton%20Harbor%20extends%20advisory%20for%20lead%20in%20the%20water%20supp

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JUL 9, 2019

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m-nothing-flints-thats-scary-part)

Benton Harbor's lead problem is nothing like Flint's. That's the scary part. (/post/benton-harbors-lead-problem-nothing-flints-thats-scary-part)

FEB 12, 2019

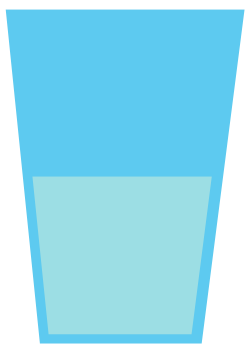
(/post/benton-harbor-residents-asked-flush-taps-more-homes-test-positive-lead-water)

Benton Harbor residents asked to flush taps, as more homes test positive for lead in the water (/post/benton-harbor-residents-asked-flush-taps-more-homes-test-positive-lead-water)

JAN 25, 2019

CITY OF BENTON HARBOR

DRINKING WATER & LEAD



OCT. 2018

During **routine** lead testing, required of every municipal water provider, City of Benton Harbor had 8 of 30 homes with lead levels greater than 15 part per billion.

This elevated result from testing triggered an **Action Level Exceedance (ALE).**

Notification & information was distributed to residents, including recommendations for flushing times.

NOV. 2018 - JAN. 2019

Additional investigation into the **source of lead in the drinking** water was completed.

335 homes participated in voluntary water testing (46 were elevated). MDHHS conducted sequential water sampling to further ensure good recommendations were being made for residents

JAN. - FEB, 2019

Following investigation period, it was determined that **lead service lines and aging infrastructure** were of concern.

Residents were recommended to use 5 minute flushing times or use a water filter that is NSF 53 certified for lead.

FEB. - MARCH, 2019

Berrien County Health Department, with support from the Michigan Department of Health & Human Services (MDHHS) **began to distribute water filters to all City residents**.

Michigan Department of Environment, Great Lakes, & Energy (EGLE) continues to work with City Water Plant; **corrosion prevention treatment** implemented by City of Benton Harbor - Water Treatment Plant on March 25th.

MAR. 2019 - PRESENT

Berrien County Health Department continues to provide water filters to residents & monitor blood lead levels in children throughout the City (and county). No increase in the trend of elevated blood lead levels has been seen.

City of Benton Harbor continues to replace lead service lines.

EGLE & MDHHS continue to support work and resident communication.

Updated April, 2020

I. 5. f BCHD Lead ALE Notice

LEAD ACTION LEVEL EXCEEDANCE IN THE CITY OF BENTON HARBOR

WATER FILTER DISTRIBUTION FOR CITY OF BENTON HARBOR:

How To Get A Water Filter or Replacement Cartridge During COVID-19 Pandemic:

Water filters and replacement cartridges are still available for Benton Harbor City Residents.

If you are in need of a water filter or your cartridge needs to be replaced, please call the Berrien County Health Department at 1-800-815-5485 (option 2) and a filter will be mailed to you.

If we miss your call, please leave a message with your phone number. We will call you back and arrange filter delivery. Stay home, stay safe!

At this time, all public distribution/pick-up dates have been cancelled.

BACKGROUND INFORMATION:

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) and the US Environmental Protection Agency (EPA) require public water supplies to test regularly for lead and copper in drinking water. The regularly scheduled testing discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the "action level" of 15 parts per billion (ppb) for lead in water. More information about water testing in the City of Benton Harbor can be found on the City of Benton Harbor Website.

When at least 10% of the samples tested exceed the action level for lead in drinking water (15ppb), public health officials recommend precautionary actions to protect residents - especially those most at risk of harm to their health, including children and fetuses. Lead exposure can pose a serious health risk for children because their bodies and

nervous systems are still developing. The use of water filters is recommended in any residence served by the City of Benton Harbor water system that is home to a child or a pregnant woman. However, free filters are being provided to any City of Benton Harbor resident who would like one.

In homes with children or pregnant women, the Berrien County Health Department also recommends using only cold filtered (or bottled) water for drinking, rinsing food, cooking, mixing powdered infant formula, and brushing teeth. When buying a water filter, make sure it is certified to NSF/ANSI Standard 53 for lead reduction and NSF/ANSI Standard 42 for particulate reduction. It is important to follow the manufacturer's instructions for installing and maintaining the filter.

FOR QUESTIONS ABOUT THE WATER OR WATER TESTING:

City of Benton Harbor
City of Benton Harbor Website
Email: bhwater@cityofbentonharbormi.gov
Phone: 269-927-8400 ext.1143

https://www.heraldpalladium.com/news/local/too-much-lead-in-benton-harbor-water/article_b5a94742-8edc-5574-8859-4e62159fa907.html

I. 5. g. October 23, 2018 Herald Palladium Newspaper Article

TOP STORY

Too much lead in Benton Harbor water

Officials hold press conference today to inform residents

By LOUISE WREGE - HP Staff Writer
Oct 24, 2018

Don Campbell / HP staff

BENTON HARBOR — Benton Harbor's water system is under a state advisory for lead after summer sampling revealed higher-than-acceptable levels, city officials confirmed Tuesday night.

City officials will hold a press conference at 11 a.m. today at City Hall to let residents know what it means now that the state has found there is too much lead in the city's tap water, City Manager Darwin Watson said.

According to an advisory from the Michigan Department of Environmental Quality, out of the water samples collected from 30 homes this summer, eight were above the action level of 15 parts per billion (ppb) for lead. And the 90th percentile of the samples was 22 ppb for lead.

“Exceeding the Action Level triggers additional actions, including, but not limited to, increased investigative sampling of water quality and educational outreach to customers,” the advisory states. “Elevated levels of lead in the drinking water can cause health concerns.”

Watson said one of the best ways to reduce the amount of lead in your drinking water is to run the tap cold for three to five minutes before using the water to drink or for cooking. He said stagnant water in pipes that aren’t used very often are more likely to contain higher levels of lead than pipes where the water is circulated more often.

“It’s all about stagnation,” he said. “Stagnant water allows for more interaction between the water and the pipes.”

To further reduce your risk of lead exposure, the advisory recommends:

• Use cold water tap for drinking or cooking.

• Use bottled water to prepare baby formula.

• Do not boil your water as boiling will not reduce the amount of lead in water.

• Water is safe for bathing.

The advisory states that the Berrien County Health Department has detected no increase in lead levels in Benton Harbor children under the age of 7. In fact, the advisory states that “there is a downward trend of elevated blood levels continuing into 2018.”

The city is being required to collect water samples every six months to determine if “corrective actions are necessary to reduce corrosion in household plumbing.”

Residents will receive more notices about lead in the city’s water, states the advisory.

More information on the health effects of lead in drinking water can be found at www.michigan.gov/deqleadpublicadvisory.

Lead can cause brain and kidney damage and can “interfere with the production of red blood cells that carry oxygen to all parts of your body.”

“The greatest risk of lead exposure is to infants, young children, and pregnant women,” states the information on the MDEQ website. “Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults.”

Questions about the water system, water testing, health concerns or getting your child’s blood lead level tested can be directed to the Benton Harbor Water Response Hotline at 1-800-815-5485 from 8:30 a.m. to 5 p.m.

Additional information can be found on the city's website at www.bhcity.us or the Berrien County Health Department website at www.bchdmi.org.

The city was notified in May that it received almost $300,000 in state grant money to replace lead and galvanized steel water service lines. At the time, Benton Harbor Water Superintendent Mike O'Malley estimated that 60 percent of the houses in Benton Harbor have lead and/or galvanized steel water lines from the main water line to the house.

Watson said the city needs to do a general inventory of the city's water service lines to determine how many are lead or galvanized steel. After that, he said, the rest of the money will be used to start replacing lead pipes.

He said state officials decided to replace galvanized steel pipes because it has been shown that lead can collect in them.

Watson said the city is responsible for the water lines up to the sidewalk. Homeowners are responsible for water lines from the sidewalk to the house. But this grant is allowing the city to replace water lines on private property.

Contact: lwrege@TheHP.com, 932-0361, Twitter: @HPWrege

I. 6. February 13, 2020 EGLE Corrosion Treatment Letter

STATE OF MICHIGAN

DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit for installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system. The treatment chemical permitted, based on a recommendation by Elhorn Engineering, was Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was 1.5 milligrams per liter (mg/L) as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City concludes the treatment is not achieving desired results quickly enough. The most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment.

The City met with representatives from EGLE on January 15, 2020, to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting and outline next steps for the City to pursue designation of optimized corrosion control treatment as required by Rule 604f of the administrative rules promulgated under Act 399.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60 certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This

designation is being made under R325.10604f(3)(d). The reason for this change is to speed up treatment effectiveness. EGLE's intent is to quickly put into place treatment that will more efficiently lower corrosion rates in the distribution system for greater protection of public health. This decision is based on corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system but, without further study, it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third-party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c) of the administrative rules promulgated under Act 399. This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immediately verify in writing to the department the valve has been closed according to the permit.

TRANSITION AND TIMELINE

Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

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Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

AGENDA

City of Benton Harbor
Water System Compliance Discussion

December 4, 2018

10:00 – 11:00

Meeting called by Michigan Department of Environmental Quality

Attendees: Mayor Marcus Muhammad, Darwin Watson, Mike O'Malley
Eric Oswald, Brandon Onan, Brian Thurston, Ernie Sarkipato

Introductions — **City Hall**

Who are we, why are we here

Background

Timeline of water system compliance

Proposed Draft Administrative Consent Order

Outstanding Items

Public Notice of repeated monitoring violations

Lead Action Level Items:

- -Alternative Water Supply, tracking
- -Consumer Notice for high results
- -Distribution Certification Form for PA & PE
- -Water Quality Parameter Sampling

Path Forward

Corrosion Treatment

Lead Grant Funds

Final ACO & Compliance Timeline

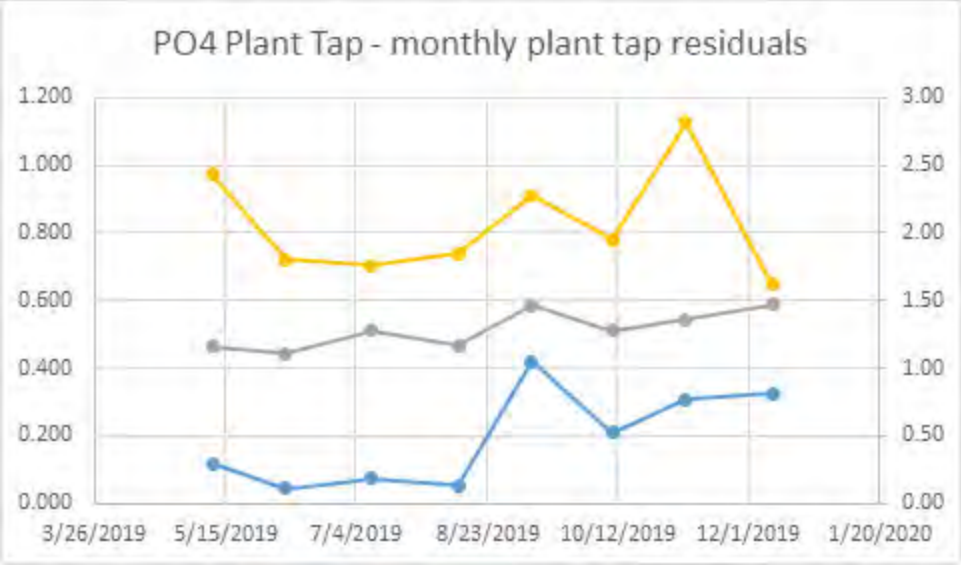
Water Plant Tour

Reference Documents

Water System Compliance Summary
Draft Administrative Consent Order
Significant Deficiency Violation Notice
Benton Harbor Chronology log

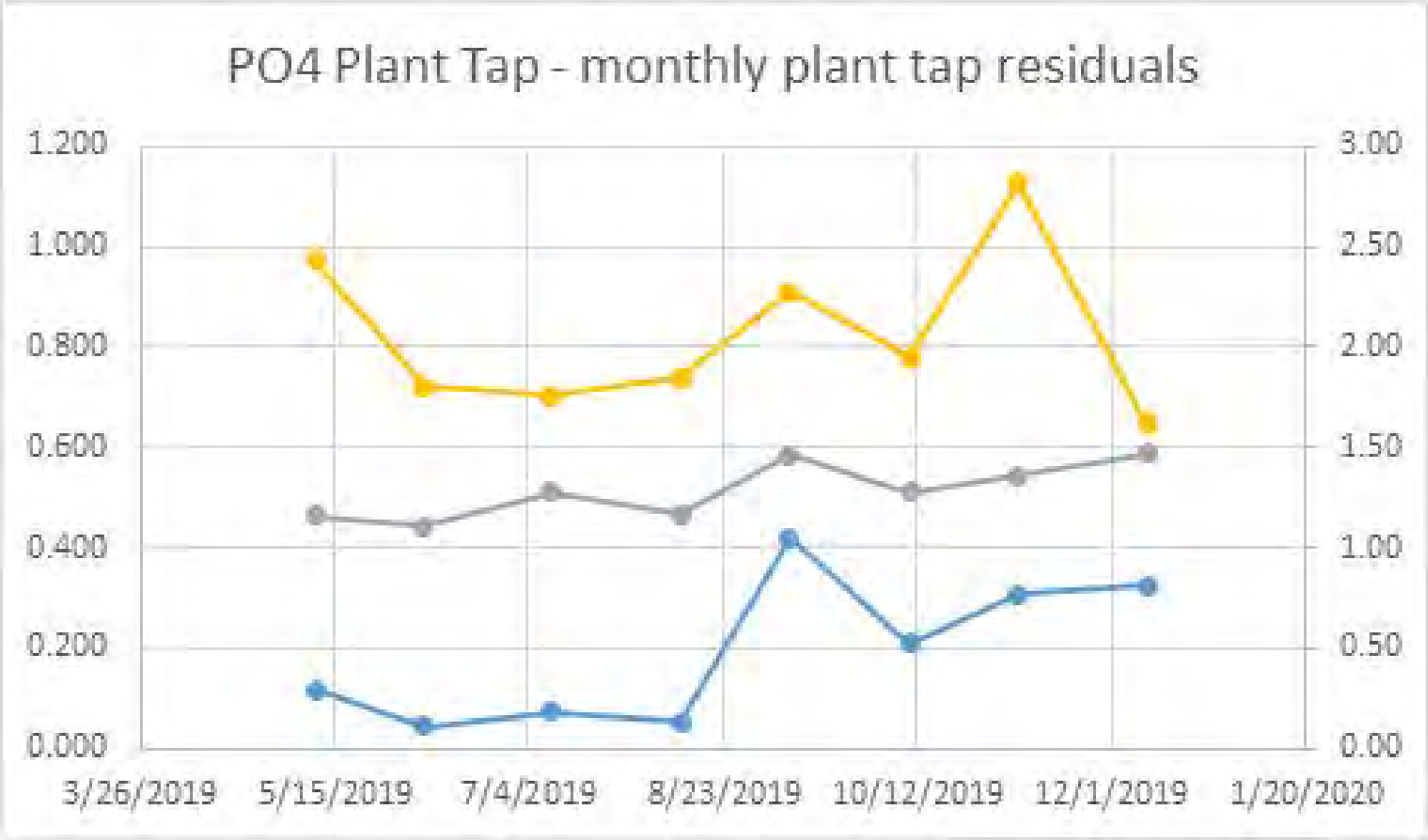
From: Sarkipato, Ernest (EGLE)
To: Onan, Brandon (EGLE)
Cc: Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject: PO4 data - Benton Harbor
Date: Wednesday, December 18, 2019 11:09:00 AM
Attachments: image001.png

FYI:



Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater


PO4 Plant Tap - monthly plant tap residuals
1.200
1.000
0.800
0.600
0.400
0.200
0.000
3.00
2.50
2.00
1.50
1.00
0.50
0.00
3/26/2019
5/15/2019
7/4/2019
8/23/2019
10/12/2019
12/1/2019
1/20/2020

From:	Sarkipato, Ernest (EGLE)
To:	"DARWIN WATSON"
Cc:	"Darold Harlan"; momalley@cityofbentonharbormi.gov
Subject:	ACO items
Date:	Monday, August 12, 2019 10:56:18 AM
Attachments:	City of Benton Harbor Signed ACO and Transmittal Letter.pdf Inspection Photos BH 08092019.pdf

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I appreciated the opportunity to spend time at the Benton Harbor water plant last Friday. Below is a summary of observations, also serving as a status update on the improvements at the water plant. Attached are photos taken during the inspection.

Monitoring Violations and CCR: EGLE staff are actively discussing a few outstanding compliance-related items, including missed samples and the recent CCR distribution. Please stay tuned for more on this.

Staffing: I had the chance to meet with Darold, who is the F&V guy for the distribution system. The decision was made recently to have distribution water guys work out of the water plant, which is a really effective way to bring some focus back to the distribution system which has suffered much neglect. Currently, they are focusing initial efforts on pursuing rate collection for accounts that are past due, starting with the highest amounts. This is essential, as revenue is fundamental. The water plant also has one new staff, giving them more options for completing maintenance activities. I sent a separate email on the cross connection program, which will be a focus in the coming months.

Finished Water Meter: The McCrometer insertion meter is installed as planned, and connected to SCADA along with a totalizer.

Corrosion Treatment: The phosphate feed pump was connected to the meter initially after installation, but two problems arose. First, for this setup all backwash water also passes through the meter, and the city was spending a lot of money on feeding corrosion chemical that was eventually heading for the backwash ponds. In addition, there was a PLC-level issue with the chem pump memory (not exactly sure the nature of the issue here). Currently, the phosphate is back to being fed when a high service pump is running. We will be analyzing the distributing residual data along with coupon testing to assess whether this system is sufficiently accurate. Bear in mind, we will be setting acceptable ranges for phosphate eventually, and the feed system will need to be accurate enough to stay within a specific range. Note, when I was there Doug measured orthophosphate, and it was between 1.4-1.5 mg/L, which is an excellent residual at the water plant tap. I'd like to see a bit more regularity in operators reading the scale twice a day and calculating the ppm dosed as well.

Alum: The bulk tank is now connected to the new day tank, and chemical pumps are installed with piping. The system is not yet running, as the permit application is still under review. Attached is a diagram and photo. The current plan is to have the operators fill the tank manually, and run the pumps manually. This is preferred by the operator.

SCADA: The scada was reviewed to ensure filter turbidity data was trending, as well as chlorine residual. Please note, the system alarms need to be reviewed to ensure low chlorine or high turbidity result in a call-out, particularly after hours in the case of low chlorine. Note, the photo of the turbidity shows some wacky data around 8/5-8/6, but this was during plant shut-down. I'd be curious to know what that was caused by!

CL17: The online chlorine analyzer has been installed and is being trended in SCADA. Note, there appears to be daily variability in plant tap chlorine, confirmed by the cl17 as well as titrations in the lab. Shift operators are in the habit of 'boosting' the chlorine first thing in the day, and this practice should be discontinued. Stable chemical levels, particularly oxidants such as chlorine, are very

important in the effort to build a passivation layer in the distribution system and minimize release of metals.

I am generally encouraged to see the staff together at the WTP, and see all the efforts to improve the water system on both the distribution and treatment ends. Thanks for all your hard work in these efforts. We hope to continue to support the city of BH in building a sustainable water system that is most protective of public health.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

March 8, 2019

CERTIFIED MAIL

The Honorable Marcus Muhammad
Mayor of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mayor Muhammad:

SUBJECT: Administrative Consent Order (ACO); City of Benton Harbor; WSSN: 00600

Enclosed please find a fully executed ACO between the City of Benton Harbor and the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), regarding the water supply at the City of Benton Harbor. The compliance schedule in this ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. The effective date of the ACO is March 5, 2019.

If you have any questions regarding the ACO, please contact me at 616-490-9590; lachancea1@michigan.gov; or DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Amy Lachance
Assistant Division Director
Drinking Water and Municipal Assistance Division

Enclosure
cc: Mr. Darwin Watson, City of Benton Harbor
Mr. Eric J. Oswald, DEQ
Mr. Brian Thurston, DEQ
Mr. Mike Bolf, DEQ
Mr. Ernie Sarkipato, DEQ
Mr. Dave Willard, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION

ADMINISTRATIVE CONSENT ORDER

In the matter of: DWMAD Order No. ACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME	OWNER☒	OPERATOR☐
City of Benton Harbor		
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
CONTACT NAME/TITLE: Darwin Watson, City Manager	PHONE #: 269-927-8408	

FACILITY NAME AND LOCATION

FACILITY NAME: Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER: 00600
FACILITY OWNER IF NOT IDENTIFIED ABOVE: City of Benton Harbor		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
COUNTY: Berrien		
CONTACT NAME: Darwin Watson	PHONE #: 269-927-8408	

1.1 This document results from allegations by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ alleges that the City of Benton Harbor, owner/operator of the city's public water supply, is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder.

1.2 Specific violations are referenced in the DEQ Significant Deficiency Violation Notice (SDVN) attached to this Administrative Consent Order (Consent Order) as Exhibit A. The Owner/Operator and the DEQ agree to resolve the violations set forth therein through entry of this Consent Order. The Owner/Operator agrees to resolve all compliance issues set forth in Exhibit A in accordance with the requirements contained in this Consent Order. This Consent Order, in its entirety, shall consist of Section I, the attached Sections II, III, and IV, Exhibit A, and any other referenced attachments, exhibits, or appendices. This Consent Order shall be considered null and void if it does not include, at a minimum, Sections I, II, III, and IV and Exhibit A. The Owner/Operator further agrees that this Consent Order shall become effective on the date it is signed by the DWMAD Director, designee of the DEQ Director.

1.3 The Owner/Operator agrees to pay a civil fine of $500 per day for failure to complete corrective actions as specified in Section II, Compliance Schedule, unless an extension has been approved under Section 4.14. Failure to make a timely payment constitutes a violation of this Consent Order.

1.4 The Owner/Operator agrees to make payment of all funds due pursuant to this agreement by certified check made payable to the "State of Michigan" and mailed to the Accounting Services Division, Cashier's Office for the DEQ, P.O. Box 30657, Lansing, Michigan 48909-8157. To ensure proper credit, all payments made pursuant to this Consent Order must include "Payment Identification Number RMD90044" on the check. The Owner/Operator agrees not to contest the legality of the civil fine.

Signatories

DEPARTMENT OF ENVIRONMENTAL QUALITY

Eric Oswald, Director
Drinking Water and Municipal Assistance Division

5-Mar-19
Date

I undersigned CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

2/25/2019
Date

SECTION II - COMPLIANCE SCHEDULE

IT IS THEREFORE AGREED AND ORDERED THAT the Owner/Operator shall take the following actions to prevent further violations of Act 399 and the administrative rules promulgated thereunder and/or to correct the significant deficiencies identified in the SDVN attached to this Consent Order as Exhibit A.

2.1 Submit to the DWMAD a completed rate study from a qualified professional consultant, along with a plan to implement rate increases as recommended by the study, no later than April 1, 2019.

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water no later than April 1, 2019.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

2.7 Submit to the DWMAD an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process, no later than May 1, 2019.

2.8 Submit an updated cross connection program for DWMAD approval, incorporating the City's plan for implementing control of residential accounts, and for obtaining adequate personnel to implement the City's cross connection control program, no later than June 1, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

2.10 Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants, no later than June 1, 2019.

2.11 Conduct professional inspection of the elevated tank interior and exterior no later than June 30, 2019.

2.12 Install working mussel control system at the intake no later than June 30, 2019.

2.13 Repair filter to waste valves no later than January 1, 2020.

Sections III and IV of this Consent Order shall not be altered in any way, including adding or eliminating any language, striking terms or parts of terms, retyping in whole or in part, or using a different format. Any changes to this document without written approval from the DEQ renders the Consent Order null and void.

SECTION III - STIPULATIONS

The Owner/Operator and the DEQ stipulate as follows:

3.1 The DEQ is authorized to enter this Consent Order requiring the Owner/Operator to comply with state law under Section 15 of Act 399.

3.2 The Owner/Operator consents to the issuance and entry of this Consent Order and stipulates that the entry of this Consent Order constitutes a final order of the DEQ and is enforceable as such under the appropriate provisions of state law identified in this Consent Order. The Owner/Operator agrees not to contest the issuance of this Consent Order and that the resolution of this matter by the entry of this Consent Order is appropriate and acceptable.

3.3 The Owner/Operator and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Owner/Operator that the law has been violated.

3.4 The Signatory to this Consent Order on behalf of the Owner/Operator agrees and attests that he/she is fully authorized to ensure that the Owner/Operator will comply with all requirements under this Consent Order.

3.5 The Owner/Operator shall achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section II of this Consent Order.

SECTION IV - GENERAL PROVISIONS

The Owner/Operator and the DEQ further stipulate as follows:

4.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Owner/Operator to comply with the requirements of Act 399 and the administrative rules promulgated thereunder.

4.2 The DEQ and the Owner/Operator consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to the provisions of Act 399.

4.3 This Consent Order in no way affects the Owner/Operator's responsibility to comply with any other applicable local, state, or federal laws or regulations.

4.4 The DEQ reserves its right to pursue appropriate action, including injunctive relief to enforce the provisions of this Consent Order, and applicable statutory fines for any violation of this Consent Order.

4.5 Nothing in this Consent Order is or shall be considered to affect any liability the Owner/Operator may have for natural resource damages caused by the

Owner/Operator's acts or omissions at the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

4.6 In the event the Owner/Operator sells or transfers the facility, he/she shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the Owner/Operator shall also notify the DWMAD Engineering Unit, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be submitted to the DWMAD Engineering Unit within 30 days of assuming the obligations of this Consent Order.

4.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their successors and assigns.

4.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

Reporting

4.9 The Owner/Operator shall make all submittals and written notifications required by this Consent Order, to the DWMAD Engineering Unit, DEQ, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503. The cover letter with each submittal or notification shall identify the specific paragraph and requirement of this Consent Order that the submittal or notification is intended to satisfy.

4.10 The Owner/Operator shall verbally report any violation(s) of the terms and conditions of this Consent Order to the DWMAD Engineering Unit Supervisor at 231-590-3430 by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with submittal of a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The Owner/Operator shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

Retention of Records

4.11 Upon request by an authorized representative of the DEQ, the Owner/Operator shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to applicable laws or rules. All such documents shall be retained by the Owner/Operator for at least a period of three years from the date of generation of the record unless a longer period of record retention is required by the applicable law or its rules.

Right of Entry

4.12 The Owner/Operator shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all

reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to Act 399 and the administrative rules promulgated thereunder or any other applicable statutory provision.

DEQ Approval of Submittals

4.13 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Owner/Operator, the following process and terms of approval shall apply:

a. All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

b. In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the reasons for such disapproval. The Owner/Operator shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

c. In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Owner/Operator to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

d. Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

e. Failure by the Owner/Operator to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the Owner/Operator to the enforcement provisions of this Consent Order.

f. Any delays caused by the Owner/Operator's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Owner/Operator's responsibility to comply with any other deadline(s) specified in this Consent Order.

g. No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted

by the Owner/Operator will be construed as relieving the Owner/Operator of his/her obligation to obtain written approval, if and when required by this Consent Order.

Extensions

4.14 The Owner/Operator and the DEQ agree that the DEQ may grant the Owner/Operator a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request to the DWMAD Engineering Unit no later than ten business days prior to the pertinent deadline and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the Owner/Operator from meeting the deadline(s).

c. A description of the measures the Owner/Operator has taken and/or intends to take to meet the required deadline(s).

d. The length of the extension requested and the specific date on which the obligation will be met.

No change or modification to this Consent Order shall be valid unless in writing from the DEQ and, if applicable, signed by both parties.

Termination

4.15 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the Owner/Operator shall submit a request consisting of a written certification that the Owner/Operator has fully complied with the requirements of this Consent Order and has made payment of any fines required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section II of this Consent Order, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the DWMAD Engineering Unit.

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Exhibit A
Administrative Consent Order

Enforcement Type	Issue Date
Significant Deficiency Violation Notice	October 3, 2018

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
GRAND RAPIDS DISTRICT OFFICE

C. HEIDI GRETHER
DIRECTOR

October 3, 2018

CERTIFIED MAIL

Mr. Marcus Muhammad, Mayor
Mr. Darwin Watson, City Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, MI 49022

SIGNIFICANT DEFICIENCY VIOLATION NOTICE
WSSN: 00600

Dear Sirs:

SUBJECT: City of Benton Harbor (City) - Water System Sanitary Survey and Significant Deficiency Violation Notice – Financial and Managerial Capacity

This letter will confirm meetings with Benton Harbor staff on multiple dates in 2017 and 2018; representing the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), and summarize the subsequent review and discussion of the water supply facilities serving the City of Benton Harbor (City). The purpose of these meetings and subsequent review is to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). **Findings from the survey, listed below, have led to the determination the water supply currently lacks the financial and managerial capacity to meet all the requirements of Act 399.** Findings of significant deficiency have been identified as having the potential to introduce contamination to the public water supply and must be addressed within 120 days or be outlined in a corrective action plan and schedule approved by this office.

Since the previous sanitary survey in 2015, staff at the City of Benton Harbor have made significant efforts to maintain and improve the historically neglected water system. The distribution pipe network alone represents $124 million in replacement value, according to the 2017 asset management program by Abonmarche. Along with the City's complex treatment plant, this represents a significant challenge for the City in terms of maintenance costs. Proper care and maintenance of the system is necessary to protect the health of all customers.

The major findings below indicate a number of areas needing immediate attention by the City, many of which have the potential to impact public health by allowing or introducing contamination to the water supply. Of utmost importance, a review of financial information finds the City presently lacks an adequate financial mechanism to conduct necessary improvements or hire necessary staff to properly maintain and operate the water system. **We strongly advise the City to work with a qualified financial consultant to identify the revenue necessary to support operation and maintenance and to implement effective revenue collection methodologies.** Investment from the City's rate payers is essential for resolving the below (significant) deficiencies and for ensuring the long term vitality of the water system assets.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	**Deficiencies Identified**
Treatment	**Significant Deficiencies Identified**
Distribution System	**Significant Deficiencies Identified**
Finished Water Storage	**Deficiencies Identified**
Pumps	Recommendations made
Monitoring & Reporting	**Significant Deficiencies Identified**
Management & Operations	**Significant Deficiencies Identified**
Operator Compliance	Recommendations made
Security	No Deficiencies or Recommendations
Financial	**Significant Deficiencies Identified**
Other	**Significant Deficiencies Identified**

The following significant deficiencies are violations of Act 399 with the potential to allow or introduce contamination to the public water supply, and must either be resolved within 120 days or be included in an approved corrective action plan.

D1. Our review included the City's asset management program, submitted in December 2017, as well as the bill payment and collections process. Current revenues are not sufficient to cover capital improvement costs, and necessary improvements identified in this survey are likely to increase operations and maintenance costs beyond the current revenues. In addition, the current water bill collection process is inadequate and creates a significant drain on staff resources and time, which would be better spent towards resolution of significant deficiencies and performance of routine maintenance activities. **In order to maintain the required financial capacity to operate a public water supply, the City must:**

a. Conduct a rate study with a qualified professional consultant, and implement findings to generate sufficient revenue to cover costs.
b. Implement a consistent and equitable program to minimize the number of unpaid bills, and streamline the collections process.

D2. An increasing trend in the number of violations of Act 399 in the past year indicates the need for increased managerial oversight of the water supply. In addition, maintenance of the water plant and distribution system components is severely lacking. The lack of separate designated distribution and plant managers prevents staff from spending adequate time and energy on managing the water system. **In order to maintain the managerial capacity to operate the public water supply and meet the requirements of Act 399, the City must hire separate certified operators to oversee the distribution system and the water treatment facility.**

D3. R 325.11008 (2) requires a sufficient primary coagulant dose shall be added to create a settleable or filterable floc at all times. Currently the City adds coagulant to an injection point in the raw water influent pipe rather than the engineered rapid mix basins in the new plate settler building. It has become apparent, through a near violation of turbidity standards in February of 2018, as well as an ongoing treatment technique violation of R 325.10610c, this coagulation practice is not acceptable to meet the requirements of Act 399. Lack of proper mixing also impacts the pathogen removal credit awarded to properly operated conventional treatment facilities. **Adequate rapid mix for the primary coagulant must be installed.**

The current raw water pH of Lake Michigan is above the optimum operating range of the City's current coagulant, aluminum sulfate. At these elevated pH ranges, iron based coagulants, such as ferric sulfate or ferrous sulfate may be more suited for creating a settleable or filterable floc. The City should hire a consultant to explore the steps necessary to explore a switch of the primary coagulant.

D4. R 325.10720 (3) requires continuous monitoring for residual disinfectant at an entry point to the distribution system (EPTD) on a continual basis, and requires the minimum to be recorded for each day. The chlorine analyzer at the City's EPTD was reading less than 0.2 mg/L, the minimum required residual under R325.10611a(2)(b). The readings were identified as unreliable by the operator, and are not recorded as required above. Moreover, plant staff were not familiar with the operational setpoints necessary to achieve sufficient disinfection. **Accurate chlorine analyzer must be in place, minimum levels recorded daily and reported to the DEQ, and connected to SCADA with callout alarms in the event of low residual.**

D5. R 325.11404 requires a water supply to develop a comprehensive control program for the elimination and prevention of all cross connections. The program must include education, inspection, preventer testing in all customer sectors including residential. In addition, an annual report summarizing activities must be submitted to the DEQ. The City has insufficient staff to conduct any activities for the last few years, as evidenced by the lack of annual reporting. **The City must dedicate a trained staff person to implement this program or obtain a contract with a qualified professional company to implement the program.**

D6. R325.11108 requires a water supply to have sufficient valves in the distribution system to minimize interruptions in service and minimize sanitary hazards during construction or repairs. In addition, R 325.11111 requires adequate records be maintained on the distribution system components including hydrants and valves. The City has struggled to conduct necessary inventory and maintenance on valves in the system. **A plan for valve inventory and maintenance must be submitted, approved and implemented consistently.**

D7. R 325.11105 requires a water supply distribution system to maintain a minimum pressure of 20psi throughout the system during emergencies such as firefighting, and allows the department to prohibit installation of fire hydrants in areas where fire flow is not sufficient. From our discussion with staff and through the hydrant flow testing activities conducted during the reliability study, a number of hydrants in town have no flow or zero flow. This may be related to closed valves in the system, which significantly impacts public safety should an emergency occur. **A plan for hydrant inventory and maintenance must be submitted,**

approved and implemented consistently.

D8. The water plant's supervisory control and data acquisition (SCADA) system is in need of upgrades to achieve the following requirements:

a. Storage and access to regulatory data such as EPTD chlorine residuals (R 325.10720), plant flow, and individual filter turbidity profiles (R10720a).
b. Alarming capabilities to call out during unstaffed hours for low chlorine residual, low tower level, high turbidity at the filter confluence point and other undesirable conditions.
c. Automation of water plant operations may be enhanced to allow staff to focus on maintenance activities.

The following deficiencies are also violations of Act 399, and must be resolved to return to compliance with Act 399.

D9. Install finished water meters at the water plant to facilitate accurate calculations and reporting of chemical treatment, calculation of non-revenue water, and more accurate calculation of CT.

D10. Significant amounts of unlined cast iron water main are in need of replacement. With funding in place, the City must prioritize replacement of old water main that is unreliable and undersized.

D11. The monthly operating report must accurately reflect the data collected at the water plant. For example, treated water has been estimated using raw water meters, and chlorine at the plant tap should be the minimum recorded for the day from the EPTD continuous analyzer as opposed to bench top analysis.

D12. Conduct a professional inspection on the elevated tank, including necessary maintenance and cleaning. This may be facilitated by installing variable frequency drive(s) on high service pumps, which would allow operating on pressure rather than on tower level.

If you have any information you would like us to consider regarding the significant deficiencies identified in this Significant Deficiency Violation Notice, please provide it in a written response by November 2, 2018.

Representatives from the City and DEQ met on September 14, 2018 to discuss preliminary findings of the sanitary survey, and to begin discussion of a corrective action plan such as an administrative consent order (ACO), to return to compliance. It is understood that a significant amount of time will be required to address many of these issues. Therefore, we recognize that this ACO contains a schedule, which is both systematic and flexible, to bring the City back into compliance with the SDWA and providing a safe and reliable source of drinking water to its residents. Upon hearing from the City of its desire to move forward with an ACO, we will forward a draft ACO for the City's review and comment. At that time, DEQ staff will be available to meet with City officials to discuss the ACO in an attempt to execute it prior to the 120 day deadline.

A reliable supply of quality drinking water is critical to the growth and strength of any community. We are committed to working with the City to improve the water distribution system and treatment plant. With a strong commitment and swift effort from the City, we believe these deficiencies can be resolved and lead to long term water system sustainability.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this Significant Deficiency Violation Notice, please contact me by telephone at 616-307-0261; by e-mail at sarkipatoe@michigan.gov; or DEQ-DWMAD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato, P.E.,
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division

Enclosure

cc: Berrien County Health Department
cc/enc: Mr. Mike O'Malley, Operator in Charge, City of Benton Harbor
Mr. Eric Oswald, Director, DEQ (via email)
Ms. Sue Maul, Enforcement Specialist, DEQ (via email)
Mr. Jon Bloemker, Engineering Unit Supervisor, DEQ (via email)

Figure 1 - CL17 installed on Plant Tap in Lab

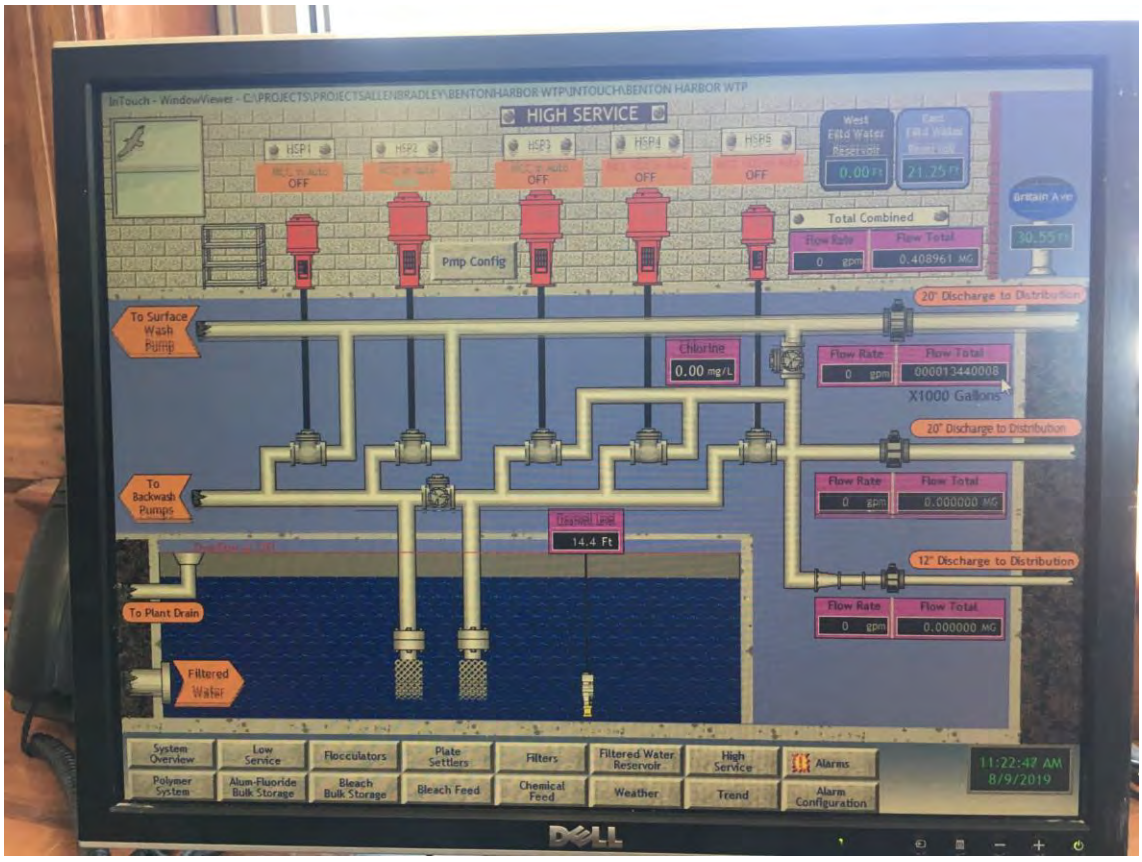

Figure 2 - SCADA with meter and totalizer

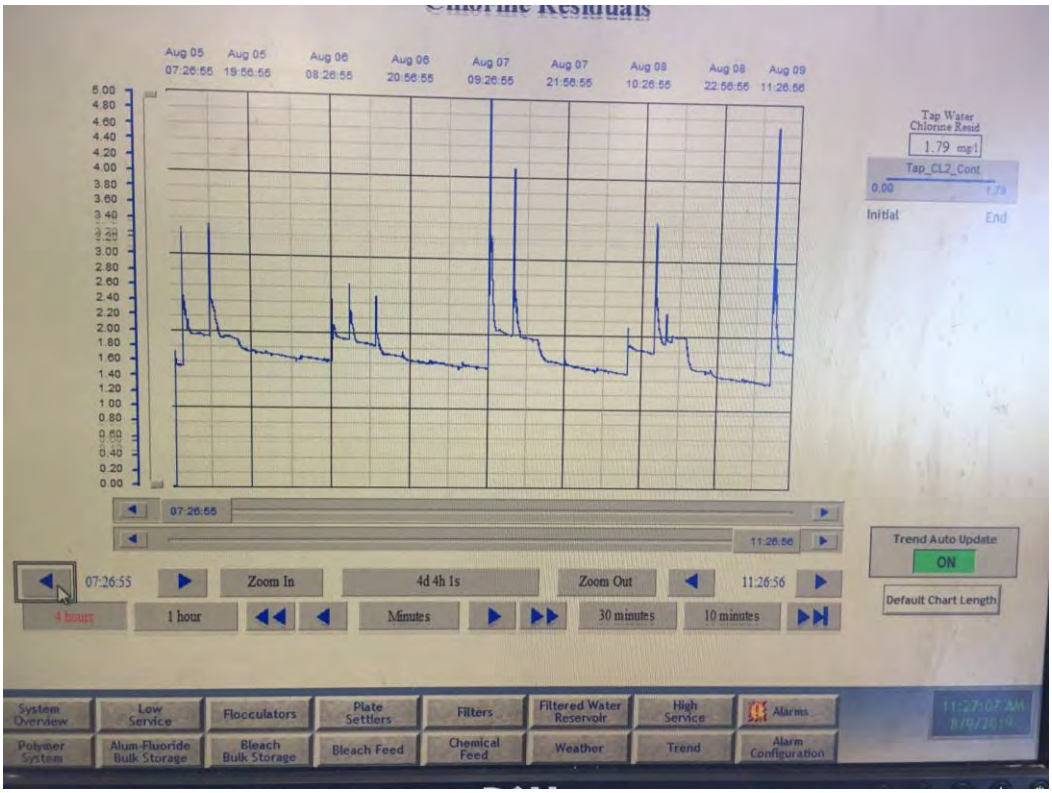

Figure 3a - SCADA with filter turbidity profiles

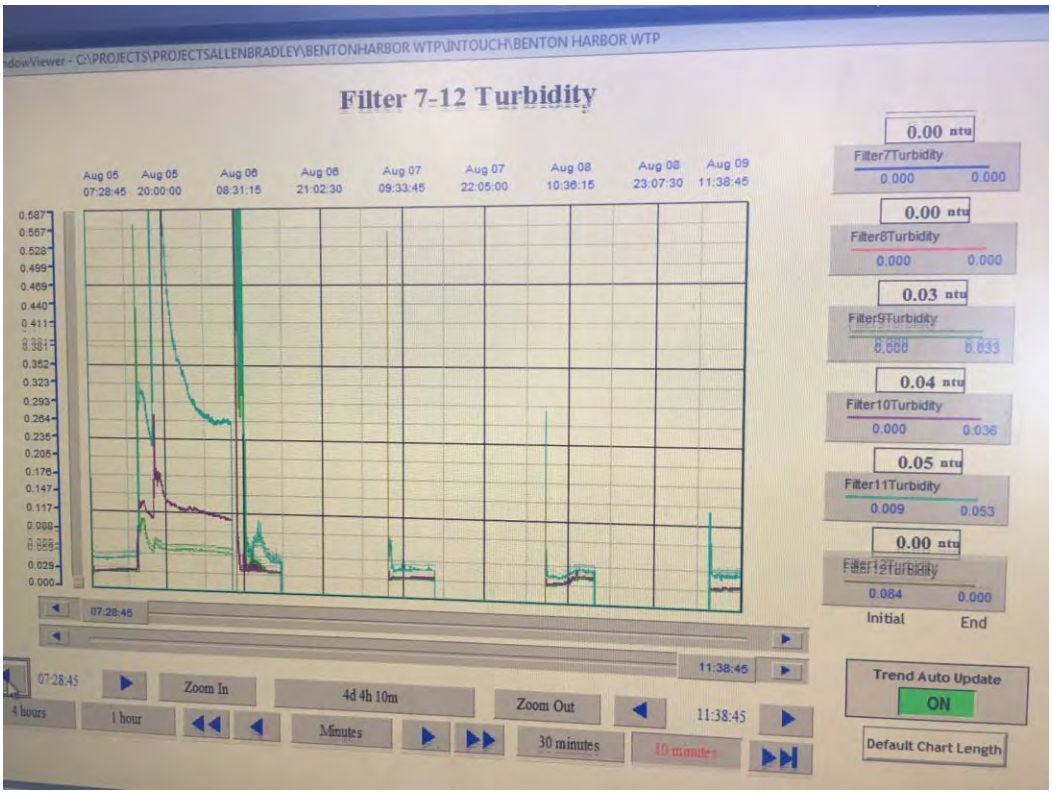

Figure 3b - SCADA with filtered turbidity trends

Figure 4 - Current Alum Feed location

Figure 5 - Phosphate Feed System

Figure 6 - Insertion flow meter

Figure 7 - Meter and PO4 feed location

Figure 8 - Proposed Alum Feed System

From: tim@oudbierinst.com
To: Sarkipato, Ernest (EGLE)
Subject: Accepted: Benton Harbor Phosphate Project Update

From: Bolf, Michael (EGLE)
To: Sarkipato, Ernest (EGLE)
Subject: Accepted: Corrosion Study Plan Discussion

From: Bolf, Michael (EGLE)
To: Sarkipato, Ernest (EGLE)
Subject: Accepted: Corrosion Study Plan Discussion

From: Charlotte Jameson
To: Ruch, Suzann (EGLE); DeBruyn, Dana (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE); Philip, Kris (EGLE); Thurston, Brian (EGLE)
Subject: Agenda and Participant List
Date: Wednesday, March 3, 2021 4:08:49 PM

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hey all,
I am looking forward to our first quarterly meeting on Friday. Below is the agenda items folks have flagged for me that they would like to discuss. Let me know if there is anything on your end that isn't included below that y'all would want to add.

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- Filter First
- Water Shut Off and Reconnection Data
- Water Utility Finance and Funding Programs
    - Water Affordability Planning Grants
    - Federal Water Assistance
    - Water Utility Bailout Funding
    - SRF Reform

And here is a list of all the participants from my end:

Charlotte Jameson	MEC
Tina Reynolds	MEC
Tom Zimnicki	MEC
Jeremy Orr	NRDC
Becca Maher	MEC
Cyndi Roper	NRDC
Sean McBrearty	CWA
Greg Eagle	MI Resource Stewards
Sandra Sorinielser	League of Women Voters
Jim Maturen	MI Citizens for Water Conservation

Elin Betanzo	Safe Water Engineering
Monica Lewis Patrick	We the People of Detroit
Sylvia Orduno	People's Water Board
Jennifer McKay	Tip of the Mitt Watershed
Horst Schmidt	Upper Peninsula Environmental Coalition
Dennis M. Louney	Mid-Michigan Environmental Action Committee
Hallie Fox	MLCV
Anthonia Ogudipe	Alliance for the Great Lakes
Ryan Bardoni	Michigan Nurses Association
Joe Bower	MEC
Kristy Meyer	Freshwater Future

--
Charlotte Jameson
Program Director Legislative Affairs, Energy, and Drinking Water Policy
Michigan Environmental Council
charlotte@environmentalcouncil.org
(c) 919-215-7133

environmentalcouncil.org
twitter.com/MichEnvCouncil
facebook.com/MichiganEnvironmentalCouncil

Join Us!

From: Charlotte Jameson
To: Ruch, Suzann (EGLE); DeBruyn, Dana (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE); Philip, Kris (EGLE); Thurston, Brian (EGLE)
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Join Us!

From: Charlotte Jameson
To: Ruch, Suzann (EGLE); DeBruyn, Dana (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE); Philip, Kris (EGLE); Thurston, Brian (EGLE)
Subject: Agenda and Participant List
Date: Wednesday, March 3, 2021 4:08:50 PM

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charlotte@environmentalcouncil.org
(c) 919-215-7133

environmentalcouncil.org
twitter.com/MichEnvCouncil
facebook.com/MichiganEnvironmentalCouncil

Join Us!

From:	Sarkipato, Ernest (EGLE)
To:	rrice@bhcity.us; emitchell@bhcity.us; Mike O"Malley; drice@bhcity.us; Darold Harlan
Cc:	Bolf, Michael (EGLE); Thurston, Brian (EGLE); Nelson, Maureen (EGLE); Oswald, Eric (EGLE); Krisztian, George (EGLE); Philip, Kris (EGLE)
Subject:	Amended Administrative Consent Order
Date:	Wednesday, July 15, 2020 9:21:16 AM
Attachments:	_draft 00600 COBH First Amended ACO 7-10-2020.docx _draft 00600 COBH Amended ACO Exhibit A.docx

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All, Please find attached a draft amended ACO for presentation to the Personnel and Finance Committee tonight at 5:30PM.

Ms. Rice, If you could please forward to me the 5:30PM calendar appointment for tonight, I'm happy to participate in the meeting and answer any questions the Committee might have.

Finally, the plan is to present this amended ACO to the full Commission on Monday, July 20, at 7:00PM.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8457		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
FACILITY OWNER IF NOT IDENTIFIED ABOVE Ellis Mitchell, City Manager			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
COUNTY Berrien			
CONTACT NAME Ellis Mitchell, City Manager	PHONE # 269-927-8457		

Executive Order 2019-06, signed by Governor Gretchen Whitmer on February 20, 2019, renamed the Michigan Department of Environmental Quality (MDEQ) as the Department of Environment, Great Lakes, and Energy (EGLE). Effective April 22, 2019, a reference to the MDEQ will be deemed a reference to EGLE. After April 22, 2019, a reference to the Director of the MDEQ will be deemed to be a reference to the Director of EGLE. The Drinking Water and Municipal Assistance Division (DWMAD) was renamed the Drinking Water and Environmental Health Division (DWEHD). A reference to the DWMAD will be deemed a reference to the DWEHD and a reference to the Director of the DWMAD will be deemed to be a reference to the Director of the DWEHD.

Administrative Consent Order (ACO) ACO-399-07-2019, entered on March 5, 2019, between the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water Environmental Health Division (DWEHD), and the City of Benton Harbor (City), is hereby amended as follows. Upon the consent of the parties and by the authority granted to EGLE by the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder it is hereby agreed and ordered:

COMPLIANCE SCHEDULE

Paragraphs 2.1(a & b), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from ACO-399-07-2019. Reference exhibit A, attached.

A number of the items below refer to a "Capacity Study". In this Amended Consent Order, under Paragraph 2.14, a Capacity Study refers to an assessment of a water system owner's technical, managerial, and financial capacity to consistently provide safe water to the public.

Paragraphs 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.7 **Not later than September 30, 2020**, the City shall formally adopt a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.8 **Not later than July 31, 2020,** the City shall submit the current cross connection program to the DWEHD for review. DWEHD's review of the existing program will help inform the city's work to complete the Capacity Study in paragraph 2.14. **No later than three (3) months following the completion of the Capacity Study**, an updated cross connection program must be submitted to DWEHD for review to address any implementation changes as a result of the study.

2.10 (a) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to DWEHD for inventorying and ongoing maintenance of distribution fire hydrants. The plan must address fixing known broken hydrants as well as preventative maintenance such as hydrant inspections and flushing.

(b) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to DWEHD for inventorying and ongoing maintenance of distribution valves. The plan must address fixing known broken valves as well as preventative maintenance such as valve turning.

2.11 **Not later than August 1, 2021**, the City shall conduct professional inspections of the City of Benton Harbor's water system's elevated tank, or complete the repairs and upgrades recommended during the 2008 Dixon inspection as included in the city's asset management program dated December 2017.

2.12 **Not later than November 1, 2020**, the City shall submit to DWEHD a plan for maintaining the raw water intake system including mussel control, based on inspection findings of the intake and mussel control system during June of 2020.

2.13 **Not later than December 31, 2020**, the City shall repair filter to waste valves at the water plant, and train operators on their use.

The following paragraphs shall be added to Section II – Compliance Schedule:

2.14 **Not later than September 30, 2020**, The City shall submit to DWEHD, for a review and approval, a project scope for completion of a technical, managerial, and financial capacity study (Capacity Study) to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City of Benton

Harbor's water system in compliance with Act 399. The City shall contract with a qualified consultant to complete the Capacity Study. The Capacity Study scope shall identify the organizational structure, and the required funding, to operate and manage the system in compliance with Act 399. The Capacity Study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed to from those departments. Last, the Capacity Study shall identify any technical needs such as development and storage of water system records to facilitate compliance with Act 399.

Not later than six (6) months following approval of the project scope, the City shall submit a completed Capacity Study for DWEHD approval.

To address any gaps identified by the Capacity Study, the Capacity Study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and management of the City's water system. **Not later than August 1, 2021 and every six (6) months after DWEHD approves the Capacity Study, the City shall submit a signed statement describing the City's progress** towards completing the implementation plan to achieve adequate capacity.

Capacity Study Phase	Description	Due Date
1: Project Scope and Outcomes	Submit to DWEHD for input on the study scope and outcomes	September 30, 2020
2: Study Completion	Complete the Capacity Study based on project scope	Six months after approval of scope
3: Implementation	Progress reports to DWEHD describing city's progress	August 1, 2021 and every six months thereafter

2.15 (a) **Not later than six (6) months following the completion of the Capacity Study** in Paragraph 2.14, as part of the implementation phase, the City shall submit to DWEHD a Staffing Plan to address findings from the Capacity Study. The Staffing Plan must indicate the number of staff, managerial oversight, as well as an outline of each position's duties needed to meet the operational and maintenance needs of the water system.

(b) **Not later than twelve (12) months following DWEHD approval of the Staffing Plan,** the City shall submit to DWEHD a certification the staffing plan has been implemented and adequate staffing and managerial oversight is in place.

2.16 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples or have them collected and have those samples analyzed in the state laboratory or a laboratory certified by DWEHD or by the United States Environmental Protection Agency for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to DWEHD in a timely manner. MCL §325.1007 also authorizes

DWEHD to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.17 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter DWEHD issued to the City.

Not later than sixty (60) days following DWEHD approval of the corrosion control optimization study scope and completion schedule, City shall secure a signed contract for the corrosion control optimization study.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this Amended Consent Order, except as specifically prescribed in this document. The effective date of this Amended Consent Order shall be the date upon which the Division Director of EGLE, DWEHD signs this document.

DRAFT

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

_____

Eric J. Oswald, Director
Drinking Water and Environmental Health Division

_____

Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

_____

Marcus Muhammad, Mayor

_____

Date

DRAFT

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

DWEHD Order No. AACO-399-07-2019

EXHIBIT A

In the matter of the first amended administrative consent order between the City of Benton Harbor and the State of Michigan Department of Environment, Great Lakes, and Energy, below are listed compliance activities that have been completed and are shown for record of completion.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the Asset Management Plan, dated December 2017, however, the second portion of 2.1 in the original ACO, requiring the City of submit an implementation rate increase plan was not completed).

COMPLETION DATE: December 31, 2017

(b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system in compliance with Act 399.

COMPLETION DATE: May 18, 2020

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.3 Install metering capabilities on the finished water (completed as part of corrosion control treatment project).

COMPLETION DATE: August 12, 2019

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

COMPLETION DATE: May 7, 2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

COMPLETION DATE: Treatment installed as of March 25, 2019. Corrosion control study insufficient as of June 2020, see First Amended ACO item 2.17.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

COMPLETION DATE: August 9, 2019

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE)
Subject:	BH ACO Update
Date:	Wednesday, May 12, 2021 9:59:00 AM
Attachments:	00600 City of Benton Harbor ACO Update april 2021.docx 00600 BH Amended ACO Exhibit A update 5-12-2021 es.docx image001.png

---

Please see attached, if OK we can send over to Maureen.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
616-307-0261
www.Michigan.gov/communitywater

DATE

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600

Dear Mr. Mitchell:

SUBJECT: City of Benton Harbor Amended Administrative Consent Order (AACO)
AACO-399-07-2019 Item Completion; Filter to Waste Valves

The Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD) has noted progress by the City of Benton Harbor Water Supply (City) to meet specific requirements of Section II – Compliance Schedule of pertaining to the first amended Administrative Consent Order (ACO) entered on August 7, 2020 and the included compliance schedule. We have outlined the requirements in the Paragraphs from the ACO that have been met, below as well as in the attached Exhibit A.

> 2.13 **Not later than March 31, 2021,** the City shall repair filter to waste valves at the water plant, and train operators on their use – **met by completing repairs to certain filter to waste filters, creating of standard operating procedure of the repaired valves, and committing to future repairs to the remaining filter to waste valves.**

If you have any questions regarding the filter to waste valve requirement, or other deadlines set forth in the Amended ACO, please contact me at 616-307-0261; or by email at SarkipatoE@Michigan.gov

Sincerely,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division

Enclosure

cc: Mayor Marcus Muhammad, City of Benton Harbor (via email)
Mr. Mr. Rob Jones, Fleis & Vanderbrink Operations (via email)
Ms. Kimberly Thompson, City of Benton Harbor (via email)
Mr. Eric Oswald, EGLE (via email)
Mr. Mike Bolf, EGLE (via email)
Ms. Maureen Nelson, EGLE (via email)

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

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In the matter of the first amended administrative consent order between the City of Benton Harbor and the State of Michigan Department of Environment, Great Lakes, and Energy, below are listed compliance activities that have been completed and are shown for record of completion.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the Asset Management Plan, dated December 2017, however, the second portion of 2.1 in the original ACO, requiring the City of submit an implementation rate increase plan was not completed).

COMPLETION DATE: December 31, 2017

(b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system in compliance with Act 399.

COMPLETION DATE: May 18, 2020

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.3 Install metering capabilities on the finished water (completed as part of corrosion control treatment project).

COMPLETION DATE: August 12, 2019

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

COMPLETION DATE: May 7, 2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

COMPLETION DATE: Treatment installed as of March 25, 2019. Corrosion control study insufficient as of June 2020, see First Amended ACO item 2.17.

2.7 **Not later than September 30, 2020,** the City shall formally adopt a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

COMPLETION DATE: September 29, 2020

2.8 **Not later than August 15, 2020,** the City shall submit the current cross connection program to the DWEHD for review. The DWEHD's review and comments on the current program will assist the City in completing the Capacity Study in paragraph 2.14.

COMPLETION DATE: August 15, 2020

No later than three (3) months following the completion of the Capacity Study, an updated cross connection program must be submitted to the DWEHD for review to address any implementation changes as a result of the study.

COMPLETION DATE: **not yet completed**

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

COMPLETION DATE: August 9, 2019

2.12 **Not later than November 1, 2020**, the City shall submit to the DWEHD a plan for maintaining the raw water intake system, including mussel control, based on inspection findings of the intake and mussel control system during June of 2020.

COMPLETION DATE: November 5, 2020

2.13 **Not later than March 31, 2021,** the City shall repair filter to waste valves at the water plant, and train operators on their use.

COMPLETION DATE: March 31, 2021

2.14 **Not later than September 30, 2020,** The City shall submit to the DWEHD, for review and approval, a project scope for completion of a technical, managerial, and financial capacity study.

COMPLETION DATE: September 25, 2020

Not later than six (6) months following approval of the project scope, the City shall submit a completed Capacity Study for DWEHD approval.

COMPLETION DATE: Pending DWEHD written notification of approval of study scope

2.15 (a) **Not later than six (6) months following the completion of the Capacity Study** in Paragraph 2.14, as part of the implementation phase, the City shall submit to the DWEHD, a Staffing Plan to address findings from the Capacity Study. The Staffing Plan must indicate the number of staff, managerial oversight, as well as an outline of each position's duties needed to meet the operational and maintenance needs of the water system.
(b) **Not later than twelve (12) months following the DWEHD approval of the Staffing Plan,** the City shall submit to the DWEHD a certification that the staffing plan has been implemented and adequate staffing and managerial oversight is in place.

COMPLETION DATE: not yet completed

2.16 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory or a laboratory certified by the DWEHD, or by the United States Environmental Protection Agency, for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to the DWEHD in a timely manner. MCL §325.1007 also authorizes the DWEHD to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

COMPLETION DATE: December 31, 2020

2.17 **Not later than September 30, 2020,** the City shall have a qualified third-party consultant submit to the DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter the DWEHD issued to the City.

COMPLETION DATE: July 28, 2020

Not later than sixty (60) days following DWEHD approval of the corrosion control optimization study scope and completion schedule, the City shall secure a signed contract for the corrosion control optimization study.

COMPLETION DATE: Pending DWEHD written notification of approval of study scope

From:	Sarkipato, Ernest (DEQ)
To:	Darwin Watson
Cc:	momalley@cityofbentonharbormi.gov; Bolf, Michael (DEQ); Bolt, Jennifer (DEQ); Onan, Brandon (DEQ); Thurston, Brian (DEQ)
Subject:	BH ACO and Lead and Copper Compliance Status
Date:	Friday, April 12, 2019 9:55:16 AM
Attachments:	compliance timeline.xlsx

Good morning Darwin,
Thank you for submitting the rate study and a request to extend a few ACO deadlines. In the future, please note Section 4.14 of the ACO requires these requests 10 days prior to the deadline.
I see the requested extensions to the ACO deadlines were granted, and as such I've attached a revised timeline for ACO compliance. The timeline also includes some of the lead and copper Action Level Exceedance dates. Please note: two items remain with a response needed that is now past the due date:
-Corrosion Plan. Based on my recollection of conversations, this proposal from the City was going to rely on Elhorn's plan to conduct a coupon study or set of studies to ensure the treatment rate and chemical selection are optimized to reduce lead release.
-Rates. The ACO requires the city to submit an implementation plan to ensure rates are sufficient to cover costs, per the recent rate study by a qualified consultant.
Please respond as soon as you can on these items, as they are now past due.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater
From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Tuesday, March 26, 2019 10:39 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov
Subject: Re: REMINDER
Good Morning Ernie,
Please find attached to this email a copy of the rate studies for water and sewer for the City of Benton Harbor.
Also, please accept this email as a formal request for extensions on the following items outlined in the Administrative Consent Order ("ACO"):

- **Finish upgrades to the SCADA system to store/access regulatory data, and ensure alarms and callouts for high turbidity and low chlorine** - the City requests that this due date be adjusted to **May 15, 2019**. This request is a result of scheduling issues with the vendor needed to install the necessary hardware and software.
- **Install metering capability on finished water**- the City is requesting that the deadline for this be adjusted to **June 15, 2019**. This request is based on challenges with getting equipment from the vendor and also the lead time needed to construct the meter for the application.
- **Have working chlorine analyzer on finished water tap** - the City is requesting that the deadline for this be adjusted to **May 15, 2019**. This request is based on challenges with

getting equipment from the vendor and installation of the equipment.

- **Hire licensed operator for distribution system** - the City is requesting that the deadline for this be adjusted to **May 1, 2019**. This request is based on negotiations with the contractor.

If you have any questions, feel free to contact me.
Thanks
On Tue, Mar 26, 2019 at 7:45 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

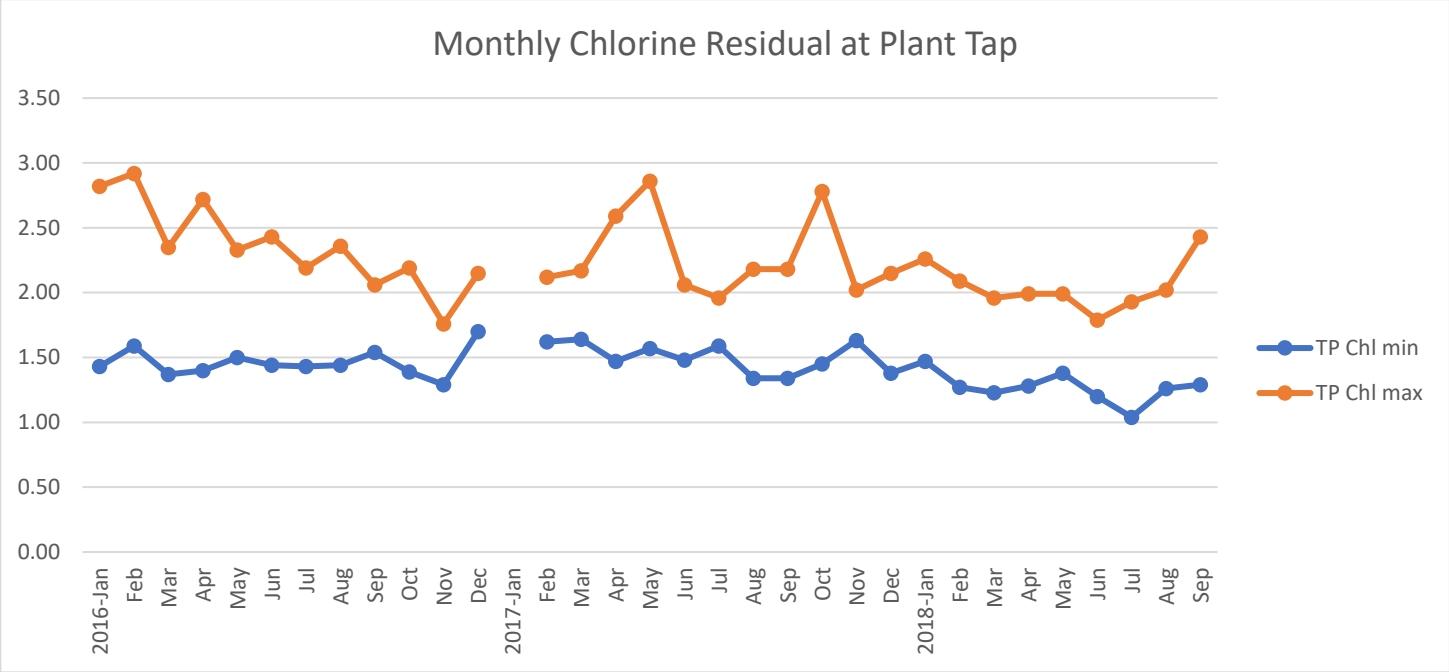
> Hi Darwin,
> Please submit a request for extension by 11AM today, as I'm off for two weeks which will span the first ACO deadline.
> Also please submit an update on pumping of phosphate, and any initial residual monitoring data if available.
> Ernie

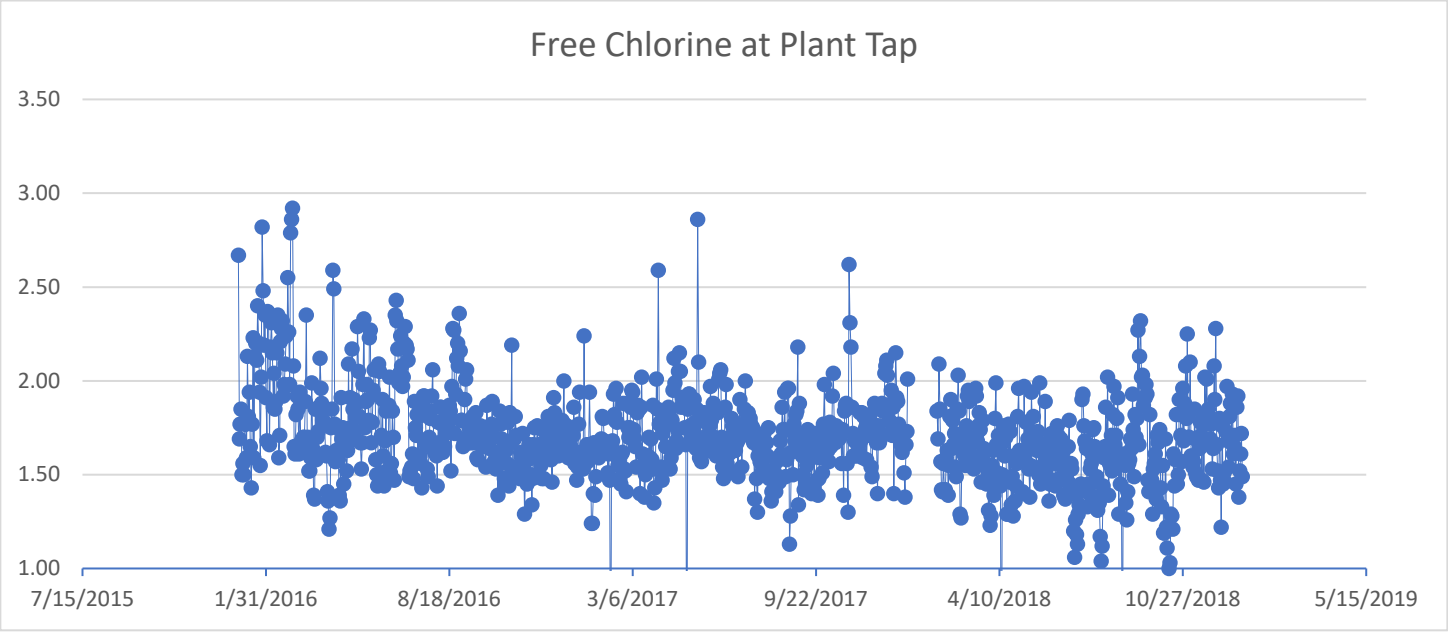
Completed?	Project Details	Due By	Notes
	Propose optimal corrosion control treatment, or a corrosion study	**3/31/19**	**Action Level Exceedance (ALE) Requirement**
	Submit rate study to DEQ with implementation plan	4/1/19	Still need a plan to implement rate increases as recommended by the study
	Obtain licensed operator in charge of water distribution system	5/1/19	
	Submit plan to streamline the rate collection process	5/1/19	
	Upgrade existing SCADA system to have historian and alarm capabilities	5/15/19	
	Fix continuous chlorine analyzer	5/15/19	
	Submit updated cross connection control program, staffing support	6/1/19	
	Submit plan to inventory valves, and plan for ongoing maintenance	6/1/19	
	Install coagulant feed to rapid mix	6/1/19	
	Install metering capabilities	6/15/19	
	Collect 60 samples for lead and copper, remembering 1st/5th liter	6/30/19	**Action Level Exceedance (ALE) Requirement**
	Collect WQP as required by ALE letter	6/30/19	**Action Level Exceedance (ALE) Requirement**
	Conduct professional inspection of water tower	6/30/19	
	Install working mussel feed control system at the raw water intake	6/30/19	
	Report 2018 ALE in the consumer confidence Report	7/1/19	**Action Level Exceedance (ALE) Requirement**
	For first round of 2019, this is the due date for reporting to DEQ	9/28/19	**Action Level Exceedance (ALE) Requirement**
	Collect 60 samples for lead and copper, remembering 1st/5th liter	12/31/19	**Action Level Exceedance (ALE) Requirement**
	Collect WQP as required by ALE letter	12/31/19	**Action Level Exceedance (ALE) Requirement**
	Repair filter to waste valves	1/1/20	
	For second round of 2019, this is the due date for reporting to DEQ	3/31/20	**Action Level Exceedance (ALE) Requirement**
	Collect one LCR sample from entry point to distribution	3/31/2022	**Action Level Exceedance (ALE) Requirement**

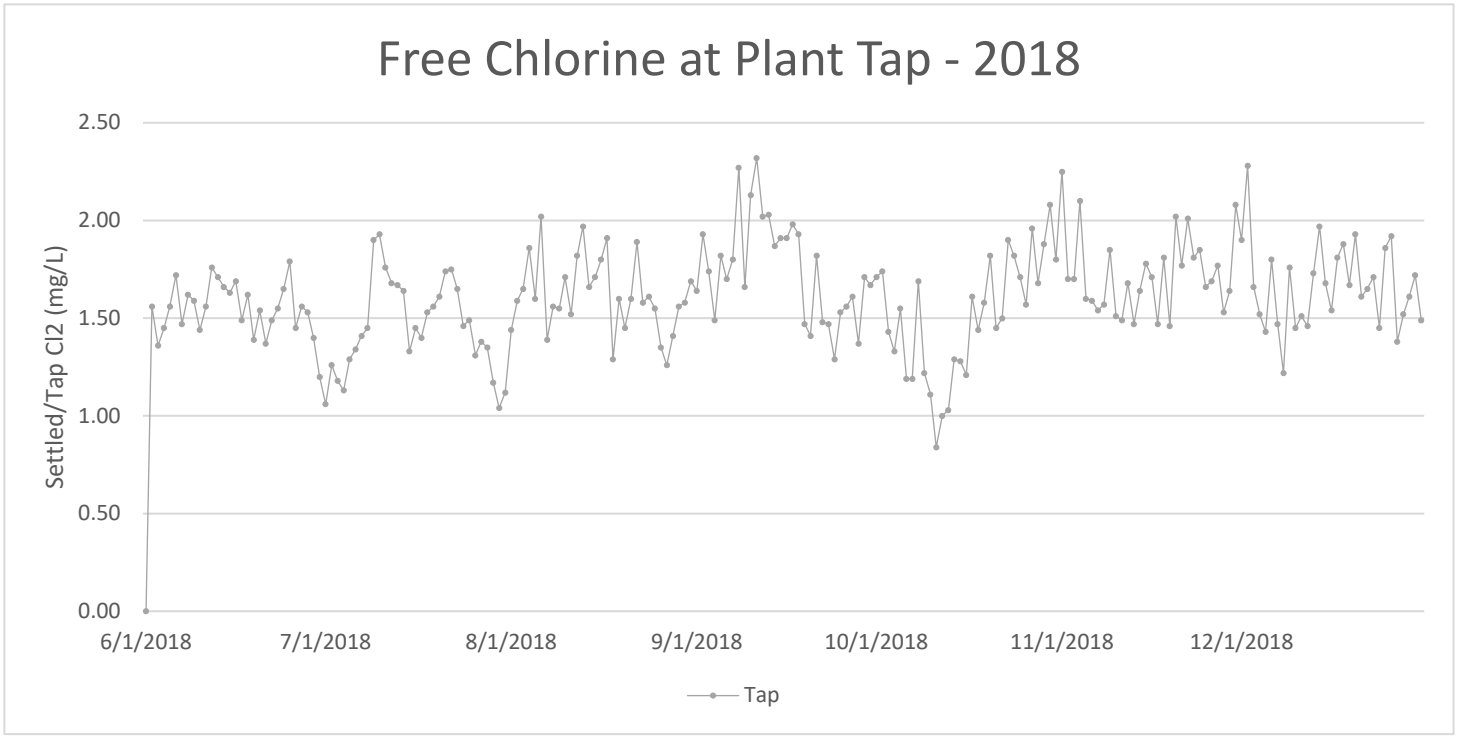
From: Sarkipato, Ernest (DEQ)
To: Onan, Brandon (DEQ); Thurston, Brian (DEQ); Bolf, Michael (DEQ)
Cc: Lachance, Amy (DEQ); Oswald, Eric (DEQ)
Subject: BH Data
Date: Wednesday, January 23, 2019 11:51:30 AM
Attachments: BH chemical data 2016-2018.xlsx

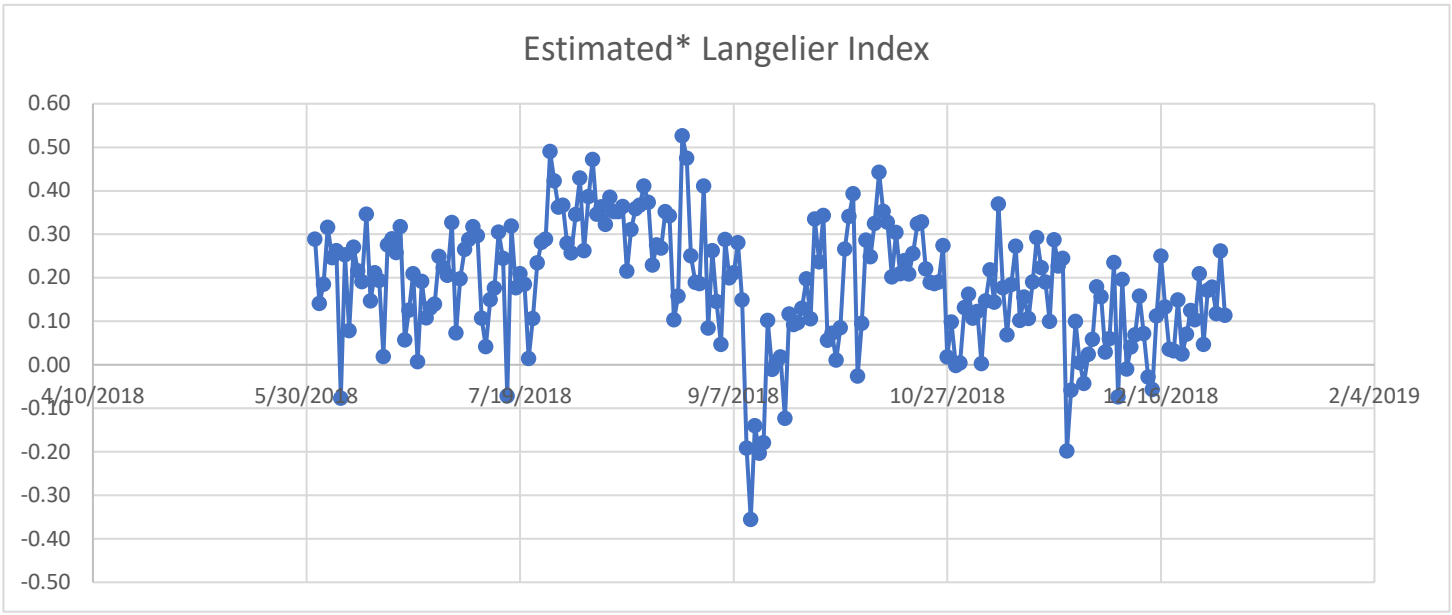
Please take a look at the attached, and provide any input as to warning flags from a corrosion sense.

Summary: The goal of this analysis is to identify any contributing factors the water plant operations may have had to higher lead samples collected during the 2018 monitoring period. Analysis of the data seems to indicate there were no abrubpt shifts in water quality at the WTP that would be expected to contribute to a system-wide corrosion issue. It may be the case the water is mildly corrosive towards lead, and the reason for a seemingly abrupt increase in lead sample results is the city is now sampling at sites with lead goosenecks and galvanized pipes.



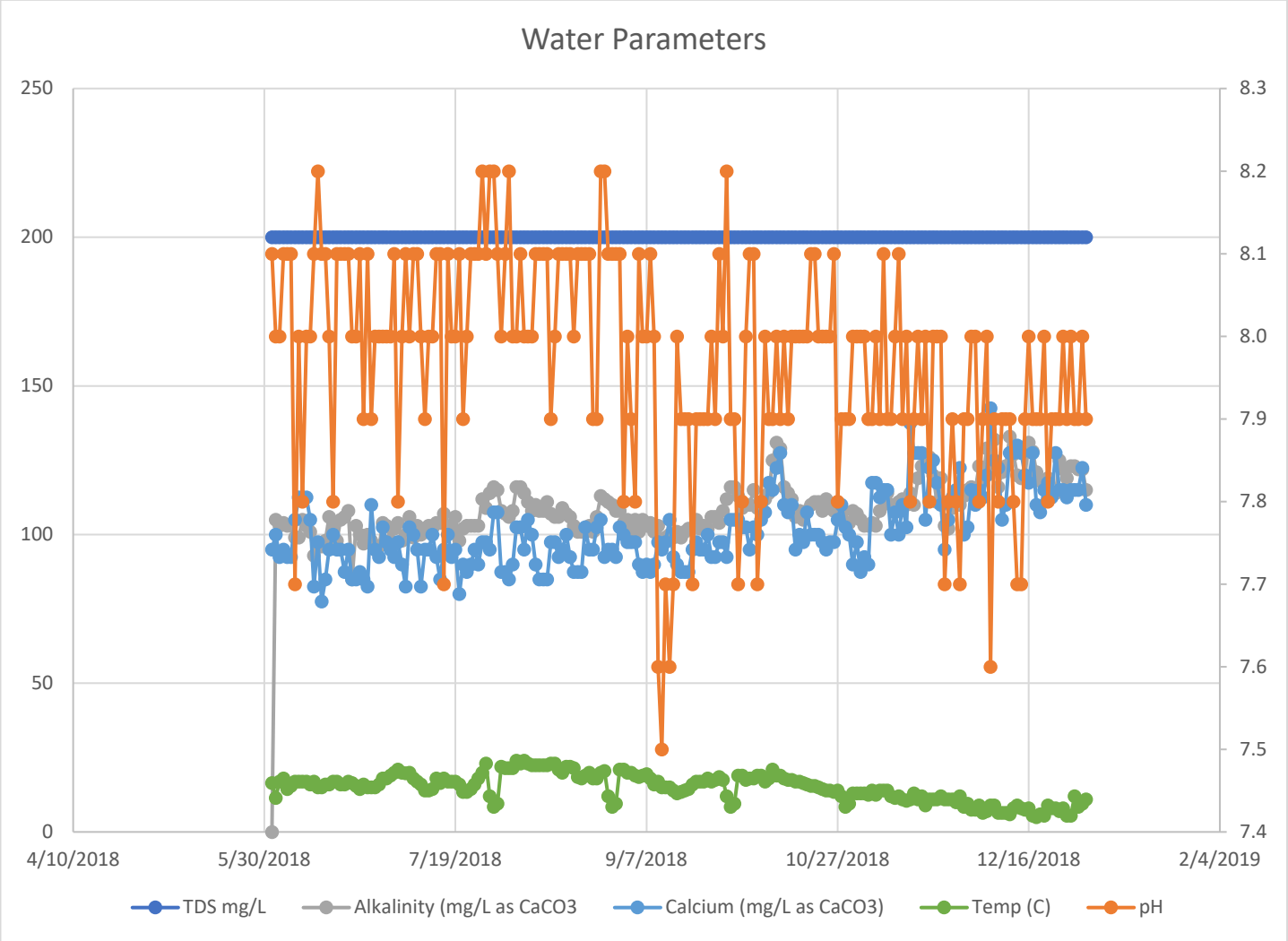






**The total dissolved solids was assumed to be 200 mg/L, which is an estimated average for the source water. Other values used in the calculation are actual water plant daily data.*

A drop in pH in September caused a dip in the estimated langelier index. While negative values indicate a non-depositional nature for calcium carbonate, waters that are above -0.5 on the langelier are generally not considered to be extremely corrosive.



These data support the above claim regarding the drop in pH being the reason for lower estimated Langelier Index in September

From: Sarkipato, Ernest (EGLE)
To: Jackson, Heather (EGLE); Bolf, Michael (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Thurston, Brian (EGLE)
Cc: Lachance, Amy (EGLE)
Subject: BH LCR discussion

This call is to discuss Benton Harbor's LCR sampling and corrosion treatment status.

Call-in Number : 888-273-3658

Access Code: 1348701

Host Pwd: 4683 (Ernie Host)

From:	Onan, Brandon (EGLE)
To:	Vincent, Courtney (EGLE)
Cc:	Sarkipato, Ernest (EGLE); Philip, Kris (EGLE); Oswald, Eric (EGLE); Nelson, Maureen (EGLE); Bolt, Jennifer (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Krisztian, George (EGLE)
Subject:	BH letter of corrosion control treatment
Date:	Tuesday, February 11, 2020 3:56:41 PM
Attachments:	Draft_Benton Harbor OCCT update_20200203.docx

Courtney,

Please finalized the letter that is attached to this email for my signature. I anticipate signing this and sending it out tomorrow morning.

Thanks,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

DATE

Mr. Ellis Mitchell, Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600

Dear Mr. Mitchell:

SUBJECT: **Water System Corrosion Treatment**

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the~~The~~ City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system.~~was approved to install corrosion control chemical treatment system under Act 399 via construction permit on February 25, 2019 to address a lead action level exceedance, as notified via letter dated October 22, 2018.~~ The treatment chemical permitted was based on a recommendation by Elhorn Engineering, being Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was ~~agreed to be~~ 1.5 mg/L as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual ~~around~~ of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City ~~for lead and copper~~ concludes the treatment is not achieving desired results quickly enough. The ~~last~~ most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment. ~~Within that time frame it was anticipated to begin seeing a reduction of lead release in residences of the City.~~

The City met with representatives from ~~Michigan's Department of Environment, Great Lakes, and Energy (EGLE)~~ EGLE on January 15, 2020 to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting, and outline next steps for the City to pursue designation of optimized corrosion control treatment (OCCT) as required by Rule 604f of the administrative rules ~~for the Michigan Safe Drinking Water Act, 1976 PA 399, as amended~~ (under Act 399~~)~~.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60~~4~~ certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of ~~3~~3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This designation is being made under R325.10604f(3)(d). The reason for this change in treatment is due to the lack of a quick response from the current permitted treatment. ~~The department's~~EGLE's intent is to quickly put into place treatment that will ~~be able to~~ more efficiently ~~get~~ lower corrosion rates ~~lowered~~ in the distribution system for greater protection of public health. The basis for this decision is from

DRAFT

corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system, but without further study it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c). This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the city of Benton Harbor's water system. Reference to analogous water systems alone will not suffice to meet this requirement.~~In addition, **the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c).** This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on a range of phosphate chemicals and dosages to optimize Benton Harbor's~~the City's ~~corrosion control treatment. Reference to analogous water systems alone will not suffice to meet this requirement.~~

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immedietly verify in writing to the department the valve has been closed according to the permit.

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TRANSITION AND TIMELINE
Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased~~ing~~ monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me below, or contact Ernie Sarkipato by telephone at 616-307-0261; by e-mail at S~~s~~arkipato~~e~~E@michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

DRAFT

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Drinking Water & Environmental Health Division
Department of Environment, Great Lakes, and Energy

cc: Mr. Mike O'Malley, Water Superintendent, City of Benton Harbor (via email)
Mr. Darold Harlan, Distribution Operator, Fleis & Vandenbrink (via email)
Mr. Eric Oswald, Division Director, EGLE (via email)
Mr. Ernie Sarkipato, Surface Water Treatment Specialist, EGLE (via email)
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE (via email)
Ms. Nicki Britten, Health Officer, Berrien County Health Department
Mr. Todd Luks, Elhorn Engineering

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From:	Onan, Brandon (EGLE)
To:	Vincent, Courtney (EGLE)
Cc:	Sarkipato, Ernest (EGLE); Philip, Kris (EGLE); Oswald, Eric (EGLE); Nelson, Maureen (EGLE); Bolt, Jennifer (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Krisztian, George (EGLE)
Subject:	BH letter of corrosion control treatment
Date:	Tuesday, February 11, 2020 3:56:41 PM
Attachments:	Draft_Benton Harbor OCCT update_20200203.docx

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Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
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DRAFT

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Drinking Water & Environmental Health Division
Department of Environment, Great Lakes, and Energy

cc: Mr. Mike O'Malley, Water Superintendent, City of Benton Harbor (via email)
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Mr. Mike Bolf, Engineering Unit Supervisor, EGLE (via email)
Ms. Nicki Britten, Health Officer, Berrien County Health Department
Mr. Todd Luks, Elhorn Engineering

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DRAFT

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Cc:	Sarkipato, Ernest (EGLE); Philip, Kris (EGLE); Oswald, Eric (EGLE); Nelson, Maureen (EGLE); Bolt, Jennifer (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Krisztian, George (EGLE)
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Thanks,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

DATE

Mr. Ellis Mitchell, Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600

Dear Mr. Mitchell:

SUBJECT: **Water System Corrosion Treatment**

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the~~The~~ City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system.~~was approved to install corrosion control chemical treatment system under Act 399 via construction permit on February 25, 2019 to address a lead action level exceedance, as notified via letter dated October 22, 2018.~~ The treatment chemical permitted was based on a recommendation by Elhorn Engineering, being Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was ~~agreed to be~~ 1.5 mg/L as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual ~~around~~ of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City ~~for lead and copper~~ concludes the treatment is not achieving desired results quickly enough. The ~~last~~ most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment. ~~Within that time frame it was anticipated to begin seeing a reduction of lead release in residences of the City.~~

The City met with representatives from ~~Michigan's Department of Environment, Great Lakes, and Energy (EGLE)~~ EGLE on January 15, 2020 to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting, and outline next steps for the City to pursue designation of optimized corrosion control treatment (OCCT) as required by Rule 604f of the administrative rules ~~for the Michigan Safe Drinking Water Act, 1976 PA 399, as amended~~ (under Act 399~~)~~.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60~~4~~ certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of ~~3~~3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This designation is being made under R325.10604f(3)(d). The reason for this change in treatment is due to the lack of a quick response from the current permitted treatment. ~~The department's~~EGLE's intent is to quickly put into place treatment that will ~~be able to~~ more efficiently ~~get~~ lower corrosion rates ~~lowered~~ in the distribution system for greater protection of public health. The basis for this decision is from

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corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system, but without further study it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c). This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the city of Benton Harbor's water system. Reference to analogous water systems alone will not suffice to meet this requirement.~~In addition, **the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c).** This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on a range of phosphate chemicals and dosages to optimize Benton Harbor's~~the City's ~~corrosion control treatment. Reference to analogous water systems alone will not suffice to meet this requirement.~~

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immedietly verify in writing to the department the valve has been closed according to the permit.

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TRANSITION AND TIMELINE
Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased~~ing~~ monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me below, or contact Ernie Sarkipato by telephone at 616-307-0261; by e-mail at S~~s~~arkipato~~e~~E@michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

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Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Drinking Water & Environmental Health Division
Department of Environment, Great Lakes, and Energy

cc: Mr. Mike O'Malley, Water Superintendent, City of Benton Harbor (via email)
Mr. Darold Harlan, Distribution Operator, Fleis & Vandenbrink (via email)
Mr. Eric Oswald, Division Director, EGLE (via email)
Mr. Ernie Sarkipato, Surface Water Treatment Specialist, EGLE (via email)
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE (via email)
Ms. Nicki Britten, Health Officer, Berrien County Health Department
Mr. Todd Luks, Elhorn Engineering

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From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc:	Henderson, Shannon (EGLE); Sylvester, Matthew (EGLE)
Subject:	BH phosphate feed & corrosion treatment
Date:	Friday, April 17, 2020 9:30:20 AM
Attachments:	MI 0600 Benton Harbor SDS new Corrosion Treatment Chemical.pdf MI 0600 Benton Harbor MOR for March 2020.pdf

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Below statement from O'Malley confirms my suspicion about pump size (scroll down, highlighted). My calculations support it too, below.
It should be as simple as communication with the city, in writing, that the corrosion treatment appears to be lagging slightly, clarifying the target residual & location, and identifying this as a potential compliance issue. The inconsistency of dosed product is definitely a concern, and a good case for getting the right pump sized *and flow-paced*.
For context, we should also clarify with the city if/when they will have official targets and designated WQPs.

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My calcs:
Pure chemical required: (3.5 ppm) x (2 MGD*8.34) = 58.4 lbs ortho as PO4 (2 MGD is typical average day demand for the WTP)
@90% ortho fraction = 64.9 lbs total phosphate as PO4
@32% strength as total PO4 = 202.8 lbs as product (32% strength as written by O'Malley on attached data sheet, assuming it is % as PO4)
Density = 11.26 lbs/gal
Gallons Per Day = 18 gal/day
However, the high service pumps are rated at 4 MGD, with means the target dosing rate is:
18 gal/day *2 = 36 gpd
This is based on a target rate of 3.5 mg/L which may be too low.
It is also very close to the rated capacity of 40 gpd capacity of the Stenner S3003 pump.

_____

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Monday, February 24, 2020 6:03 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Daniel McGinnis <dmcginnis@cityofbentonharbormi.gov>; Michael Clark <mclark@cityofbentonharbormi.gov>; Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>; Dr R. Johansen <rjohansen@bchdmi.org>; Nicki Britten <nbritten@bchdmi.org>
Subject: Re: What constitutes "Gentle Flushing"
Thanks for the info.
Some of you may wonder why you are on the copy line. I believe if I reference someone or something done by someone, I add them to the copy line.
If you read through this, you will see where you fit in to this email.
Dr. Johanson, Nicki Britten, Chief McGinnis, and Deputy Police Chief Michael Clark.
Unfortunately this email is from Mike O'Malley, Operator IN Charge and not by the City Manager, Mr. Ellis Mitchell.

This is my take on the situation, and may not be Ellis Mitchell's opinion, but he is copied (as agreed) on this email.
The switch over from 70/30 OPP to 90/10 OPP was Friday 02 21 2020 in the morning.
It took Darold all day Thursday and me all day Friday to get the West Suction Line closed nearly 100% Proof for this valve being closed; was a flow through the new meter of 2,604 gpm which is roughly equal to 3.75 MGD, which is very close to what the High Service pump is expected to deliver.
Unfortunately, the new demanded feed rate of 3.0 mg/L as P requires the pump to function at Top Speed, (100%) speed the original Pump is designed for.
The Permit Change is something different and will take me awhile to properly fill out. I propose the permit that exists is still in force and has only been altered by the type of Chemical Make Up percentages "ORTHO"
I am working on it today. Maybe, you can send me a blank form of the one you used and I can copy/paste the appropriate existing conditions and basically only to add the new chemical treatment.
As you know the Orthopolyphosphate treatment scheme was decided upon by the EGLE staff with the recommendation of Elhorn Engineering.
The State also agreed to allow Benton Harbor to use the MDEQ Pilot Grant Funding to reimburse the expenditures that were incurred, Thank You.
EGLE pushed to have the OPP treatment in place before the proposed Suction Line Meter was installed, due to its long lead time.
Elhorn Engineering delivered the 1st set of 55-gallon barrels; set up the pump and injection point, and put in a Rack of various metals to determine the rate of decay.
This all started to take effect 3/26/2019.
A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.
With no background data, the results are not really worth noticing, just yet. But the Mild Steel decay was most troublesome at the Outside location. The lead result was pretty small, as well as the copper at both locations.
Hence, your letter drove us to remove the 2nd Rack on 2/17/2020 and send the coupons in for analysis.
If, you had requested, or If you had waited a bit longer with the NOTICE; we may have seen results that indicated that the original corrosion treatment program was working enough to wait out the 18-Month time frame that we were told would be when a relatively full exchange would be evident. Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."
To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " *The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years*". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!

As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio.
*It was probably written before EPA knew about this chemical blend.
And, before the Dramatic Change in the Lead Rules.
I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).
And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; **and should not be**, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.
As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product.
However either one of the treatment chemicals they supply is the same price but different results.
Unfortunately, some would see this as a conflict of interest.
And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.
If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.
It appeared in your letter, that other systems have been involved in this type of corrosion treatment.
Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.
Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with high water levels, the residential portions of Benton Harbor are on top of the hills.
However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions.,
And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.
At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.
After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.
Sincerely,

Mike O'Malley
Benton Harbor Water Operator IN Charge.
On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike,
> Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:
> -The goal is to bring the newly treated water throughout the distribution system
> -The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.
> -It's best to start at the water plant and move to the ends of the system
> -For example, on a 6" pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it's a dead end run. As you can see, it can be easy to get into the scouring velocity range.
> -At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing level. Then, next day, move further into the system.
> I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.
> Hopefully that is helpful information,
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
>
>
>
>
> www.michigan.gov/drinkingwater
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Friday, February 21, 2020 4:56 PM
> **To:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** What constitutes "Gentle Flushing"

SAFETY DATA SHEET

BH 1 from Carus Corporation

MI 0600 Benton Harbor new corrosion treatment

Sold to BH by Elhorn Engineering

Started change Friday 2/21/20

1. Identification

Product identifier	**Aquadene® SK-7661**
Other means of identification	
SDS number	-
Recommended use	Aquadene® SK-7661 s an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems.
Recommended restrictions	None known.

Note: SG Product 1.35

Strength @ 32%

Manufacturer / Importer / Supplier / Distributor information

Company name	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixtures	
Composition comments	The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling	Avoid inhalation and contact with skin and eyes. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate.
Individual protection measures, such as personal protective equipment	
Eye/face protection	If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.
Form	Liquid.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	1% solution = 5.4±0.5
Melting point/freezing point	Not available.

Initial boiling point and boiling range	213.8 °F (101 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1.35±0.03 at 25°C
Solubility(ies)	
Solubility (water)	Completely soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

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1.35 × 8.34 = 11.259 #/gal

32% Strength = 3.603 #/gal OPP

OR

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization will not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure	
Ingestion	May cause discomfort if swallowed.
Inhalation	In high concentrations, vapors may be irritating to the respiratory system.
Skin contact	Prolonged or repeated skin contact may cause irritation.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
Information on toxicological effects	
Acute toxicity	May cause discomfort if swallowed.
Skin corrosion/irritation	Prolonged contact may cause dryness of the skin.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	No data available.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Reproductive toxicity	No data available.
Specific target organ toxicity - single exposure	No data available.

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Specific target organ toxicity - repeated exposure	No data available.
Aspiration hazard	Not classified.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	The product is not expected to be readily biodegradable.
Bioaccumulative potential	No data available for this product.
Mobility in soil	Not available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

15. Regulatory information

US federal regulations

This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.

BH 5

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-March-2014

Revision date -

Version # 01

NFPA Ratings

References HSDB® - Hazardous Substances Data Bank

Disclaimer The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CORPORATION DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CORPORATION MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTIABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Corporation, and shall be the sole responsibility of the holder or user of the product.

Aquadene® is a registered trademark of Carus Corporation.

MI0600 Benton Harbor MOR for March 2020

MONTHLY OPERATION REPORT OF THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1

Signature of Operator-in-Charge

Month/Year **March-20** F1-S2

Water Plant Classification

Berrien County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1375	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	180.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.99	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.94	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.82%	Percent of Treated Water

Chemical Data

Chlorine on hand:	53530	lb.	Est. supply:	356	days
Primary Coagulant (Alum (Al3+)) on hand:	77444	lb.	Est. supply:	174	days
Cost of All Chemicals per Million Gallons:	$63.61	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **If yes,** indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	NO
Did POE disinfectant residual fall below 0.2 ppm during the month? **If yes,** indicate date(s) and duration on a separate sheet.	NO
Was minimum C*T credit achieved for the entire month? **If no,** indicate on a separate sheet the date(s) not achieved.	YES
Was continuous POE chlorine residual monitoring equipment off-line during the month? **If yes,** indicate date(s) and duration on a separate sheet.	NO

Distribution	Total	37.3951	Avg	1.2459774	Max	1.4139	Min	0.997

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **March-20**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.37	0.27	0.76		0	0.00	184	2.97	16	0.26	200	2.43	0.63	1.64	1.80
2	0.52	0.33	0.83		0	0.00	231	3.14	20	0.27	251	2.72	1.02	1.56	1.70
3	0.40	0.34	0.82		0	0.00	238	3.84	17	0.27	255	2.81	1.01	1.63	1.80
4	0.50	0.29	0.77	0.80	0	0.00	227	3.11	21	0.29	248	2.71	0.68	1.83	2.03
5	0.51	0.40	0.87		0	0.00	198	3.09	13	0.20	211	2.91	1.10	1.63	1.81
6	0.55	0.36	0.83		0	0.00	206	3.06	98	1.46	304	3.71	1.48	2.06	2.23
7	0.72	0.22	0.76		0	0.00	213	3.08	27	0.39	240	2.91	0.87	1.76	2.04
8	0.50	0.19	0.87		0	0.00	214	3.07	24	0.34	238	2.73	0.77	1.76	1.96
9	0.55	0.33	0.90		0	0.00	201	3.20	19	0.30	220	2.42	0.64	1.61	1.78
10	0.52	0.33	0.90		0	0.00	218	3.08	18	0.25	236	2.65	0.98	1.50	1.67
11	0.53	0.37	0.85	0.78	0	0.00	206	2.91	22	0.31	228	2.68	1.00	1.52	1.68
12	0.58	0.35	0.83		0	0.00	188	3.03	20	0.32	208	2.31	0.47	1.68	1.84
13	0.47	0.44	0.89		0	0.00	207	2.91	21	0.30	228	2.42	0.69	1.56	1.73
14	0.51	0.41	0.85		0	0.00	181	2.84	20	0.31	201	2.39	0.66	1.57	1.73
15	0.51	0.28	0.76		0	0.00	201	2.78	23	0.32	224	2.37	0.62	1.59	1.75
16	0.52	0.37	0.71		0	0.00	214	3.00	39	0.55	253	2.93	0.95	1.83	1.98
17	0.54	0.41	0.88		0	0.00	211	3.01	31	0.44	242	2.81	1.03	1.64	1.78
18	0.48	0.52	0.90		0	0.00	192	3.08	28	0.45	220	2.57	0.68	1.73	1.89
19	0.61	0.34	0.87	0.83	0	0.00	166	2.72	22	0.36	188	2.07	0.12	1.75	1.95
20	0.49	0.39	0.85		0	0.00	182	2.70	21	0.31	203	2.41	0.37	1.67	2.04
21	0.47	0.30	0.91		0	0.00	204	2.75	27	0.36	231	3.03	1.04	1.79	1.99
22	0.55	0.38	0.94		0	0.00	214	2.81	35	0.46	249	2.94	0.96	1.79	1.98
23	0.48	0.26	0.97		0	0.00	161	2.84	28	0.49	189	2.38	0.42	1.78	1.96
24	0.50	0.36	0.87		0	0.00	206	2.78	33	0.44	239	2.71	0.90	1.61	1.81
25	0.55	0.31	0.98		0	0.00	177	2.82	27	0.43	204	2.70	0.63	1.91	2.07
26	0.52	0.32	0.75		0	0.00	173	2.80	24	0.39	197	2.58	0.70	1.64	1.88
27	0.47	0.27	0.81		0	0.00	179	2.80	25	0.39	204	2.67	0.81	1.64	1.86
28	0.51	0.43	0.92		0	0.00	189	2.99	29	0.46	218	3.01	1.47	1.41	1.54
29	0.61	0.35	0.91		0	0.00	156	2.96	21	0.40	177	2.65	1.04	1.45	1.61
30	0.51	0.32	0.85		0	0.00	189	3.08	26	0.42	215	3.09	1.49	1.45	1.60
31	0.48	0.24	0.85		0	0.00	195	3.22	29	0.48	224	2.81	1.07	1.58	1.74
Tot.							5,937		808		6,945				
Avg.	0.52	0.34	0.85	0.80	0.00	0.00	197.53	2.97	26.50	0.40	224.03	2.69	0.84	1.67	1.85
Max	0.72	0.52	0.98	0.83	0.00	0.00	238.00	3.84	98.00	1.46	304.00	3.71	1.49	2.06	2.23
Min.	0.37	0.19	0.71	0.78	0.00	0.00	156.00	2.70	13.00	0.20	177.00	2.07	0.12	1.41	1.54

WSSN 0600 City of Benton Harbor Month/Year March-20

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.9250	284.00	1.62	16.30	25.40	3.10	3	0.10	0.11	3	0.08	0.09	6	0	0
2	1.0975	336.00	1.61	11.40	20.10	2.80	3	0.10	0.11	3	0.08	0.09	6	0	0
3	0.9250	301.00	1.71	10.00	18.00	2.40	3	0.10	0.12	3	0.07	0.08	6	0	0
4	1.0900	363.00	1.75	6.80	10.70	1.50	3	0.08	0.09	3	0.06	0.06	6	0	0
5	0.9575	325.00	1.79	5.00	5.70	1.90	3	0.10	0.12	3	0.09	0.09	6	0	0
6	1.0050	312.00	1.70	10.00	11.70	1.70	3	0.09	0.10	3	0.07	0.07	6	0	0
7	1.0325	325.00	1.66	21.20	24.50	3.30	3	0.10	0.11	3	0.09	0.10	6	0	0
8	1.0400	339.00	1.71	14.20	18.20	3.20	3	0.08	0.09	3	0.08	0.09	6	0	0
9	0.9375	287.00	1.61	16.80	21.30	3.10	3	0.12	0.13	3	0.08	0.09	6	0	0
10	1.0550	346.00	1.73	17.10	20.60	2.50	3	0.08	0.11	3	0.08	0.09	6	0	0
11	1.0550	330.00	1.65	16.20	22.70	2.10	3	0.07	0.08	3	0.08	0.10	6	0	0
12	0.9275	291.00	1.65	14.20	26.20	1.90	3	0.08	0.09	3	0.07	0.08	6	0	0
13	1.0625	318.00	1.57	11.60	15.50	1.70	3	0.11	0.15	3	0.08	0.10	6	0	0
14	0.9500	303.00	1.68	10.00	16.60	1.60	3	0.06	0.07	3	0.09	0.09	6	0	0
15	1.0775	343.00	1.67	10.10	14.50	1.60	3	0.07	0.08	3	0.07	0.08	6	0	0
16	1.0650	338.00	1.67	8.90	11.30	1.50	3	0.07	0.08	3	0.10	0.11	6	0	0
17	1.0475	358.00	1.80	6.80	10.00	1.40	3	0.08	0.09	3	0.08	0.08	6	0	0
18	0.9300	293.00	1.66	7.90	13.30	1.60	3	0.09	0.10	3	0.12	0.13	6	0	0
19	0.9125	280.00	1.61	10.50	21.90	1.60	3	0.08	0.10	3	0.12	0.16	6	0	0
20	1.0075	301.00	1.57	6.70	8.50	1.50	3	0.08	0.08	3	0.08	0.09	6	0	0
21	1.1075	331.00	1.57	12.00	12.80	1.80	3	0.07	0.08	3	0.12	0.18	6	0	0
22	1.1375	352.00	1.63	10.90	12.20	2.10	3	0.07	0.08	3	0.16	0.18	6	0	0
23	0.8475	262.00	1.63	10.00	13.90	1.80	3	0.07	0.09	3	0.13	0.15	6	0	0
24	1.1075	341.00	1.62	6.70	7.30	1.40	3	0.08	0.09	3	0.18	0.19	6	0	0
25	0.9375	288.00	1.62	6.80	9.20	1.40	3	0.08	0.09	3	0.16	0.17	6	0	0
26	0.9225	280.00	1.62	4.90	5.90	1.40	3	0.08	0.08	3	0.15	0.16	6	0	0
27	0.9550	285.00	1.57	5.50	6.70	1.30	3	0.08	0.10	3	0.15	0.16	6	0	0
28	0.9450	275.00	1.53	6.50	11.10	1.40	3	0.10	0.13	3	0.13	0.16	6	0	0
29	0.7875	228.00	1.52	11.50	17.40	1.40	3	0.12	0.14	3	0.12	0.15	6	0	0
30	0.9175	269.00	1.54	13.50	19.20	1.70	3	0.10	0.12	3	0.14	0.17	6	0	0
31	0.9050	279.00	1.62	10.10	17.20	1.40	3	0.08	0.09	3	0.13	0.16	6	0	0
Total	30.6700	9563.00					93			93			186	0	0
Avg.	0.9894	308.48	1.64	10.65	15.15	1.91		0.09	0.10		0.10		Total	Total	Total
Max	1.1375	363.00	1.80	21.20	26.20	3.30		0.12	0.15		0.18	0.19	6	0	0
Min.	0.7875	228.00	1.52	4.90	5.70	1.30		0.06	0.07		0.06				

WSSN 0600 MONTH/YEAR March-20 PAGE 4

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness		Total Alkalinity		Non-Carb. Hardness							
D	pH		as CaCO3		as CaCO3		as CaCO3		Calcium as Ca++		Magnesium as Mg++		Chloride as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	7.9	206	162	142	116	64	46	54	42	17	14		
2	8.1	8.0	198	184	153	120	45	64	44	46	21	17		
3	8.0	7.9	194	180	141	130	53	50	46	43	19	17	22.0	26.5
4	8.1	8.0	158	168	130	121	28	47	45	45	11	14		
5	8.0	8.0	188	180	139	126	49	54	46	51	18	13		
6	8.1	8.0	180	176	134	122	46	54	44	46	17	15		
7	8.1	8.1	152	158	123	125	29	33	43	46	11	10		
8	8.3	7.9	176	166	143	121	33	45	55	49	9	11		
9	8.1	8.2	192	184	138	121	54	63	51	46	16	17		
10	8.0	8.0	184	196	119	128	65	68	46	51	17	17	19.5	23.5
11	7.9	8.0	196	170	156	122	40	48	41	45	23	14		
12	8.1	8.1	194	176	137	117	57	59	46	46	19	15		
13	8.1	8.1	180	172	126	117	54	55	45	46	17	14		
14	8.1	8.1	180	170	129	120	51	50	48	46	15	14		
15	8.0	8.0	182	172	124	117	58	55	46	45	16	15		
16	8.2	7.9	146	154	116	121	30	33	43	47	9	9	21.0	22.5
17	8.2	8.1	164	158	133	117	31	41	49	51	10	7		
18	8.0	8.0	190	172	130	113	60	59	48	45	17	15		
19	8.0	8.1	178	170	127	118	51	52	46	42	16	16		
20	8.3	8.3	178	166	138	121	40	45	52	46	12	12		
21	8.1	8.3	146	156	119	121	27	35	46	53	7	6		
22	8.1	8.0	178	166	141	123	37	43	58	57	8	6		
23	8.1	8.1	168	162	130	121	38	41	46	45	13	12	22.0	23.0
24	8.2	8.2	148	170	115	119	33	51	44	55	9	8		
25	8.1	8.1	148	150	109	123	39	27	42	46	11	9		
26	8.3	8.2	180	156	147	114	33	42	58	51	9	7		
27	8.2	8.2	176	154	147	122	29	32	52	46	11	9		
28	8.1	8.1	182	172	134	124	48	48	44	42	17	16		
29	8.1	8.0	196	188	132	124	64	64	49	46	18	17		
30	8.1	8.0	196	184	132	123	64	61	49	46	18	17	21.5	24.5
31	8.0	8.1	196	180	144	125	52	55	48	46	18	16		
Avg.	8.1	8.1	177.8	169.7	132.8	120.9	45.0	48.8	47.5	47.0	14.4	12.8	21.2	24.0
Max	8.3	8.3	206.0	196.0	156.0	130.0	65.0	68.0	58.0	57.0	23.0	17.0	22.0	26.5
Min.	7.9	7.9	146.0	150.0	109.0	113.0	27.0	27.0	41.0	42.0	7.0	6.0	19.5	22.5

WSSN 0600 MONTH/YEAR March-20 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1		0	1	A	108	0	2	2.5	0.9436	83	3.46	2.74
2		0	1	A	77	0	2	2.5	1.0651	87	3.25	2.95
3		0	1	A	98	0	3	2.5	1.0201	46	1.78	2.47
4	2.06	City Hall	1	A	46	1	3	4.0	1.0256	96	3.70	3.06
4	1.29	Wolfs	1	A	29	0	3	3.0	0.9190	90	3.89	2.99
4	1.58	Bait Shed	1	A	49	1	3	3.5	0.9945	84	3.35	3.01
4	2.72	Sunny Spot	1	A	93	0	3	5.0	0.9846	67	2.70	3.08
4	2.46	B & Z	1	A	91	0	4	5.0	0.9499	84	3.49	3.09
9		0	1	A	82	0	5	3.5	1.0003	82	3.24	2.99
10		0	1	A	87	0	4	5.0	1.0048	82	3.23	3.05
11	2.90	City Hall	1	A	127	0	4	5.5	0.9446	100	4.21	3.00
11	2.89	Wolfs	1	A	78	0	4	4.5	1.0273	92	3.54	2.82
11	2.82	Bait Shed	1	A	91	0	4	5.0	1.0761	86	3.17	3.23
11	2.85	Sunny Spot	1	A	88	0	4	5.1	0.9306	97	4.14	3.19
11	2.43	B & Z	1	A	78	0	4	4.5	1.0662	64	2.36	0.59
16		0	1	A	16	0	4	6.0	0.9614	71	2.92	3.02
17		0	1	A	31	0	5	5.0	1.0010	92	3.62	2.94
18		0	1	A	32	0	5	4.5	0.9713	83	3.37	2.83
19	2.72	City Hall	1	A	46	0	4	4.5	1.0271	85	3.27	2.81
19	2.81	Wolfs	1	A	58	0	5	7.0	0.9800	89	3.59	2.89
19	2.54	Bait Shed	1	A	27	0	4	6.0	0.8992	63	2.76	3.03
19	2.60	Sunny Spot	1	A	32	0	5	6.0	0.9842	62	2.48	2.85
19	2.25	B & Z	1	A	47	0	5	6.0	0.8789	83	3.74	2.98
24		0	1	A	16	0	5	6.0	1.0177	80	3.09	3.18
25		0	1	A	38	0	5	6.0	0.8329	91	4.33	3.23
26		0	1	A	58	1	6	6.0	0.8512	99	4.60	3.12
27		0	1	A	15	1	6.0	7.0	0.9134	81	3.51	3.08
28		0	1	A	123	0	9.0	12.0	0.8263	57	2.72	3.08
29		0	1	A	44	0	8.7	8.5	0.7592	82	4.29	2.94
30		0	1	A	149	1	8.5	9.5	0.8649	74	3.40	3.08
31		0	1	A	84	0	6.3	6.5	0.9270	71	3.01	3.17
Totals									29.6479	2501.2		
AVG.	2.46		1	A	64	0	5	6	0.9564	80.7	3.36	2.93
Max	2.90				149	1	9	12	1.0761	100.4	4.60	3.23
Min	1.29				15	0	2	3	0.7592	45.8	1.78	0.59

MI 0600 Distribution Monitoring Report MI 0600 DMR

DISTRIBUTION SYSTEM MONITORING WSSN 0600 March-20

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4	1.44		1.40	1.19	1.30		1.14			
5										
6										
7										
8										
9										
10										
11	1.21		1.20	1.36	1.59		1.36			
12										
13										
14										
15										
16										
17										
18										
19	0.79		1.01	1.49	1.49		1.01			
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.27	1.59	0.79
Total number of check samples	0600			
Total number of positive check samples	0600			

From:	Sarkipato, Ernest (EGLE)
To:	Oswald, Eric (EGLE); Onan, Brandon (EGLE); Pennington, Stephen (EGLE); Bolf, Michael (EGLE); Bolt, Jennifer (EGLE)
Cc:	Klein, Jeremy (EGLE)
Subject:	BH population
Date:	Monday, January 13, 2020 10:44:21 AM
Attachments:	population.xlsx image002.png

Thank you Eric. I think the determination of the statistical significance of the dataset is up to folks in the LCR. However, other factors play in such as existence of a robust corrosion study, coupon racks, sequential sampling, etc.
To inform the discussion, attached is an updated summary of population served. Here is the estimate:
2963 residential accounts X 2.77 avg household size = 8,208 residents served.
Ernie

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Tuesday, January 7, 2020 8:12 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Cc: Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>
Subject: RE: Distribution Water Quality Parameter Sampling Results
Ernie, very good point. We do need to answer the question at hand. I want to make sure we keep our overall vision and values in mind when making a decision like this. We make data driven decisions that protect public health.
I am OK with dropping them to a lower sampling requirement based on their population. The question is can we do that and still meet the intent of the sampling to provide us data on the efficacy of their corrosion control treatment. The city struggling with collecting samples is an issue but if our experts think it is necessary they need to step up and collect the number of samples needed to give everyone the data required to make decisions on corrosion control.
Eric

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 7, 2020 8:02 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>
Subject: RE: Distribution Water Quality Parameter Sampling Results
Internal only: I am not sure how to communicate with this person any more. It doesn't appear helpful to send emails, evidenced below. Reading through this thread, it is an utter waste of time engaging in this manner even though I think we are trying to be helpful at every turn.
Mike deserves a direct answer to his repeated question about population & sampling, regardless of how abusive he is in his language.
I'd like to have that discussion about the samples soon, as the 2020 monitoring schedule is coming up. Is that something the LCR staff were planning on doing formally?
Should it also be a discussion about WQP's?

Should it also be a discussion about an ALE and monitoring violation?
-Ernie
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Monday, January 6, 2020 4:25 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Subject: Re: Distribution Water Quality Parameter Sampling Results
Ernie,
Your 2 cents falls well short of what in addition, you should have said!
Additional information could have read: *" You see the City of Benton Harbor is under strict monitoring for lead and copper sampling, above the population of 10,000 people. Hence our requirement of collecting 60 Renewed samples for the 1st and 2nd half of 2019. Additionally to collect 10 Water Quality Parameters each quarter in 2019 of 2 sets no less than 1 day apart, using the Multi-parameter worksheet I personally delivered to him back in 2018. I even believe he told me that he purchased the necessary equipment to do the field parameters and do the Sulfate requirement, so the work could be done in house. Yes, I did issue 2 NOVs for only having 9 locations in the 1st & 2nd Quarters in 2019. And, yes he did add 1 site to make up the number of locations of 10 for the 3rd and 4th Quarter sets. Yes, EGLE did send him the new Lead and Copper rules, including the new Water Quality Parameter form, but NO, I and EGLE did not allow Benton Harbor to change to the New Lead and Copper Regulations, even though Mike begged for that to be the case at that time, stating that the 47 Lead and Copper Samples was the "Best They Could Do" and We (EGLE) gave Benton Harbor a less stringent NOV for that but (CCR Notice Only). Hence, I can see why Mike submitted the Water Quality Parameters as he had always been instructed to do, instead of the new EGLE format. I find that he was abiding by what he has been told, and perhaps, we could have mentioned that the new form would have been okay to use for the WQPTesting."*
Now that's what I call 2 cents.
So, are your ready to allow Benton Harbor to follow the Medium Sized Lead and Copper Monitoring Schedule at this time?
Ernie, Jennifer and Eric:
Benton Harbor Water requests to be treated as a Medium System based upon a Water Population of less than 10,000 people, regardless if we use the 2015 Sanitary Survey number of 9,639 or the 2019 calculation of 9,939 served by our water system. You probably already know that I will ask again if you deny it again.
One thing to note, I had even less success getting 60 locations to sample, even with MDHHS help for 2 full weeks, and Help from people I would not really ever put any faith into. Thus a NOV as well as most likely and ALE will be sent to Benton Harbor again in January 2020.
It is hardly fair for one person in the EGLE Drinking Water Group to enforce a set of rules, and another person in the EGLE Drinking Water Group to enforce another set of rules.
Sincerely,
Mike O'Malley
Benton Harbor Water Operator IN Charge
On Thu, Jan 2, 2020 at 9:10 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

Good morning gentlemen,
A couple things:
-The revised monitoring schedule to include orthophosphate is attached, emailed to the city in June of 2019. I can't tell if that's what Mike is asking for, below, or not.
-The City's MOR on page 6 includes orthophosphate residuals from distribution each month. The results are in the second column, with the date changed in the first column to reflect sample date. Note, the rest of the columns on this page are to be considered as taken on dates that follow sequentially, even though the first column has been altered. Admittedly, this is a mess and a better system for reporting should be implemented.
That's my two cents.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Monday, December 30, 2019 1:06 PM
To: Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Distribution Water Quality Parameter Sampling Results
Stephen,
You got what I was instructed to do, in 2018, prior to the addition of Orthopolyphosphate but after the September Lead ALE.
These WQPs I have submitted for 2019 are pretty much exactly the same, except for Early on when I only had 9 locations and I received an NOV from Ernie Sarikipato at least twice.
So extra samples, is just that.
Now, if you or anyone else believes you sent me the New Michigan Requirement for Water Quality Parameters, you better have proof.
Because, I never have been given permission to start using the MI EGLE WQP Data submission.
And, those new requirements are nowhere near the burden that EGLE has demanded from the City of Benton Harbor.
I've seen them on the EGLE Website, that is all I get.
You know you emailed me completely out of the Blue on 12/12/2019.
Welcome to the game that has been going on for a very long time..
Mike O'Malley
Benton Harbor Water Operator IN Charge
On Mon, Dec 30, 2019 at 11:11 AM Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov> wrote:

> Hi Mike,
> I was processing your Distribution WQP's that we received on Dec 10. I noticed 2 thing:

1. There does not appear to be any measures of orthophosphate from any of the sites. If indeed this is the case you have today and tomorrow to obtain the orthophosphate samples (only, not the full suite of parameters) from each of your ten sites and have them analyzed and sent to us by January 10, 2020; and
2. You appear to have samples 2 x in quarters 3 & 4, Unless Ernie has told you otherwise for reasons that I might not be aware of you are only required to sample once per quarter.

Hope this helps.

Steve Pennington
Environmental Quality Analyst
DWEHD – Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-3923 | penningtons1@michigan.gov
Follow Us | michigan.gov/EGLE

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, December 12, 2019 3:50 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Distribution Water Quality Parameter Sampling Results Due

That is not what I am talking about.
I've seen one on the State Web Site that lists the requirements based upon population served.
And, Benton Harbor is a Medium Sized system for lead and copper.
Even though your web site, previously was impossible to navigate, I have found most of the things I've needed.
Mike O'Malley
Benton Harbor Water Operator IN Charge, lucky me.
On Thu, Dec 12, 2019 at 2:08 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike (and Steve),
> We've already had discussion on the number of samples and population. The next opportunity for that would be the 2020 monitoring schedule.
> I think you asked for a copy of the form, which I know the state website doesn't interface well with your computer. So, I've attached the WQP form which I am guessing you were asking for.
> If you needed something else please let us know,
> -Ernie
>
> ---
>
> **From:** Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>
> **Sent:** Thursday, December 12, 2019 11:04 AM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>

Subject: FW: Distribution Water Quality Parameter Sampling Results Due

Morning, Ernie,

Seems Mike has some questions regarding sampling requirements. Can you please help him.

Thank You!

Steve Pennington
Environmental Quality Analyst
DWEHD – Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-3923 | penningtons1@michigan.gov
Follow Us | michigan.gov/EGLE

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, December 12, 2019 10:20 AM
To: Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Distribution Water Quality Parameter Sampling Results Due

Steve,

I sent the Water Quality Parameters the other day 12/10/2019.

Can you help me?

Benton Harbor has a water population of 9,639 residents.

I am pretty sure I know, but with that population, under the new EGLE guidelines states:

1. Populations less than 10,000 have to collect 40 lead and copper samples for the initial sampling period.

2. Populations less than 10,000 have to collect 4 (not sure) Water Quality Parameters for after and Action Level Exceedence.

And, if you have the documentation, and forms, could you email them to me.

Thanks,

Mike O'Malley

MI 0600 Benton Harbor Operator IN Charge.

On Wed, Dec 11, 2019 at 4:14 PM Pennington, Stephen (EGLE) <PenningtonS1@michigan.gov> wrote:

> **Water Quality Parameter (WQP) monitoring results are due by December 31, 2019.** This reminder is being sent to the administrative contact and certified operator contact for your community water system.
>
> If you have already sampled and submitted your results and are still getting this email, it is because we have not yet processed all the data for the second half of 2019. We appreciate your patience as we work through this busy lead and copper season.
>
> Your water system is required to collect WQP samples from a specified number of ***distribution*** locations based on your system's population. **Please refer to your 2019 Monitoring Schedule for your individualized requirements for the locations and frequency of your monitoring and the specific parameters that your samples need to be analyzed for.**
>
> As you are completing sampling, don't forget about common sampling issues:

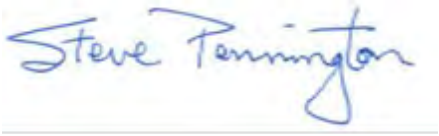
- Temperature and pH are field tests and should be completed at the time of sample collection.
- These samples are not first-draw; there is no stagnation time.
- Sampling locations need to be representative of your distribution system. Routine bacteriological sampling locations are good locations to use, as long as, they do not have any type of point-of-use or point-of entry treatment.

Please report these results on the summary sheet available on our website, www.michigan.gov/LCR and email it to your local District Office email address by January 10, 2020.

DISTRICT EMAILS:

EGLE-DWEH-Lansing@michigan.gov
EGLE-DWEH-Bay-City@michigan.gov
EGLE-DWEH-Jackson@michigan.gov
EGLE-DWEH-Warren@michigan.gov
EGLE-DWEH-Kalamazoo@michigan.gov
EGLE-DWEH-Grand-Rapids@michigan.gov
EGLE-DWEH-Cadillac@michigan.gov
EGLE-DWEH-Marquette@michigan.gov

If you are unsure of how many samples are required, or where they should be collected, or what parameters are required, please contact me and we can review your individual requirements together.



Steve Pennington
Environmental Quality Analyst
DWEHD – Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-3923 | penningtons1@michigan.gov
Follow Us | michigan.gov/EGLE

Benton Harbor Population Analysis

created: 4/17/2019
updated: 1/13/2020

Census Bureau Data:

11,182 2000 population
10,038 2010 population
9,868 2017 population estimate
9,826 2018 population estimate
2.77 2010 average household size

City provided data:

3,025 number of residential customer accounts as of 4/17/2019
144 number of units in Cogic Village apts, served by the Township but in City limits

2,963 number of residential customer accounts as of 1/10/2020
1,100 vacant lots served by water system (estimate from pDSMI)

DEQ Sanitary Survey Population

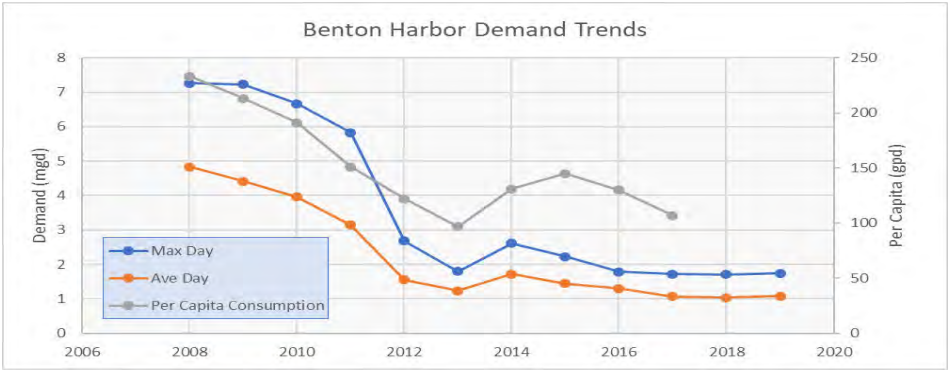
9,970 since 2011, based on census population minus Cogic Village

Estimate based on connections:

8,208 = 2.77 x 2963

Observations

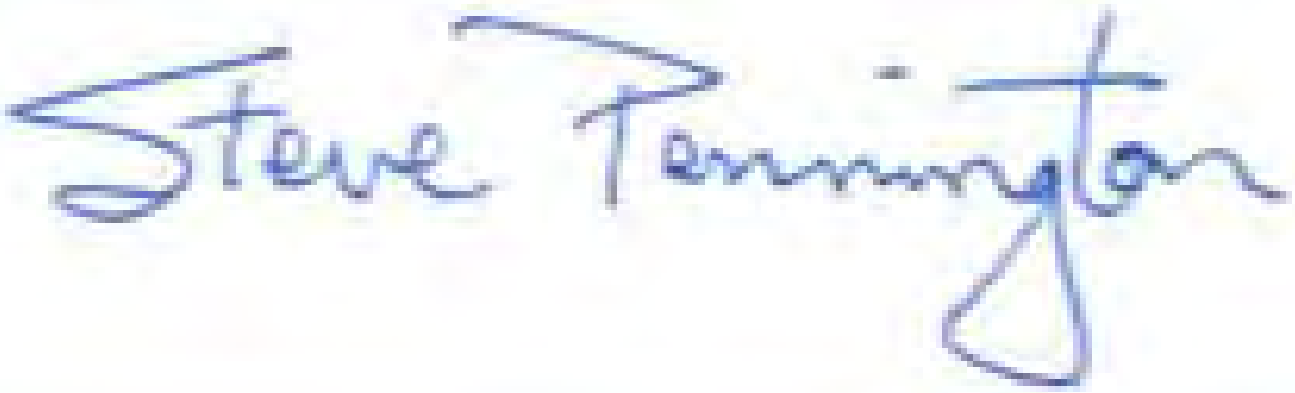
It appears the population is declining in the city based on census data. The water production at the plant is also declining, which may be a result of lower population and/or lower use rates.



REFERENCE: *Classification Of Public Water Supplies Policy 399-013*

Determining Population of a Type I Water Supply: For the purposes of population-specific rules, the following methods will be utilized to determine the population of a Type I water supply that is not categorized based on the number of beds, in order of accuracy and preference:

1. Actual count of residents in small Type I water supplies.
2. Most recent U.S. Census information for Type I water supplies where distribution system extent is the same as the census unit.
3. An estimate based upon best available information from the water supply, which may include the use of a multiplier based on the average number of persons per service connection and approved by the DWEH.



From:	Walstrom, Kimberly (EGLE)
To:	Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Cc:	Sarkipato, Ernest (EGLE)
Subject:	Benton Harbor ACO - Corrosion Study
Date:	Wednesday, June 17, 2020 11:39:44 AM
Attachments:	Benton Harbor - Corrosion Study.pdf

For your file/review.

ERNIE – you indicated you would like the cc's emailed in your letter. Do you have Todd Luks and Ellis Mitchell's email addresses? If so, could you forward a copy of this letter to them? Thanks!

Thank you, Kim

Kim Walstrom, Secretary
Drinking Water and Environmental Health Division
Materials Management Division
Department of Environment, Great Lakes and Energy
Phone: 616-356-0290
Michigan.gov/EGLE

Please Note: Due to temporary layoffs, I am not available to respond to emails or phone calls on Mondays starting the week of May 18, 2020 through July 24, 2020. Thank you.

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 17, 2020

Mr. Mike O'Malley, Water Superintendent
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: **00600**

Dear Mr. O'Malley:

SUBJECT: Response to Draft ACO – Corrosion Study

The City of Benton Harbor (City) received a letter from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) dated February 13, 2020, regarding required changes to the Water System Corrosion Treatment. In addition to requiring an updated chemical formula and higher dose, the letter also required the City have a third-party consultant submit a corrosion control study proposal following the requirements of Rule 325.106.04f(3)(c) from Act 399. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. The City also received a draft Administrative Consent Order (ACO) with cover letter from EGLE dated March 20, 2020. The draft ACO also references the required corrosion control study proposal.

EGLE received a letter from the City dated May 19, 2020, regarding the requirement to submit a corrosion control optimization study proposal. The letter included a data analysis of lead samples in the City, and a project scope for a corrosion control study from Elhorn Engineering. The corrosion control study scope is not detailed but describes the creation of pipe loops from harvested lead and galvanized service lines in the City. The loops would be installed at the water treatment plant for the purpose of determining optimum corrosion control in accordance with EPA guidance.

While the approach for the corrosion control study plan has merit, we have two concerns with the proposed plan.

First, the department requests to see a fully detailed corrosion control study plan. A fully detailed corrosion study plan must include at a minimum the following items: the treatment schemes to be studied; the standard operating procedures as they pertain to sample collection and routine maintenance of the pile loop rig(s); a detailed timeline of anticipated sample collection activities; a detailed layout of the pipe loop rig including all appurtenances; and all methods of analyses that will be utilized to support the outcome of the study. As required in EGLE letter dated February 13, 2020, the corrosion control study plan must be submitted within six months of the date of the change in phosphate treatment.

Second, the department is concerned that the pipe loop study proposal relies on City water operations staff to conduct daily supervision, testing, and sample collection. The concern is not with operations staff's technical ability, but in the current lack of managerial capacity to perform the requirements of the study while completing other routine water system duties. The study of this nature requires careful timing and quality control to maintain data integrity and a successful outcome.

Current Corrosion Treatment Status

The City is reminded of the designation under R325.10604f(3)(d) in EGLE's February 13, 2020 letter to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system at all times. While phosphate levels have increased significantly, the target of 3.0 mg/L orthophosphate is not being met in the distribution system.

Please accept these comments and concerns as part of a constructive conversation. We continue to offer our assistance to help the City in any way we can to maintain compliance. If you have any questions regarding this letter, please contact me below, or in writing at EGLE-Drinking Water and Environmental Health Division, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
616-307-0261
sarkipatoe@michigan.gov

cc/via email: Mr. Ellis Mitchell, City Manager, City of Benton Harbor
Mr. Todd Luks, President, Elhorn Engineering
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Brandon Onan, Lead and Copper Unit Supervisor, EGLE

From:	Clendenon, Cynthia (EGLE)
To:	Sarkipato, Ernest (EGLE)
Cc:	Clendenon, Cynthia (EGLE); Patton, Karol (EGLE)
Subject:	Benton Harbor ACO, LCR, and LSLR
Date:	Friday, August 23, 2019 11:55:01 AM

Ernie,
Are you the EGLE person who can confirm and edit for accuracy the following three paragraphs? If not, please forward to whomever. It's for my upcoming pre-loan Environmental Assessment (EA) for Benton Harbor that will include the water main replacements with LSLR when encountered.
Also, can I have a copy of the drinking water ACO for the Benton Harbor loan file? Is there an EGLE factsheet briefly summarizing it? Although the upcoming DWRF loan does not include plant improvements, I probably should very briefly mention the ACO in the EA as background.
Thanks in advance. Below are the two draft "background" paragraphs; please edit for accuracy.
"Tests of Benton Harbor's drinking water since 2018 have shown some exceedances of the EPA federal action level for lead in drinking water (15 parts per billion). The city [or was it DEQ?] issued its first advisory for lead in drinking water in [when? October?] 2018. Michigan's Safe Drinking Water Act, 1976 PA 399, as amended, requires a water system to provide a public advisory to its consumers regarding lead within three business days of exceeding the action level for lead."
"Since late 2018, the city has started using corrosion controls in the water supply, and it has begun replacing lead service lines, some of which were financed through a state-funded pilot grant. Since xx 2019, the city's water plant has been under an Administrative Consent Order from EGLE [briefly for what purpose?] . Since late 2018 [?], the Berrien County Health Department has been distributing free water filters to residents in homes with confirmed elevated lead levels. [is this still happening? Or is the City now distributing free filters?]"
Ernie, here is a third paragraph for the Construction Impacts section of the EA, to explain what residents (and commercial customers) can expect after the water main either with or without lead service is replaced, affecting their water supply. Please edit for accuracy, thanks:
"Occupants of Benton Harbor properties affected by water main construction should expect a short-term (2 to 6-hour) daytime (or evening) interruption to their water supply during the switchover from the old water pipe to the new pipe, and similarly when lead/galvanized service lines are replaced. The city [will be?] [will not be?] distributing water filters specifically as result of the water main construction, (i.e., apart from elevated lead concerns), but will advise customers to flush their lines after water service is restored. Customers will be given the name and phone number of a contact person for any construction-related problems."
Cindy Clendenon
517.284.5403

From:	Sarkipato, Ernest (EGLE)
To:	emitchell; momalley@cityofbentonharbormi.gov; Darold Harlan
Cc:	Bolf, Michael (EGLE); Onan, Brandon (EGLE); Henderson, Shannon (EGLE); Thurston, Brian (EGLE)
Subject:	Benton Harbor Corrosion Treatment Check-in
Date:	Friday, April 17, 2020 5:04:33 PM
Attachments:	00600_Benton Harbor OCCT update_20200203_FINALIZED.pdf Re What constitutes Gentle Flushing.msg MI 0600 Benton Harbor MOR for March 2020.pdf

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Recently we received the March Operation Report from Operator In Charge Mr. O'Malley for the City of Benton Harbor's water treatment plant. This is the first full month of treatment after changing to the new phosphate chemical as directed by our letter dated February 13, 2020, attached. The increase in phosphate in the distribution system is notable in the samples collected by Mr. O'Malley and staff, and we appreciate the time and effort to steer the corrosion treatment in this direction. The purpose of our request and our shared goal continues to be an expedited path to minimizing impacts to public health from lead in drinking water.
Based on the operational data in March, we had some observations for the city:

1. The target orthophosphate residual is 3.0 mg/L as PO4 *in the distribution system*. While the phosphate levels at the water plant exceed this level on 17 out of 31 days, the *distribution residual* has not yet reached 3.0 mg/L as directed.
2. There is variation in the amount of phosphate being added each day, which is to be expected as operators must adapt to a new treatment chemical and target.

Again, we fully understand there is time needed to work out the kinks of a new chemical and new target. To help the city achieve the target dose consistently, the following are some suggestions:

A. It appears the pump may be undersized and unable to meet the higher treatment target. This was stated by Mr. O'Malley previously (attached email), and independent calculations support his claim. *We recommend doing a pump test* (i.e. drawdown test) with the existing chemical pump to measure the flow rate at max setting. If found inadequate, *please explore improvements to increase pump output*. This might include *increasing the pump tubing size* or it may be necessary to *install a larger pump*.
B. The variability of the chemical treatment may be reduced by *implementing the full functionality of the pump and insertion meter* (i.e. flow-pacing the pump). This system was intended to function independently, basing the chemical added on the presence and amount of water flow through high service pumping. I believe this could be done by a *qualified instrumentation/controls integrator*.
C. We would like to offer assistance in continuing the conversation regarding a corrosion study. While the new treatment chemical and higher target is based on analogous systems with success in curbing lead release, it is necessary to select the best treatment for the City of Benton Harbor. An initial conversation has been held with Dr. Dave Cornwell, and a follow-up call can also be arranged at the city's request.

All in all, we would like to thank the city and Mr. O'Malley for the progress thus far, and hope to offer our assistance in keeping that momentum. I have drafted this email on behalf of our team at EGLE, in an attempt to respect Mr. Mitchell's request that communication from our department funnel through me to the extent practical. If you would like to arrange a discussion of this email and the corrosion treatment, I would be very happy to arrange that.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit for installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system. The treatment chemical permitted, based on a recommendation by Elhorn Engineering, was Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was 1.5 milligrams per liter (mg/L) as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City concludes the treatment is not achieving desired results quickly enough. The most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment.

The City met with representatives from EGLE on January 15, 2020, to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting and outline next steps for the City to pursue designation of optimized corrosion control treatment as required by Rule 604f of the administrative rules promulgated under Act 399.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60 certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This

designation is being made under R325.10604f(3)(d). The reason for this change is to speed up treatment effectiveness. EGLE's intent is to quickly put into place treatment that will more efficiently lower corrosion rates in the distribution system for greater protection of public health. This decision is based on corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system but, without further study, it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third-party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c) of the administrative rules promulgated under Act 399. This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immediately verify in writing to the department the valve has been closed according to the permit.

TRANSITION AND TIMELINE

Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

From: Mike O'Malley [momalley@cityofbentonharbormi.gov]
To: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]; Onan, Brandon (EGLE) [OnanB@michigan.gov]
CC: Mike OMalley [momalley@cityofbentonharbormi.gov]; Darold Harlan [dharlan@fv-operations.com]; emitchell [emitchell@cityofbentonharbormi.gov]; Daniel McGinnis [dmcginnis@cityofbentonharbormi.gov]; Michael Clark [mclark@cityofbentonharbormi.gov]; Jim and Todd Luks Elhorn Engineerint [elhorneng@aol.com]; Dr R. Johansen [rjohansen@bchdmi.org]; Nicki Britten [nbritten@bchdmi.org]
Subject: Re: What constitutes "Gentle Flushing"
Sent: Monday, February 24, 2020 19:02:38
Attachment 1: image003.jpg

Thanks for the info.

Some of you may wonder why you are on the copy line. I believe if I reference someone or something done by someone, I add them to the copy line.
If you read through this, you will see where you fit in to this email.
Dr. Johanson, Nicki Britten, Chief McGinnis, and Deputy Police Chief Michael Clark.

Unfortunately this email is from Mike O'Malley, Operator IN Charge and not by the City Manager, Mr. Ellis Mitchell.
This is my take on the situation, and may not be Ellis Mitchell's opinion, but he is copied (as agreed) on this email.

The switch over from 70/30 OPP to 90/10 OPP was Friday 02 21 2020 in the morning.
It took Darold all day Thursday and me all day Friday to get the West Suction Line closed nearly 100%
Proof for this valve being closed; was a flow through the new meter of 2,604 gpm which is roughly equal to 3.75 MGD, which is very close to what the High Service pump is expected to deliver.
Unfortunately, the new demanded feed rate of 3.0 mg/L as P requires the pump to function at Top Speed, (100%) speed the original Pump is designed for.

The Permit Change is something different and will take me awhile to properly fill out. I propose the permit that exists is still in force and has only been altered by the type of Chemical Make Up percentages "ORTHO" I am working on it today. Maybe, you can send me a blank form of the one you used and I can copy/paste the appropriate existing conditions and basically only to add the new chemical treatment.

As you know the Orthopolyphosphate treatment scheme was decided upon by the EGLE staff with the recommendation of Elhorn Engineering.
The State also agreed to allow Benton Harbor to use the MDEQ Pilot Grant Funding to reimburse the expenditures that were incurred, Thank You.
EGLE pushed to have the OPP treatment in place before the proposed Suction Line Meter was installed, due to its long lead time.
Elhorn Engineering delivered the 1st set of 55-gallon barrels; set up the pump and injection point, and put in a Rack of various metals to determine the rate of decay.
This all started to take effect 3/26/2019.
A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.
With no background data, the results are not really worth noticing, just yet. But the Mild Steel decay was most troublesome at the Outside location. The lead result was pretty small, as well as the copper at both locations.

Hence, your letter drove us to remove the 2nd Rack on 2/17/2020 and send the coupons in for analysis.
If, you had requested, or If you had waited a bit longer with the NOTICE; we may have seen results that

indicated that the original corrosion treatment program was working enough to wait out the 18-Month time frame that we were told would be when a relatively full exchange would be evident.
Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."

To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!

As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio. *It was probably written before EPA knew about this chemical blend.
And, before the Dramatic Change in the Lead Rules.

I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).

And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; and should not be, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.

As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product.
However either one of the treatment chemicals they supply is the same price but different results.
Unfortunately, some would see this as a conflict of interest.

And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.

If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.

It appeared in your letter, that other systems have been involved in this type of corrosion treatment. Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.

Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with high water levels, the residential portions of Benton Harbor are on top of the hills.
However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions.,
And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.

At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.

After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.

Sincerely,

Mike O'Malley
Benton Harbor Water Operator IN Charge.

On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> > wrote:

Hi Mike,

Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:

-The goal is to bring the newly treated water throughout the distribution system

-The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.

-It's best to start at the water plant and move to the ends of the system

-For example, on a 6" pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it's a dead end run. As you can see, it can be easy to get into the scouring velocity range.

-At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing level. Then, next day, move further into the system.

I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.

Hopefully that is helpful information,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

<https://gcc01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C5a88e456c7cf424f912908d7b97dad11%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C1%7C637181821732153673&sdata=ZlRbWd4ry%2F1o2RC1FdlpwSSqEoZvRxHg%2FkC3w5V5hb0%3D&reserved=0>
www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov <mailto:momalley@cityofbentonharbormi.gov> >
Sent: Friday, February 21, 2020 4:56 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov <mailto:momalley@cityofbentonharbormi.gov> >
Subject: What constitutes "Gentle Flushing"

MI0600 Benton Harbor MOR for March 2020

MONTHLY OPERATION REPORT OF THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1

Signature of Operator-in-Charge

Month/Year **March-20** F1-S2

Water Plant Classification

Berrien County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1375	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	180.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.99	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.94	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.82%	Percent of Treated Water

Chemical Data

Chlorine on hand:	53530	lb.	Est. supply:	356	days
Primary Coagulant (Alum (Al3+)) on hand:	77444	lb.	Est. supply:	174	days
Cost of All Chemicals per Million Gallons:	$63.61	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **If yes,** indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	NO
Did POE disinfectant residual fall below 0.2 ppm during the month? **If yes,** indicate date(s) and duration on a separate sheet.	NO
Was minimum C*T credit achieved for the entire month? **If no,** indicate on a separate sheet the date(s) not achieved.	YES
Was continuous POE chlorine residual monitoring equipment off-line during the month? **If yes,** indicate date(s) and duration on a separate sheet.	NO

Distribution	Total	37.3951	Avg	1.2459774	Max	1.4139	Min	0.997

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **March-20**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.37	0.27	0.76		0	0.00	184	2.97	16	0.26	200	2.43	0.63	1.64	1.80
2	0.52	0.33	0.83		0	0.00	231	3.14	20	0.27	251	2.72	1.02	1.56	1.70
3	0.40	0.34	0.82		0	0.00	238	3.84	17	0.27	255	2.81	1.01	1.63	1.80
4	0.50	0.29	0.77	0.80	0	0.00	227	3.11	21	0.29	248	2.71	0.68	1.83	2.03
5	0.51	0.40	0.87		0	0.00	198	3.09	13	0.20	211	2.91	1.10	1.63	1.81
6	0.55	0.36	0.83		0	0.00	206	3.06	98	1.46	304	3.71	1.48	2.06	2.23
7	0.72	0.22	0.76		0	0.00	213	3.08	27	0.39	240	2.91	0.87	1.76	2.04
8	0.50	0.19	0.87		0	0.00	214	3.07	24	0.34	238	2.73	0.77	1.76	1.96
9	0.55	0.33	0.90		0	0.00	201	3.20	19	0.30	220	2.42	0.64	1.61	1.78
10	0.52	0.33	0.90		0	0.00	218	3.08	18	0.25	236	2.65	0.98	1.50	1.67
11	0.53	0.37	0.85	0.78	0	0.00	206	2.91	22	0.31	228	2.68	1.00	1.52	1.68
12	0.58	0.35	0.83		0	0.00	188	3.03	20	0.32	208	2.31	0.47	1.68	1.84
13	0.47	0.44	0.89		0	0.00	207	2.91	21	0.30	228	2.42	0.69	1.56	1.73
14	0.51	0.41	0.85		0	0.00	181	2.84	20	0.31	201	2.39	0.66	1.57	1.73
15	0.51	0.28	0.76		0	0.00	201	2.78	23	0.32	224	2.37	0.62	1.59	1.75
16	0.52	0.37	0.71		0	0.00	214	3.00	39	0.55	253	2.93	0.95	1.83	1.98
17	0.54	0.41	0.88		0	0.00	211	3.01	31	0.44	242	2.81	1.03	1.64	1.78
18	0.48	0.52	0.90		0	0.00	192	3.08	28	0.45	220	2.57	0.68	1.73	1.89
19	0.61	0.34	0.87	0.83	0	0.00	166	2.72	22	0.36	188	2.07	0.12	1.75	1.95
20	0.49	0.39	0.85		0	0.00	182	2.70	21	0.31	203	2.41	0.37	1.67	2.04
21	0.47	0.30	0.91		0	0.00	204	2.75	27	0.36	231	3.03	1.04	1.79	1.99
22	0.55	0.38	0.94		0	0.00	214	2.81	35	0.46	249	2.94	0.96	1.79	1.98
23	0.48	0.26	0.97		0	0.00	161	2.84	28	0.49	189	2.38	0.42	1.78	1.96
24	0.50	0.36	0.87		0	0.00	206	2.78	33	0.44	239	2.71	0.90	1.61	1.81
25	0.55	0.31	0.98		0	0.00	177	2.82	27	0.43	204	2.70	0.63	1.91	2.07
26	0.52	0.32	0.75		0	0.00	173	2.80	24	0.39	197	2.58	0.70	1.64	1.88
27	0.47	0.27	0.81		0	0.00	179	2.80	25	0.39	204	2.67	0.81	1.64	1.86
28	0.51	0.43	0.92		0	0.00	189	2.99	29	0.46	218	3.01	1.47	1.41	1.54
29	0.61	0.35	0.91		0	0.00	156	2.96	21	0.40	177	2.65	1.04	1.45	1.61
30	0.51	0.32	0.85		0	0.00	189	3.08	26	0.42	215	3.09	1.49	1.45	1.60
31	0.48	0.24	0.85		0	0.00	195	3.22	29	0.48	224	2.81	1.07	1.58	1.74
Tot.							5,937		808		6,945				
Avg.	0.52	0.34	0.85	0.80	0.00	0.00	197.53	2.97	26.50	0.40	224.03	2.69	0.84	1.67	1.85
Max	0.72	0.52	0.98	0.83	0.00	0.00	238.00	3.84	98.00	1.46	304.00	3.71	1.49	2.06	2.23
Min.	0.37	0.19	0.71	0.78	0.00	0.00	156.00	2.70	13.00	0.20	177.00	2.07	0.12	1.41	1.54

WSSN 0600 City of Benton Harbor Month/Year March-20

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.9250	284.00	1.62	16.30	25.40	3.10	3	0.10	0.11	3	0.08	0.09	6	0	0
2	1.0975	336.00	1.61	11.40	20.10	2.80	3	0.10	0.11	3	0.08	0.09	6	0	0
3	0.9250	301.00	1.71	10.00	18.00	2.40	3	0.10	0.12	3	0.07	0.08	6	0	0
4	1.0900	363.00	1.75	6.80	10.70	1.50	3	0.08	0.09	3	0.06	0.06	6	0	0
5	0.9575	325.00	1.79	5.00	5.70	1.90	3	0.10	0.12	3	0.09	0.09	6	0	0
6	1.0050	312.00	1.70	10.00	11.70	1.70	3	0.09	0.10	3	0.07	0.07	6	0	0
7	1.0325	325.00	1.66	21.20	24.50	3.30	3	0.10	0.11	3	0.09	0.10	6	0	0
8	1.0400	339.00	1.71	14.20	18.20	3.20	3	0.08	0.09	3	0.08	0.09	6	0	0
9	0.9375	287.00	1.61	16.80	21.30	3.10	3	0.12	0.13	3	0.08	0.09	6	0	0
10	1.0550	346.00	1.73	17.10	20.60	2.50	3	0.08	0.11	3	0.08	0.09	6	0	0
11	1.0550	330.00	1.65	16.20	22.70	2.10	3	0.07	0.08	3	0.08	0.10	6	0	0
12	0.9275	291.00	1.65	14.20	26.20	1.90	3	0.08	0.09	3	0.07	0.08	6	0	0
13	1.0625	318.00	1.57	11.60	15.50	1.70	3	0.11	0.15	3	0.08	0.10	6	0	0
14	0.9500	303.00	1.68	10.00	16.60	1.60	3	0.06	0.07	3	0.09	0.09	6	0	0
15	1.0775	343.00	1.67	10.10	14.50	1.60	3	0.07	0.08	3	0.07	0.08	6	0	0
16	1.0650	338.00	1.67	8.90	11.30	1.50	3	0.07	0.08	3	0.10	0.11	6	0	0
17	1.0475	358.00	1.80	6.80	10.00	1.40	3	0.08	0.09	3	0.08	0.08	6	0	0
18	0.9300	293.00	1.66	7.90	13.30	1.60	3	0.09	0.10	3	0.12	0.13	6	0	0
19	0.9125	280.00	1.61	10.50	21.90	1.60	3	0.08	0.10	3	0.12	0.16	6	0	0
20	1.0075	301.00	1.57	6.70	8.50	1.50	3	0.08	0.08	3	0.08	0.09	6	0	0
21	1.1075	331.00	1.57	12.00	12.80	1.80	3	0.07	0.08	3	0.12	0.18	6	0	0
22	1.1375	352.00	1.63	10.90	12.20	2.10	3	0.07	0.08	3	0.16	0.18	6	0	0
23	0.8475	262.00	1.63	10.00	13.90	1.80	3	0.07	0.09	3	0.13	0.15	6	0	0
24	1.1075	341.00	1.62	6.70	7.30	1.40	3	0.08	0.09	3	0.18	0.19	6	0	0
25	0.9375	288.00	1.62	6.80	9.20	1.40	3	0.08	0.09	3	0.16	0.17	6	0	0
26	0.9225	280.00	1.62	4.90	5.90	1.40	3	0.08	0.08	3	0.15	0.16	6	0	0
27	0.9550	285.00	1.57	5.50	6.70	1.30	3	0.08	0.10	3	0.15	0.16	6	0	0
28	0.9450	275.00	1.53	6.50	11.10	1.40	3	0.10	0.13	3	0.13	0.16	6	0	0
29	0.7875	228.00	1.52	11.50	17.40	1.40	3	0.12	0.14	3	0.12	0.15	6	0	0
30	0.9175	269.00	1.54	13.50	19.20	1.70	3	0.10	0.12	3	0.14	0.17	6	0	0
31	0.9050	279.00	1.62	10.10	17.20	1.40	3	0.08	0.09	3	0.13	0.16	6	0	0
Total	30.6700	9563.00					93			93			186	0	0
Avg.	0.9894	308.48	1.64	10.65	15.15	1.91		0.09	0.10		0.10		Total	Total	Total
Max	1.1375	363.00	1.80	21.20	26.20	3.30		0.12	0.15		0.18	0.19	6	0	0
Min.	0.7875	228.00	1.52	4.90	5.70	1.30		0.06	0.07		0.06				

WSSN 0600 MONTH/YEAR March-20 PAGE 4

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness		Total Alkalinity		Non-Carb. Hardness							
D	pH		as CaCO3		as CaCO3		as CaCO3		Calcium as Ca++		Magnesium as Mg++		Chloride as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	7.9	206	162	142	116	64	46	54	42	17	14		
2	8.1	8.0	198	184	153	120	45	64	44	46	21	17		
3	8.0	7.9	194	180	141	130	53	50	46	43	19	17	22.0	26.5
4	8.1	8.0	158	168	130	121	28	47	45	45	11	14		
5	8.0	8.0	188	180	139	126	49	54	46	51	18	13		
6	8.1	8.0	180	176	134	122	46	54	44	46	17	15		
7	8.1	8.1	152	158	123	125	29	33	43	46	11	10		
8	8.3	7.9	176	166	143	121	33	45	55	49	9	11		
9	8.1	8.2	192	184	138	121	54	63	51	46	16	17		
10	8.0	8.0	184	196	119	128	65	68	46	51	17	17	19.5	23.5
11	7.9	8.0	196	170	156	122	40	48	41	45	23	14		
12	8.1	8.1	194	176	137	117	57	59	46	46	19	15		
13	8.1	8.1	180	172	126	117	54	55	45	46	17	14		
14	8.1	8.1	180	170	129	120	51	50	48	46	15	14		
15	8.0	8.0	182	172	124	117	58	55	46	45	16	15		
16	8.2	7.9	146	154	116	121	30	33	43	47	9	9	21.0	22.5
17	8.2	8.1	164	158	133	117	31	41	49	51	10	7		
18	8.0	8.0	190	172	130	113	60	59	48	45	17	15		
19	8.0	8.1	178	170	127	118	51	52	46	42	16	16		
20	8.3	8.3	178	166	138	121	40	45	52	46	12	12		
21	8.1	8.3	146	156	119	121	27	35	46	53	7	6		
22	8.1	8.0	178	166	141	123	37	43	58	57	8	6		
23	8.1	8.1	168	162	130	121	38	41	46	45	13	12	22.0	23.0
24	8.2	8.2	148	170	115	119	33	51	44	55	9	8		
25	8.1	8.1	148	150	109	123	39	27	42	46	11	9		
26	8.3	8.2	180	156	147	114	33	42	58	51	9	7		
27	8.2	8.2	176	154	147	122	29	32	52	46	11	9		
28	8.1	8.1	182	172	134	124	48	48	44	42	17	16		
29	8.1	8.0	196	188	132	124	64	64	49	46	18	17		
30	8.1	8.0	196	184	132	123	64	61	49	46	18	17	21.5	24.5
31	8.0	8.1	196	180	144	125	52	55	48	46	18	16		
Avg.	8.1	8.1	177.8	169.7	132.8	120.9	45.0	48.8	47.5	47.0	14.4	12.8	21.2	24.0
Max	8.3	8.3	206.0	196.0	156.0	130.0	65.0	68.0	58.0	57.0	23.0	17.0	22.0	26.5
Min.	7.9	7.9	146.0	150.0	109.0	113.0	27.0	27.0	41.0	42.0	7.0	6.0	19.5	22.5

WSSN 0600 MONTH/YEAR March-20 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1		0	1	A	108	0	2	2.5	0.9436	83	3.46	2.74
2		0	1	A	77	0	2	2.5	1.0651	87	3.25	2.95
3		0	1	A	98	0	3	2.5	1.0201	46	1.78	2.47
4	2.06	City Hall	1	A	46	1	3	4.0	1.0256	96	3.70	3.06
4	1.29	Wolfs	1	A	29	0	3	3.0	0.9190	90	3.89	2.99
4	1.58	Bait Shed	1	A	49	1	3	3.5	0.9945	84	3.35	3.01
4	2.72	Sunny Spot	1	A	93	0	3	5.0	0.9846	67	2.70	3.08
4	2.46	B & Z	1	A	91	0	4	5.0	0.9499	84	3.49	3.09
9		0	1	A	82	0	5	3.5	1.0003	82	3.24	2.99
10		0	1	A	87	0	4	5.0	1.0048	82	3.23	3.05
11	2.90	City Hall	1	A	127	0	4	5.5	0.9446	100	4.21	3.00
11	2.89	Wolfs	1	A	78	0	4	4.5	1.0273	92	3.54	2.82
11	2.82	Bait Shed	1	A	91	0	4	5.0	1.0761	86	3.17	3.23
11	2.85	Sunny Spot	1	A	88	0	4	5.1	0.9306	97	4.14	3.19
11	2.43	B & Z	1	A	78	0	4	4.5	1.0662	64	2.36	0.59
16		0	1	A	16	0	4	6.0	0.9614	71	2.92	3.02
17		0	1	A	31	0	5	5.0	1.0010	92	3.62	2.94
18		0	1	A	32	0	5	4.5	0.9713	83	3.37	2.83
19	2.72	City Hall	1	A	46	0	4	4.5	1.0271	85	3.27	2.81
19	2.81	Wolfs	1	A	58	0	5	7.0	0.9800	89	3.59	2.89
19	2.54	Bait Shed	1	A	27	0	4	6.0	0.8992	63	2.76	3.03
19	2.60	Sunny Spot	1	A	32	0	5	6.0	0.9842	62	2.48	2.85
19	2.25	B & Z	1	A	47	0	5	6.0	0.8789	83	3.74	2.98
24		0	1	A	16	0	5	6.0	1.0177	80	3.09	3.18
25		0	1	A	38	0	5	6.0	0.8329	91	4.33	3.23
26		0	1	A	58	1	6	6.0	0.8512	99	4.60	3.12
27		0	1	A	15	1	6.0	7.0	0.9134	81	3.51	3.08
28		0	1	A	123	0	9.0	12.0	0.8263	57	2.72	3.08
29		0	1	A	44	0	8.7	8.5	0.7592	82	4.29	2.94
30		0	1	A	149	1	8.5	9.5	0.8649	74	3.40	3.08
31		0	1	A	84	0	6.3	6.5	0.9270	71	3.01	3.17
Totals									29.6479	2501.2		
AVG.	2.46		1	A	64	0	5	6	0.9564	80.7	3.36	2.93
Max	2.90				149	1	9	12	1.0761	100.4	4.60	3.23
Min	1.29				15	0	2	3	0.7592	45.8	1.78	0.59

MI 0600 Distribution Monitoring Report MI 0600 DMR

DISTRIBUTION SYSTEM MONITORING WSSN 0600 March-20

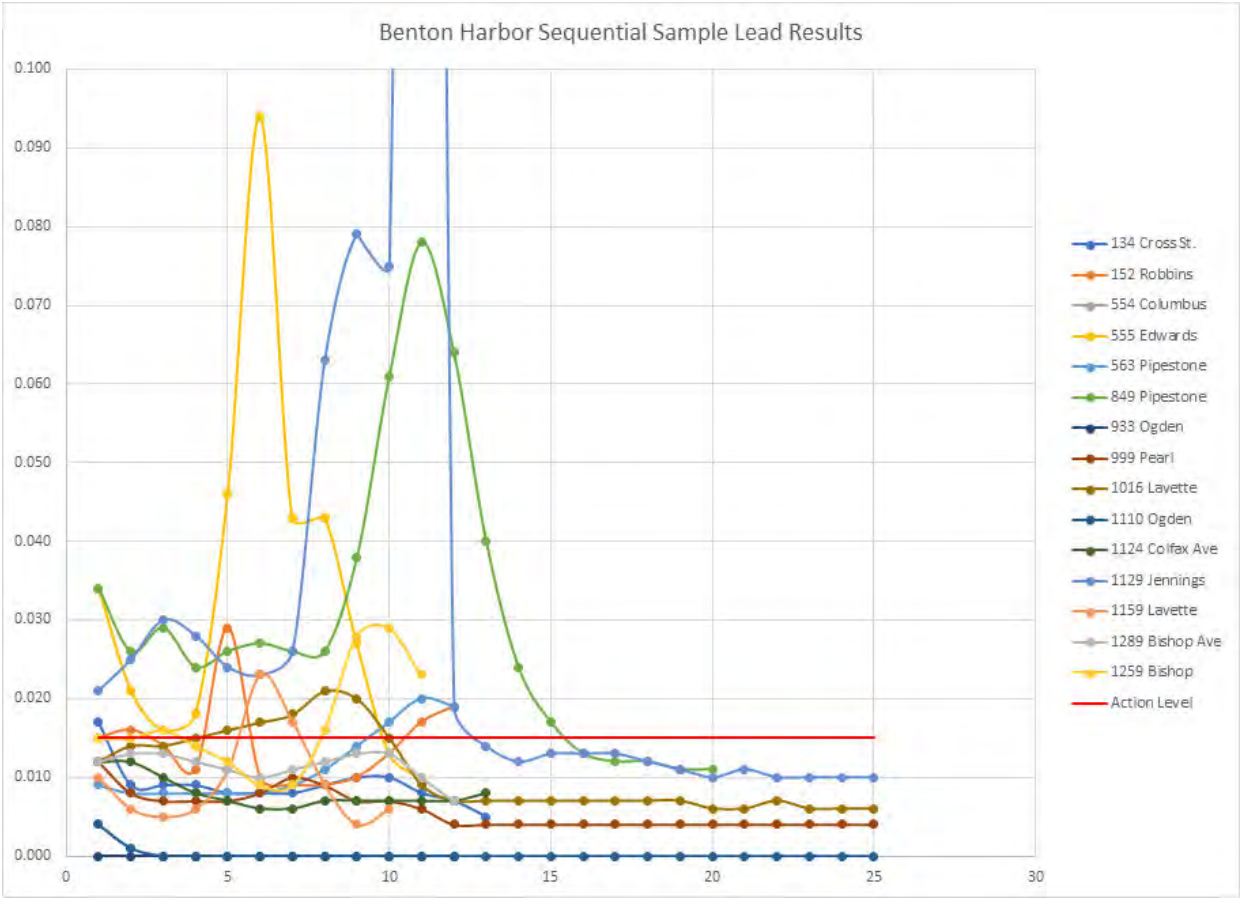
DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4	1.44		1.40	1.19	1.30		1.14			
5										
6										
7										
8										
9										
10										
11	1.21		1.20	1.36	1.59		1.36			
12										
13										
14										
15										
16										
17										
18										
19	0.79		1.01	1.49	1.49		1.01			
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.27	1.59	0.79
Total number of check samples	0600			
Total number of positive check samples	0600			

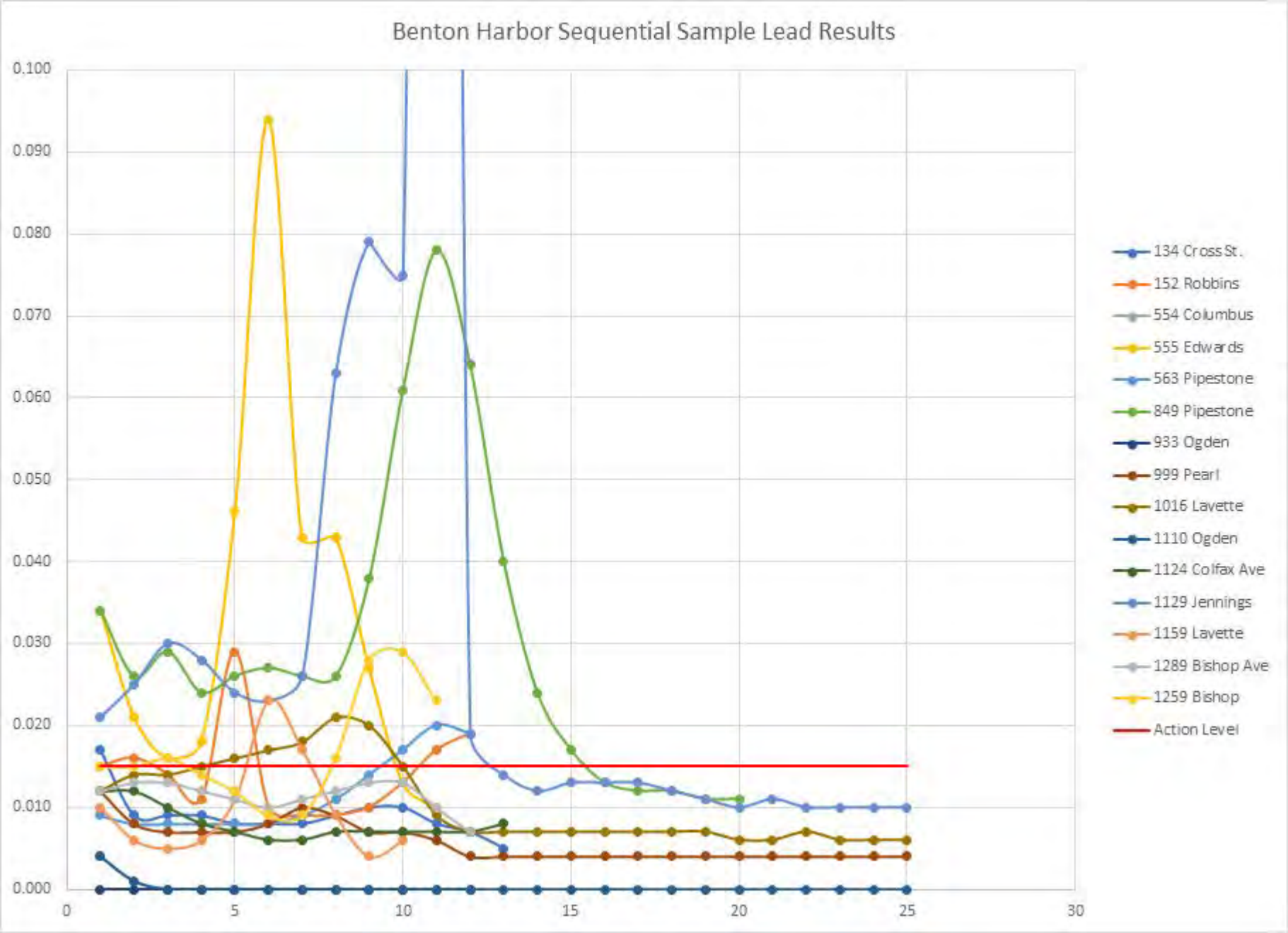
From: Onan, Brandon (DEQ)
To: Sarkipato, Ernest (DEQ); Krisztian, George (DEQ); Lachance, Amy (DEQ); Bolf, Michael (DEQ); Thurston, Brian (DEQ); Bolt, Jennifer (DEQ); Philip, Kris (DEQ)
Cc: Crider, Steven (DHHS)
Subject: Benton Harbor DHHS sequential data
Date: Wednesday, February 27, 2019 12:25:54 PM
Attachments: image001.png
image004.png

All, below is a chart of the data that DHHS recently provided us via email to Ernie. We can see that there are some spikes that are relatively high but the data looks to be consistent with what would be expected from dissolved lead, not particulate, as the numbers do not rise and fall with one sample. The numbers tend to go up in the service line and then drop off once we begin pulling water in from the main. I do not think there is any major take homes from this data. It just confirms that treatment for corrosion control is prudent and that we are on the correct path.
Also as a side note, out of the 15 homes sampled, 5 of them had no lead detected over the action level in any of the samples, and only one home had two samples that exceeded the copper action level.



Let me know if you have any questions.
Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov


Benton Harbor Sequential Sample Lead Results
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
0
5
10
15
20
25
30
134 Cross St.
152 Robbins
554 Columbus
555 Edwards
563 Pipestone
849 Pipestone
933 Ogden
999 Pearl
1016 Lavette
1110 Ogden
1124 Colfax Ave
1129 Jennings
1159 Lavette
1289 Bishop Ave
1259 Bishop
Action Level

From:	Onan, Brandon (DEQ)
To:	Sarkipato, Ernest (EGLE)
Cc:	Bolf, Michael (EGLE); Thurston, Brian (EGLE); London, Bob (EGLE)
Subject:	Benton Harbor Permit for CCT
Date:	Friday, February 22, 2019 12:44:54 PM
Attachments:	image001.png

As per our conference call, the overall consensus from the PRT is for the current permit to construct to be issued with a special condition to the permit that addresses the lack of a corrosion control study plan post installation. Through our conversations with the City and Elhorn Engineering, we know a coupon study to identify optimum dose for the proposed product is to be conducted. The PRT would like the plan for said coupon study to be proposed to the department for evaluation and comment. This way we can try and make sure that the data received after the study will allow the department to make a determination on optimized dose.

If you have any questions please feel free to ask, and PRT if I have missed any pertinent comments from our call please feel free to interject them now.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From:	Sarkipato, Ernest (DEQ)
To:	"Mike O"Malley"; mike@michonline.net; "Todd Luks"; "Ron Oudbier"; "roudbier@fnwusers.com"; "jmommersmmiinc@gmail.com"; "Curtis Brzyski"
Cc:	dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Subject:	Benton Harbor Phosphate Project Update
Date:	Thursday, February 14, 2019 1:01:15 PM

All – Quick update on things needing follow-up in Benton Harbor:

- Submit order to MMI for meter, controller, and display (2 week lead time, O'Malley will do)
- Oudbier Instruments Start up (Ron or his son need to come see the plant for a quote)
- Tap the Suction line? (O'Malley was going to contact DA Dodd or someone local for the tap)
- Pay Elhorn Engineering? (Mike was going to send you an invoice)
- A digital read out for flow, pump variable, and scale? (Scale and pump are with Elhorn, Flow readout is with the MMI quoted McCrometer flow meter)
- The Orthopolyphosphate injector? (comes with Elhorn's setup, dependent on contractor's tapping capabilities, i.e. thread type)

It would be great to have Elhorn and Oudbier onsite at the same time, maybe even with the tapping contractor. Todd (Elhorn) said he might be going down next week. Any days work for everybody to meet? Thursday 2/21 looks good for me.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, February 14, 2019 11:47 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: FW: Benton Harbor job

Ii will get Darwin a PR today.
Now, was there other things I need to arrange for a PO for.

- Oudbier Instruments Start up
- Tap the Suction line?
- Pay Elhorn Engineering?
- A digital read out for flow, pump variable, and scale?
- The Orthopolyphosphate injector?

Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Feb 14, 2019 at 10:36 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Can you give me an update on where you are at with moving the phosphate project forward?
>
> **From:** Sarkipato, Ernest (DEQ)
> **Sent:** Tuesday, February 5, 2019 10:19 AM
> **To:** momalley@cityofbentonharbormi.gov; 'DARWIN WATSON'

<dwatson@cityofbentonharbormi.gov>
Cc: jmommersmmiinc@gmail.com; 'Ron Oudbier' <ron@oudbierinst.com>; 'Curtis Brzyski' <cbrzyskimmi@msn.com>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net
Subject: FW: Benton Harbor job

Mike: here's a bump on this email quote from Curtis at MMI. All they need is an indication from you to get the meter on order. I spoke with Darwin who understands the need for a more expensive model (accuracy, NSF approval).
Also, they confirmed this would also include the processing unit to send the signal to the Stenner phosphate pump.
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** Sarkipato, Ernest (DEQ)
> **To:** Curtis Brzyski ; James Mommers
> **Cc:** momalley@cityofbentonharbormi.gov
> **Sent:** Monday, February 4, 2019 10:29 AM
> **Subject:** RE: Benton Harbor job
>
> City is going to have a local contractor tap the main and install the meter.
> Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
> We probably need 40' of cable.
> Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
> Ernie
>
> ---
>
> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
> **Sent:** Tuesday, January 29, 2019 9:36 AM

To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.
Ernie
From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst

<ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (DEQ)
To:	Mike O"Malley; mike@michonline.net; "Todd Luks"; Ron Oudbier; roudbier@fnwusers.com; jmommersmmiinc@gmail.com; "Curtis Brzyski"
Cc:	dwatson@cityofbentonharbormi.gov; Bolf, Michael (DEQ); Onan, Brandon (DEQ)
Subject:	Benton Harbor Phosphate Project Update
Date:	Thursday, February 14, 2019 1:01:15 PM

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Ernie Sarkipato, P.E.
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From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, February 14, 2019 11:47 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: FW: Benton Harbor job

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- Tap the Suction line?
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Mike O'Malley
Benton Harbor Water Superintendent

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> **Sent:** Tuesday, February 5, 2019 10:19 AM
> **To:** momalley@cityofbentonharbormi.gov; 'DARWIN WATSON'

<dwatson@cityofbentonharbormi.gov>
Cc: jmommersmmiinc@gmail.com; 'Ron Oudbier' <ron@oudbierinst.com>; 'Curtis Brzyski' <cbrzyskimmi@msn.com>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net
Subject: FW: Benton Harbor job

Mike: here's a bump on this email quote from Curtis at MMI. All they need is an indication from you to get the meter on order. I spoke with Darwin who understands the need for a more expensive model (accuracy, NSF approval).
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From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
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Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
Thank you,
Curtis Brzyski
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(C) 517 250 3063
www.midwestmunicipalinc.com

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$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
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Installation ??
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Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
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Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst

<ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
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> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
To: Mike O'Malley; elhorneng@aol.com; toudbier@oudbierinst.com
Cc: mike@michonline.net
Subject: Benton Harbor Phosphate Project Update

Narrowing the meeting down to the following, Thursday at 10AM, at 601 Ridgeway St, St Joseph, MI 49085.

-Todd Luks, Elhorn

-Tim Oudbier, Oudbier Instrumentation

-Tapping Contractor?

-Ernie Sarkipato, DEQ

-Mike O'malley, City

_____

From: Mike O'Malley <momalley@cityofbentonharbormi.gov <mailto:momalley@cityofbentonharbormi.gov> >
Sent: Thursday, February 14, 2019 5:02 PM
To: elhorneng@aol.com <mailto:elhorneng@aol.com>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >; mike@michonline.net <mailto:mike@michonline.net> ; ron@oudbierinst.com <mailto:ron@oudbierinst.com> ; roudbier@fnwusers.com <mailto:roudbier@fnwusers.com> ; jmommersmmiinc@gmail.com <mailto:jmommersmmiinc@gmail.com> ; cbrzyskimmi@msn.com <mailto:cbrzyskimmi@msn.com> ; Darwin Watson <dwatson@cityofbentonharbormi.gov <mailto:dwatson@cityofbentonharbormi.gov> >; Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >; Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >; Mike O'Malley <momalley@cityofbentonharbormi.gov <mailto:momalley@cityofbentonharbormi.gov> >
Subject: Re: Benton Harbor Phosphate Project Update

I can be there on Feb. 21st around 10:00am if that works for you guys?
I propose we meet at the Benton Harbor Water Plant

601 Ridgeway

St. Joseph, MI. 49085

I do not know all of the guys on the copy line, so, when you reply, could you please include your contact information,

Thank You,

Mike O'Malley

Benton Harbor Water Superintendent

cell 269 363-0575

On Thu, Feb 14, 2019 at 1:12 PM <elhorneng@aol.com <mailto:elhorneng@aol.com> > wrote:

All,

I plan to be there on Feb. 21st around 10:00am if that works for you guys?

Todd

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

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Cc: dwatson@cityofbentonharbormi.gov <mailto:dwatson@cityofbentonharbormi.gov> <dwatson@cityofbentonharbormi.gov <mailto:dwatson@cityofbentonharbormi.gov> >; Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >; Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Sent: Thu, Feb 14, 2019 1:01 pm
Subject: Benton Harbor Phosphate Project Update

All – Quick update on things needing follow-up in Benton Harbor:

* Submit order to MMI for meter, controller, and display (2 week lead time, O'Malley will do)
* Oudbier Instruments Start up (Ron or his son need to come see the plant for a quote)
* Tap the Suction line? (O'Malley was going to contact DA Dodd or someone local for the tap)
* Pay Elhorn Engineering? (Mike was going to send you an invoice)
* A digital read out for flow, pump variable, and scale? (Scale and pump are with Elhorn, Flow readout is with the MMI quoted McCrometer flow meter)
* The Orthopolyphosphate injector? (comes with Elhorn's setup, dependent on contractor's tapping capabilities, i.e. thread type)

It would be great to have Elhorn and Oudbier onsite at the same time, maybe even with the tapping contractor. Todd (Elhorn) said he might be going down next week. Any days work for everybody to meet? Thursday 2/21 looks good for me.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

www.michigan.gov/drinkingwater <https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C633714946ddb4b427f8b08d692c800c8%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636857785035023211&sdata=BLt6j2ldht5WTuRk%2Ffomd6tX1LuPCJIUMbpdMsE5BZc%3D&reserved=0>

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Freight , installation and startup are not included

Freight around $300.00

Installation ??

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Curtis

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From:	Sarkipato, Ernest (EGLE)
To:	Dean, Scott (EGLE); Boeskool, Travis (EGLE); Bolf, Michael (EGLE); Sasy, Ninah (EGLE); Thurston, Brian (EGLE); Nelson, Maureen (EGLE); Philip, Kris (EGLE); Onan, Brandon (EGLE); Oswald, Eric (EGLE); Krisztian, George (EGLE)
Subject:	Benton Harbor Presentation Tomorrow
Date:	Tuesday, April 7, 2020 10:20:42 AM
Attachments:	Benton Harbor - ACO Update Apr-2020 es2 _4 5 20.pptx

We are scheduled to do a remote presentation to the Benton Harbor City Commission tomorrow at 5:30PM, and I just found out the meeting will be open to the public and media (remotely). It looks like just local print and TV were invited from what I can tell. This email is an FYI, especially for Scott and Travis. At this time, Mike Bolf, Ninah Sasy, Brian Thurston, and myself are slated to attend.
The goal of the meeting is to present our proposal to revise the current Administrative Consent Order, which includes a compliance schedule for necessary improvements to and studies of the city's drinking water system. Our goal is also to introduce Ninah Sasy as the Drinking Water Public Advocate, and express our intentions for being an active partner in providing assistance to the community.
The draft presentation is attached for your review.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

EGLE

www.michigan.gov/drinkingwater

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

City of Benton Harbor Water System

Administrative Consent Order Update

April 8, 2020

Introductions

EGLE Representatives

- Ninah Sasy, Clean Water Public Advocate, Executive Office
- Brian Thurston, Field Operations Section Manager, DWEHD
- Michael Bolf, Engineering Unit Supervisor, DWEHD
- Ernie Sarkipato, Engineering Specialist, DWEHD

Not Present: Eric Oswald, Director of DWEHD

DWEHD = Drinking Water and Environmental Health Division of EGLE

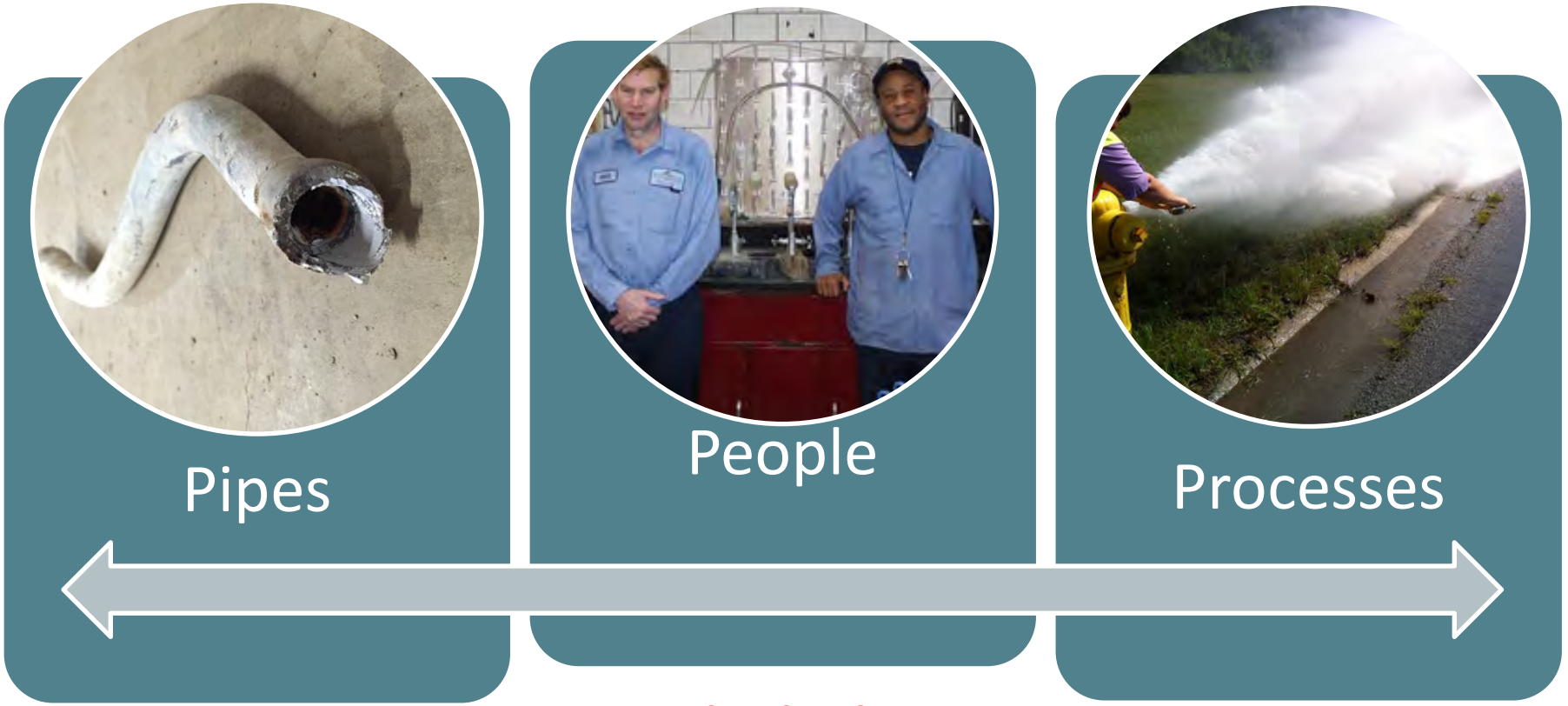
We Share the Same Goal

[Ninah, the goal of this slide is to hopefully foster some trust and cooperation up front. We welcome your input here.]

- Protect public health
- Provide safe, reliable, and affordable water service
- Independent and Sustainable Operations

What is the water system?

What is the water system?



$ $ $

EGLE-DWEH's Mission

Safeguarding Michigan's Drinking Water and Environmental Health

Compliance with Act 399 & Rules, to protect and inform the public

- Qualified operators
- Water sampling
- Proper water treatment
- Water system design, operation, and maintenance
- **Sanitary Survey**

Sanitary Survey

- Assessment of Capacity in Three Categories:
  - Technical — Pipes, Pumps, Sampling, Filters, Hydrants, Towers
  - Managerial — Organizational structure, Training plans, Operating Procedures, Communications
  - Financial — Rates, Billing, Collections, Asset Management

City of Benton Harbor

Water Supply Compliance Summary

2/9/15 Disinfection Byproduct MCL violation for HAA5

6/15/16 TOC sample missed

10/26/17 Missed samples: VOC, Cyanide

2/25/18 Near violation of turbidity limits due to poor raw water

3/10/18 Missed E Coli sample

4/17/18 Violation for lack of DBP Precursor (TOC) Removal

4/30/18 - Lead Pilot Grant Awarded $284k

8/1/18 E Coli reporting violation

8/9/18 Violation for TOC removal

8/17/18 Invalidated 3 TOC samples

9/1/18 Invalidated 1 TOC Sample

10/11/18 Missed samples: cyanide, VOC, SOC

11/1/18 Invalidated Sample but August THM>80ppb

11/20/18 Violation TOC removal (3rd Quarter)

2015 *July 16*

Sanitary Survey

Findings of Deficiency for:

-lack of valves in distribution

-poor cross connection program

2016 *April 4*

SS Follow-up

Letter to follow-up, referencing:

-lack of valves, ongoing leaks

-Capital Improvement Plan overdue

2018 *April 16*

Compliance Communication

-Move alum feed point

-VFDs for low lift

-SCADA upgrades

-Filter to Waste

-Coagulant feed model

-High service pumps

2018 *October 3*

Sanitary Survey

Nine Significant Deficiencies Identified, requiring a compliance schedule. See Draft Administrative Consent Order

2018 *October 22*

Lead Exceedance

90th Percentile of 22 parts per billion of lead.

Follow-up sampling confirms corrosive water leaching metals from plumbing materials.

4.1.2020
EGLE-DWEH

City of Benton Harbor

ACO History & Compliance

2019 March

Signed ACO

Compliance Timeline for 13 action items from Sanitary Survey

3/25/2019 Corrosion Treatment Installed

2019 April

1st Extension

-Computer systems
-flow meter
-Chlorine meter
-Hiring Distribution Operator
-Rate increase & collections plan

4/1/2019 SCADA upgrades and chlorine meter completed

2019 May

2nd Extension

-flow meter

-alum feed

5/7/2019 Darold Harlan from F&V onsite

6/30/2019 Round of Lead Copper samples due

August 2019 Alum Feed built prior to permit issuance

8/23/2019 violation notice for not enough lead samples taken

2019 July

3rd Extension

-Rate increase plan

-flow meter

9/26/2019 Alum Feed system accepted

12/31/2019 Round of Lead Copper Samples Due

2019 November

4th Extension

-Rate increase plan

-flow meter

-rate collections plan

-cross connections

11/21/2019 violation notice for not reporting correctly

1/29/2020 Rate collection plan sent, but not approved

4.1.2020
EGLE-DWEH

Administrative Consent Order (ACO)

Where are we at and how did we get here?

- Oct-2018: Sanitary Survey of water system
  - Little or no progress on past deficiencies
  - Nine (9) *significant* deficiencies were issued
  - Focus on technical, managerial, and financial capacity
- Both parties agreed to an administrative consent order (ACO)
- Establish a timeline for compliance

Lead in Benton Harbor's Drinking Water

- Routine sampling for lead in 2018
- High levels required additional action
  - Public notification
  - Additional sampling
  - Corrosion control treatment
  - Treatment study
- Berrien County and MI DHHS assistance
- Not enough samples collected

[Ninah, the goal of this slide is to hopefully foster some trust and cooperation up front. We welcome your input here.]

Compliance

Sanitary Survey

ACO

Community

Communications

Partnering

Partners in Community

[Ninah, the goal of this slide is to hopefully foster some trust and cooperation up front. We welcome your input here.]

- Bring together Stakeholders
- Identify roadblocks
- Make a plan
- Communicate

Public Communication from City of BH

Lead Communications

- 10/24/2018 – Press Conference
- 10/24/2018 – Public Advisory
- 11/29/2018 – Public Education
- 1/24/2019 – Public Meeting
- 7/29/2019 – Public Advisory
- 8/28/2019 – Public Education
- 1/22/2020 – Public Advisory
- 2/26/2020 – Public Education

Other Water Communications

- 8/1/2018 – E Coli public notice required (failure to sample)
- 8/7/2018 – TOC removal public notice required (failure to remove)
- 12/1/2018 TOC removal public notice required (failure to remove)
- 7/1/2019 Consumer Confidence Report, included many small violations

Recent Progress - ACO

- Complete a water rate study
- Maintain water plant computer system
- Install flow metering capability at the plant
- Repaired chlorine analyzer
- Employ a full-time water distribution operator
- Installed corrosion control treatment
- Improved treatment chemical injection at WTP

What Still Needs to be Done?

Technical Items

- Properly maintain hydrants and valves
- Inspect and/or repair water tower
- Repair mussel control system on Lake MI intake
- Repair filter valves at WTP

Managerial Capacity

- Submit a revised written backflow prevention plan
- **Hire a utility services director**
- Meet monitoring and reporting requirements
- **Commission a study on corrosion control treatment**
- **Commission a study on water system capacity**

Financial Capacity

- **Implement water rate adjustments**
- Submit a consistent and equitable rate collection plan

EGLE

What is the Commission's Role?

- Provide input on ACO compliance schedule
- Pass a resolution adopting the ACO compliance schedule
- Provide support to the city's efforts to achieve compliance
- Be prepared to inform local residents about water issues

ACO Goal: Establish realistic and achievable deadlines.

Consider adopting intermediate deadlines internally

Think Long Term

What's easiest today, may not be best for tomorrow.

Evaluate all alternatives including regionalization options

- Form a water authority
- Purchase treated water
- Share operation/maintenance services

*Rural Community Assistance Partnership (RCAP) has resources

Challenges

- Competing issues
  - ACO -ALE -Monitoring
  - Schools -COVID-19
- Communication
  - Partners -Strategies -Implementation
- Funding
  - Water Rates & Collections
  - Low Interest Loans through EGLE (some principle forgiveness)
  - Possible Grants

Moving Forward

- Much has been accomplished in 2 years
- Let's build on the progress
  1. Agree to a schedule
  2. Pass a formal resolution adopting the schedule
  3. Sign the revised ACO
  4. Provide the support city management needs
  5. Communicate effectively

How can we help?

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Questions?

Contact Info:

Michael Bolf, bolfm@michigan.gov, 906-630-4107

Ernie Sarkipato, sarkipatoe@michigan.gov, 616-307-0261

Ninah Sasy, sasyn@michigan.gov, 517-881-5219

From: Sarkipato, Ernest (EGLE)
To: Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE)
Cc: Bolf, Jennifer (EGLE); Oswald, Eric (EGLE); Thurston, Brian (EGLE); Ruch, Suzann (EGLE); Kristian, George (EGLE)
Subject: Benton Harbor Weekly Check-in
Start: Thursday, April 8, 2021 11:00:00 AM
End: Thursday, April 8, 2021 11:01:00 AM
Location: Microsoft Teams Meeting

SPRING BREAK/AL: Feel free to touch base without me if you'd like.

Topics for weekly discussion:

1. Summary of external weekly meeting
2. ACO Progress
3. Corrosion Treatment
4. LCR Compliance
5. Financial

Microsoft Teams meeting

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From:	Mike O"Malley
To:	Sarkipato, Ernest (DEQ); Bolf, Michael (DEQ); Onan, Brandon (DEQ); Jim and Todd Luks Elhorn Engineerint; Bolt, Jennifer (DEQ)
Cc:	Mike OMalley; Darwin Watson; Nick Margaritis; Nicki Britten; Tim Lynch
Subject:	Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor
Date:	Wednesday, March 27, 2019 12:03:34 PM

All involved (Ernie you better be on vacation!),

We started feeding the Orthopolyphosphate into the water distribution system here at the plant on Monday afternoon.

We need a few days in a row to iron out a dose of **1.5 ppm**. So far we have:

Monday into Tuesday: **1.35 ppm**
Tuesday into Wednesday: **1.18 ppm**

Ernie and Brandon did tons of work to help us get this going.
Elhorn Engineering is our go-to Contractor for Corrosion Control. They will continue to work with us to evaluate the treatment and make adjustments as needed.

Berrien County has been a REAL PARTNER in this whole lead thing. I do not remember all the names so if you 2, Nicki and Nick can let the others that helped know, that would be great.

Thank you all for all the hard work you put into this whole lead exceedence issue in Benton Harbor.

Some time (hopefully near future) the pipes serving all the residents and business in the City of Benton Harbor's water system will have this protection.

Love (actually, just like) you all,

Mike O'Malley
Benton Harbor Water Superintendent
(269) 363-0575

From: mike@michonline.net
To: Onan, Brandon (DEQ)
Subject: Benton Harbor informaion
Date: Tuesday, November 20, 2018 6:48:43 PM
Attachments: RWU Lead and Copper Compliance-Carus Webinar final.pdf
Carus 8600 Data Sheet.pdf
Carus 8600 SDS.pdf
Benton Harbor MI Oct30.pdf
benton harbor 11-18.doc

Hi Brandon, As discussed on the phone, I wanted to provide recommendations for a corrosion control program for the City of Benton Harbor. The product is Carus 8600 which is a 70/30 ortho/poly blend. The product weights 11.4 lbs and 33% total phosphate. The starting recommended dosage is 1.0 ppm as PO4. Attached is a case study, product literature and SDS sheets , water quality results, and a recommendation letter to the City of Benton Harbor. Please review and I look forward to having a phone conversation on Wednesday afternoon to discuss. Thanks much, Mike Enlow, Elhorn Eng. Co.

Racine Water Utility's LCR Compliance Story

Carus Corp. Webinar

Lead & Copper Control with Phosphates

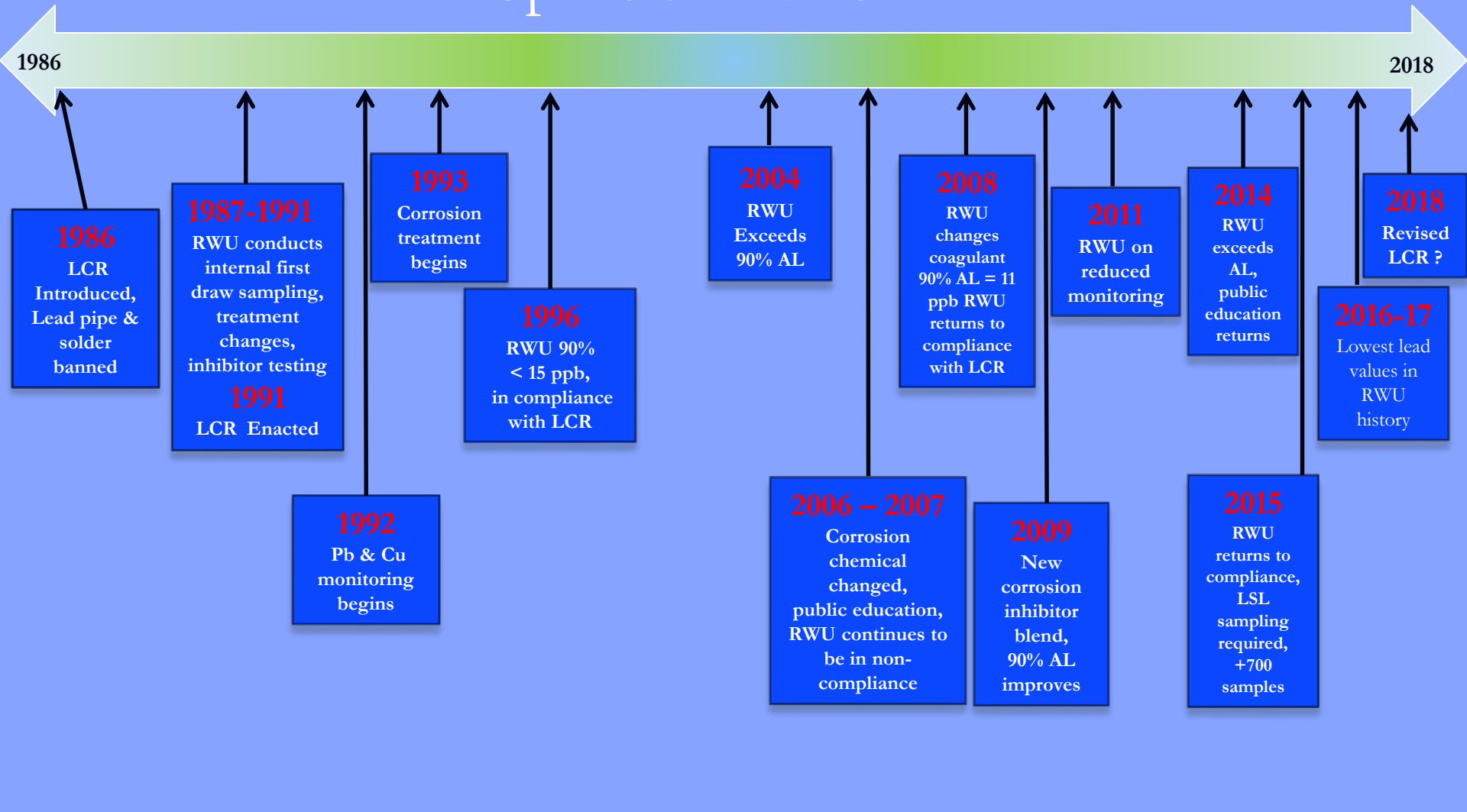
October 27, 2017

Utility Founded in 1886

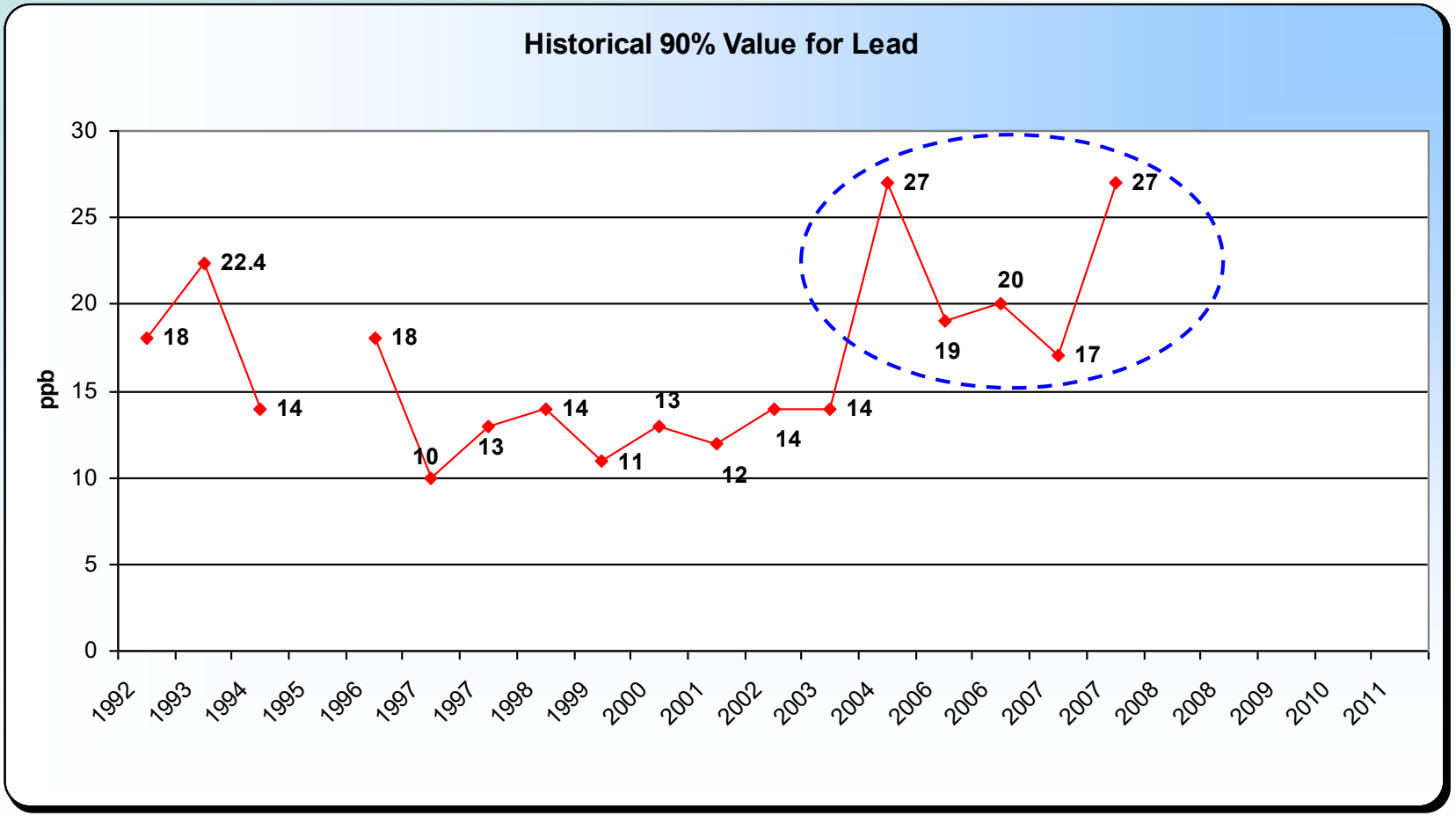
- 3rd largest surface water plant in Wisconsin
  (60 MGD Conventional/50MGD Membrane)
- Serve a population of 100,000 to 110,000
- Approximately 14,000 lead service lines originally
- Ceased using lead service lines about 1940
- Historically performed partial lead service line replacements

RWU LCR Timeline

Spans 32 Years!

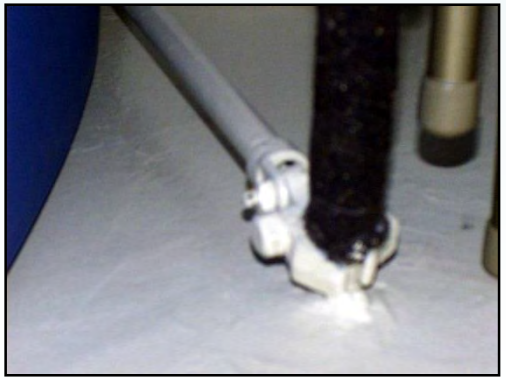


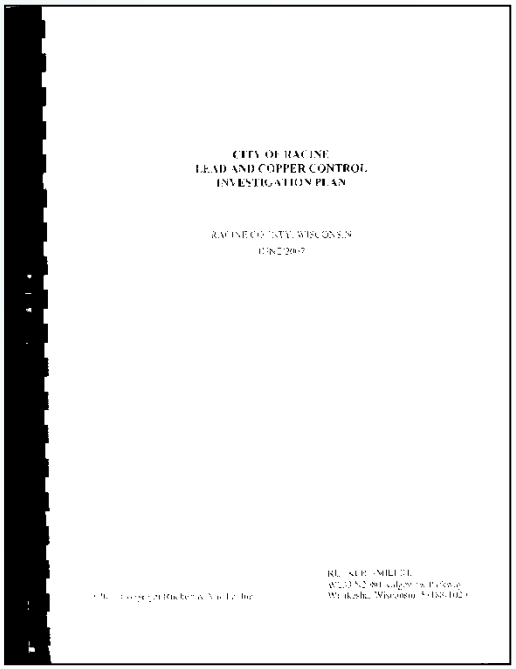
2004-2007
LCR Non-Compliance



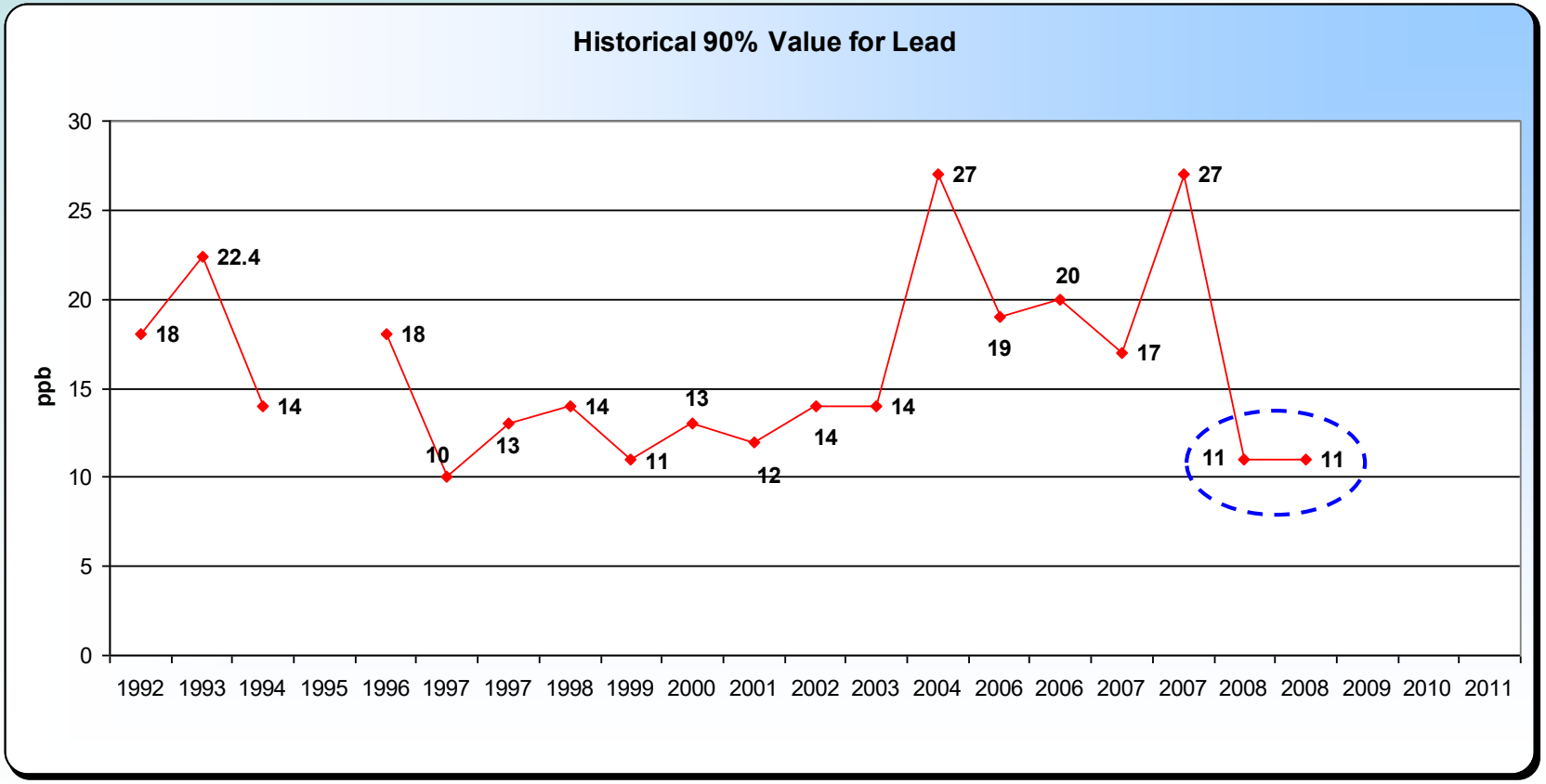
RWU Actions

- Loop studies
- Stray current survey
- Investigation & Report





2008
LCR Compliance

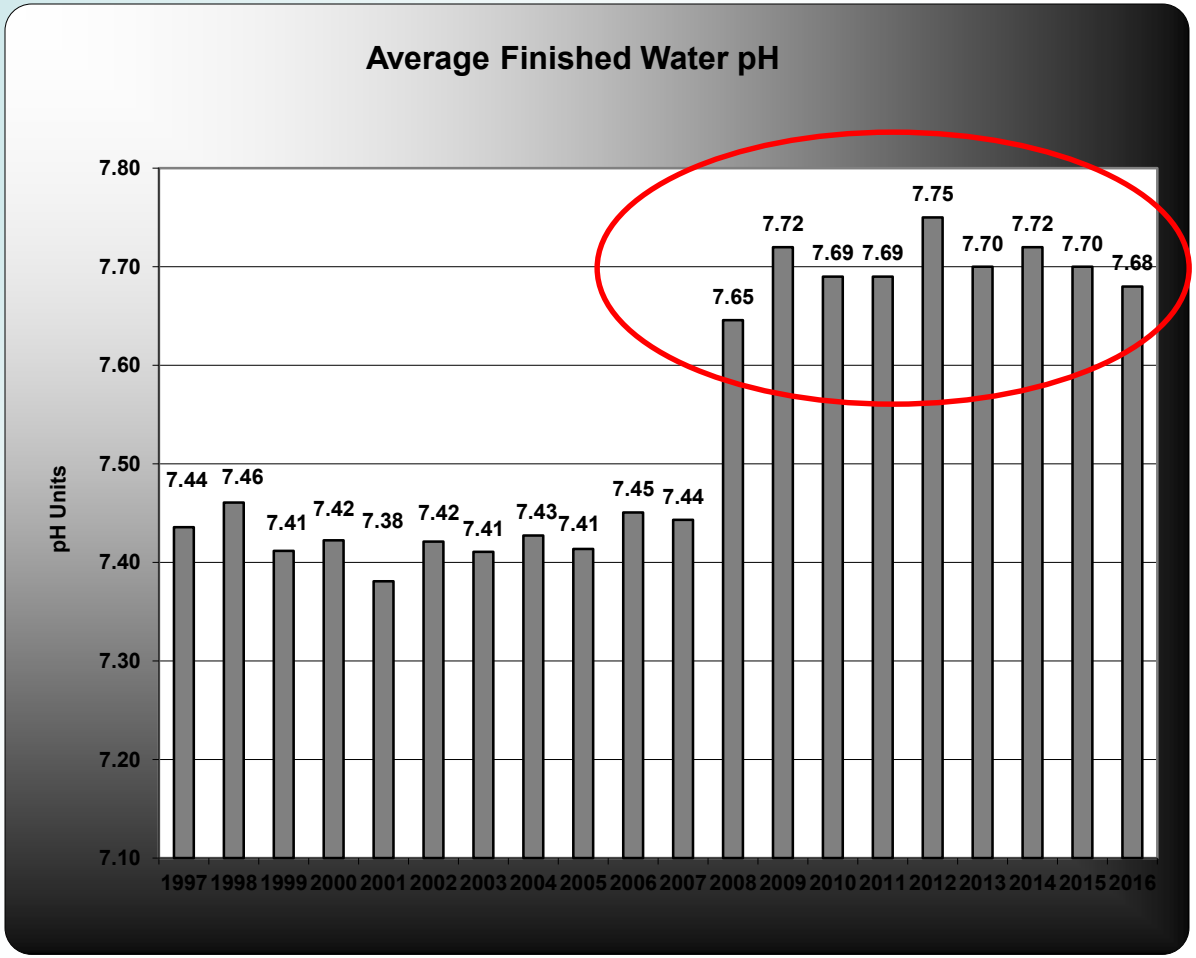


Coagulant Change

- Feb. 2008, RWU switches coagulant from ferric sulfate to poly-aluminum chloride
  - Jar testing conducted
  - WDNR approval for plant trial
- RWU goal was to reduce iron fouling of its membrane system
- RWU sees other profound affects on water quality and plant operations

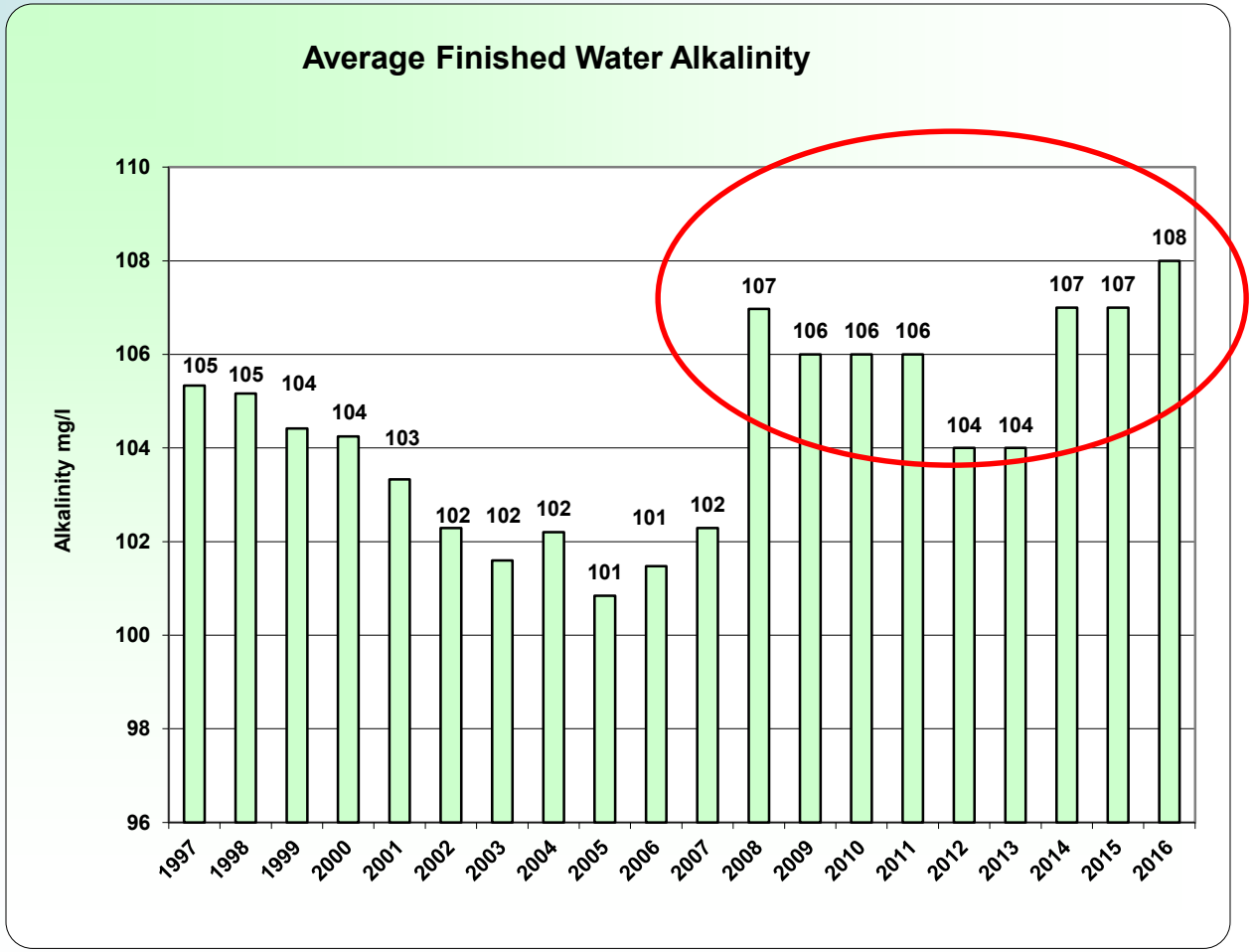
PACl Affect - pH

- RWU began treating water in 1926
- Until 1987 Alum used for clarification
- Finished pH = 7.7-7.8
- 1987 – 2000 RWU employed $FeCl_3$
- 2001- 2007 RWU used $Fe_2(SO_4)_3$
- Feb 2008 RWU feeds PACl

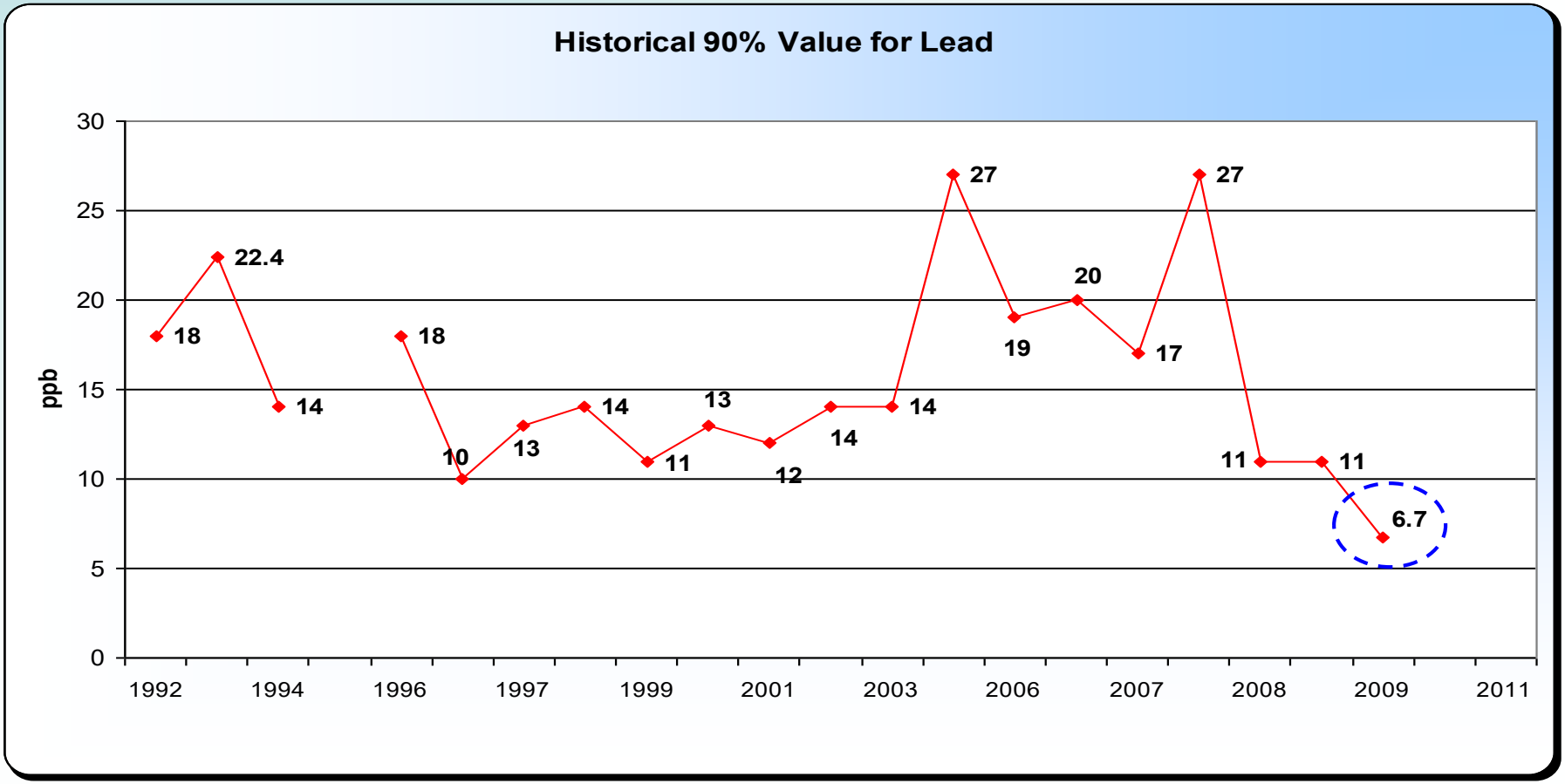


PACl Affect - Alkalinity

- Using iron salts, alkalinity depression averaged ≥ 10 ppm
- With PACl, alkalinity depression lowered to less than 5 ppm
- Higher pH and alkalinity made finished water less corrosive

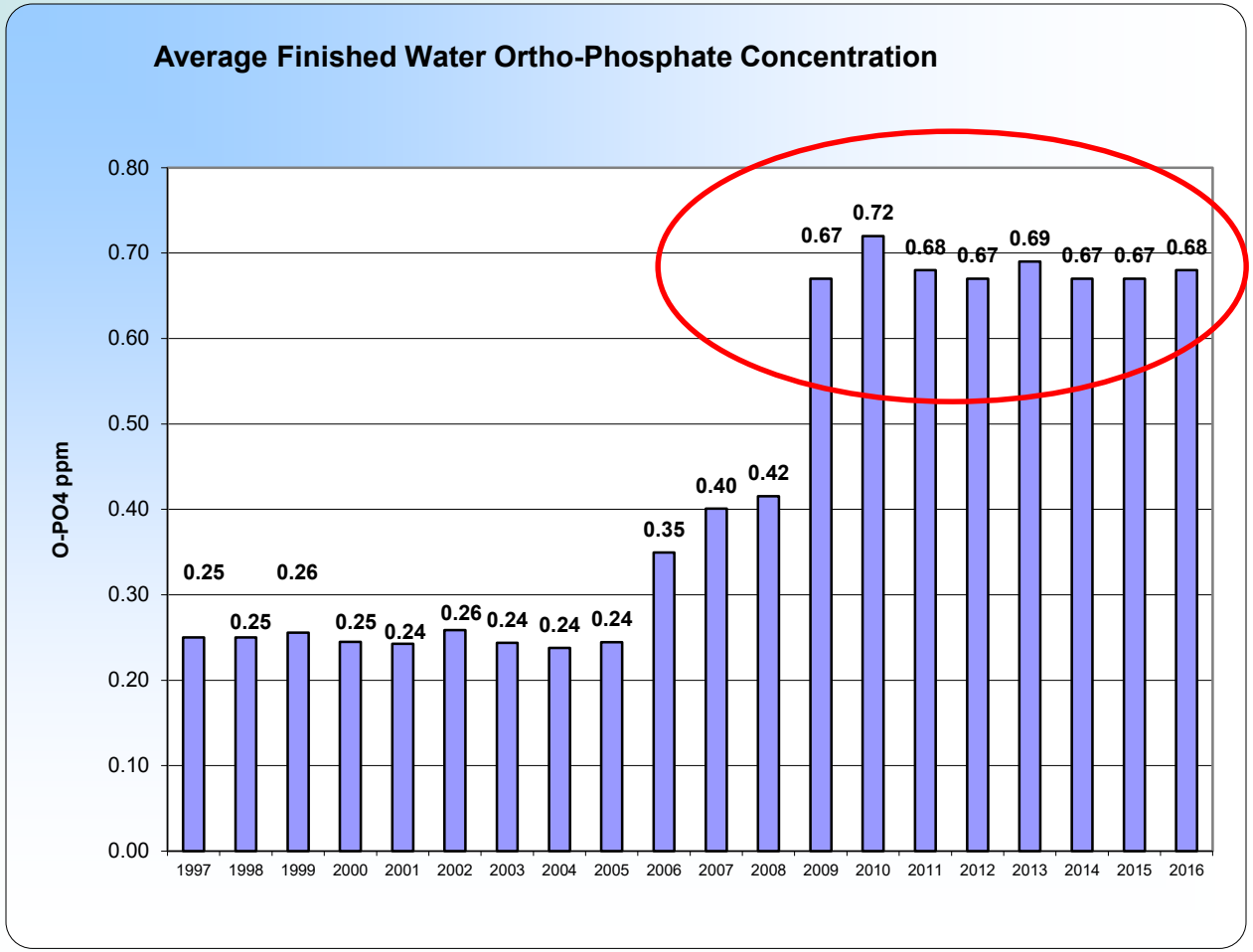


2009
LCR Improvement

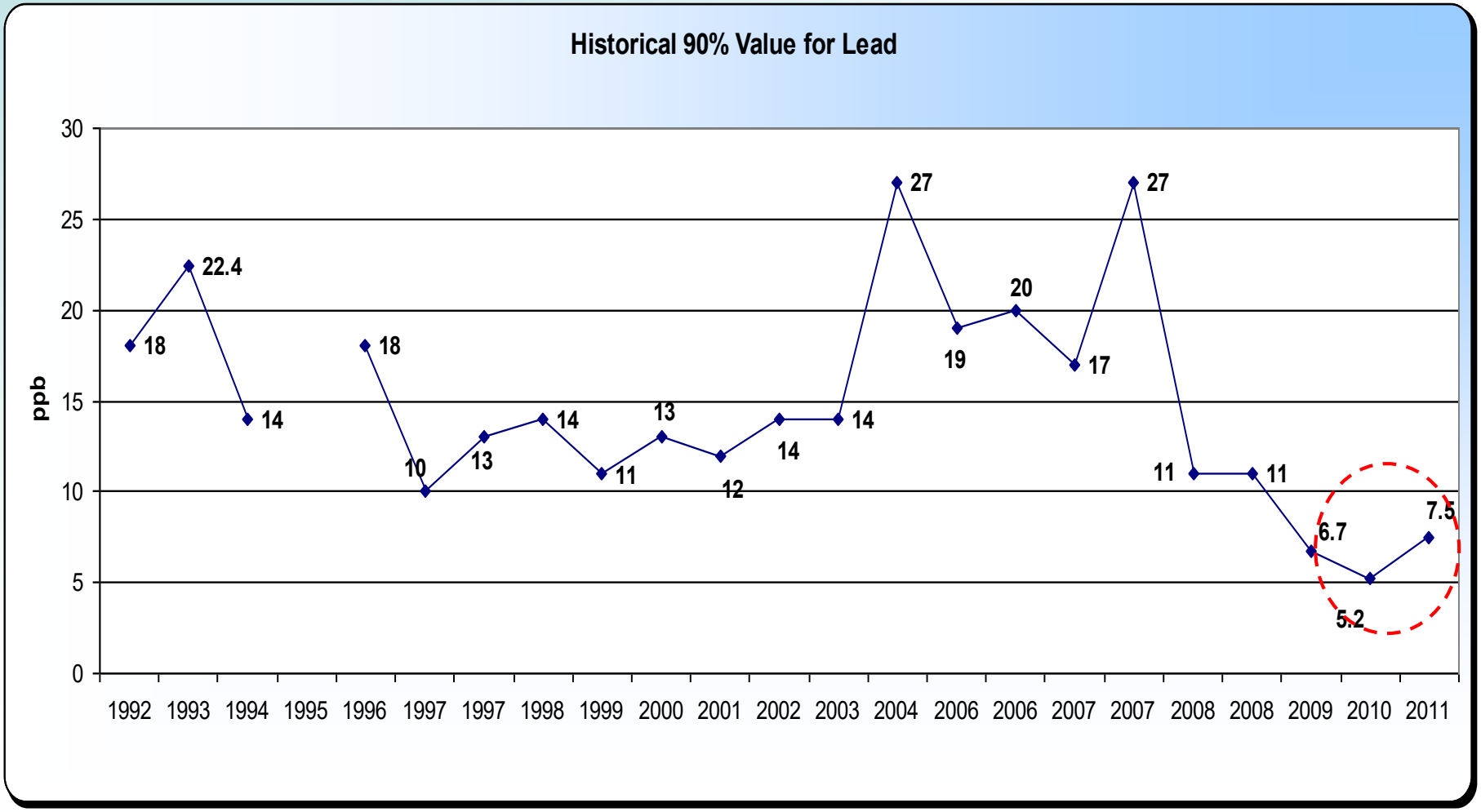


Water Quality – $O\text{-}PO_4$

- January 2009, RWU changed inhibitor blend
- 70/30 ortho to poly phosphate now used
- Target of 0.70 ppm as $O\text{-}PO_4$ in finished water



2010-2011 Lead 90th %



2014

Lead

- 90% = 25 ppb
- Sampling errors
- Re-sampling of action level samples had results back under action level

Copper

- First exceedance of 1300 ppb action level ever

LSL Replacement

- Testing in lieu of replacement
- 7% replacement of RWU system would require approximately 700+ LSL
- Cost would exceed $3.0 million
- Impossible to replace required number of LSL in regulatory timeline

- 721 homes participated in voluntary program to test for lead
- Sample kits with detailed instructions given to volunteers
- Sampling occurred in same sample period at required first draw sampling
- 6.4% (46) of samples exceeded 15 ppb action limit with 90% value of 11 ppb
- RWU processed and tested nearly 1000 samples for lead in 2015

Compliance Lead Sampling Instructions

Dear Racine Water Utility Customer:

Thank you for helping to monitor for lead in your drinking water. It is important that you follow these instructions so that we may collect an accurate measurement. This sample should represent the water you would typically drink and the sample should be taken from a faucet you would normally use to drink from, such as a kitchen sink or bathroom sink. Call your water supplier if you have any questions.

1. Select a faucet in the KITCHEN or BATHROOM that has been commonly used for drinking water in the past few weeks.
   - **DO NOT sample from a laundry sink, a hose spigot, or bathtub**
   - **DO NOT remove the screen/aerator from the faucet**
   - **DO NOT sample from a faucet attached to a water softener or point of use filter**
   - **Run or make sure to use the water as normal from the chosen sampling faucet before the start of the 6 hour no use period**
2. Collect the sample from a tap that hasn't been used for **at least 6 hours**. If you have a single handle faucet, turn it to the COLD side. **DO NOT use any other faucet or toilet flushing again until lead sampling is completed.** Either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water exists.
3. Wait at least 6 hours before collecting your sample, but we do not recommend sampling if the faucet has sat idle for more than 12 hours. Do not rinse bottle before taking the sample.
4. To sample, place the open sample bottle under the tap, turn the **'cold water'** faucet on slowly and collect the first draw water (that is the water which comes from the tap as soon as you open the faucet). **Be sure to fill the bottle to the neck**. Replace the cap on the bottle securely.
5. Please answer the questions below.
6. Place the bottle (there is no need to refrigerate sample) and instruction sheet in the provided bag on your front porch for pick up.

a) What date and time did you **last use the faucet that you sampled from**?
Date _____ Time:_____ ☐am ☐pm

b) What date and time did you **fill the bottle**? Date _____ Time:_____ ☐am ☐pm

c) Which faucet did you use to fill the bottle? ☐Kitchen ☐Main Bathroom ☐Other

If OTHER, please describe: _____

d) Is this faucet connected to a home treatment device such as a water softener, a reverse osmosis unit, an iron removal device OR is any kind of additive used in the home? ☐ Yes ☐ No

If YES, please describe:_____

e) Has there been any type of plumbing work done within the last 6 months in the home such as new faucets, pipe repair, new hot water heater, etc. ☐ Yes ☐ No

If YES, please describe:_____

Your Printed Name: _____
Address: _____
_____
Phone/Email: _____

If you have any questions call:

Water Sampler: Joel Brunner

Phone: (262) 939-2961

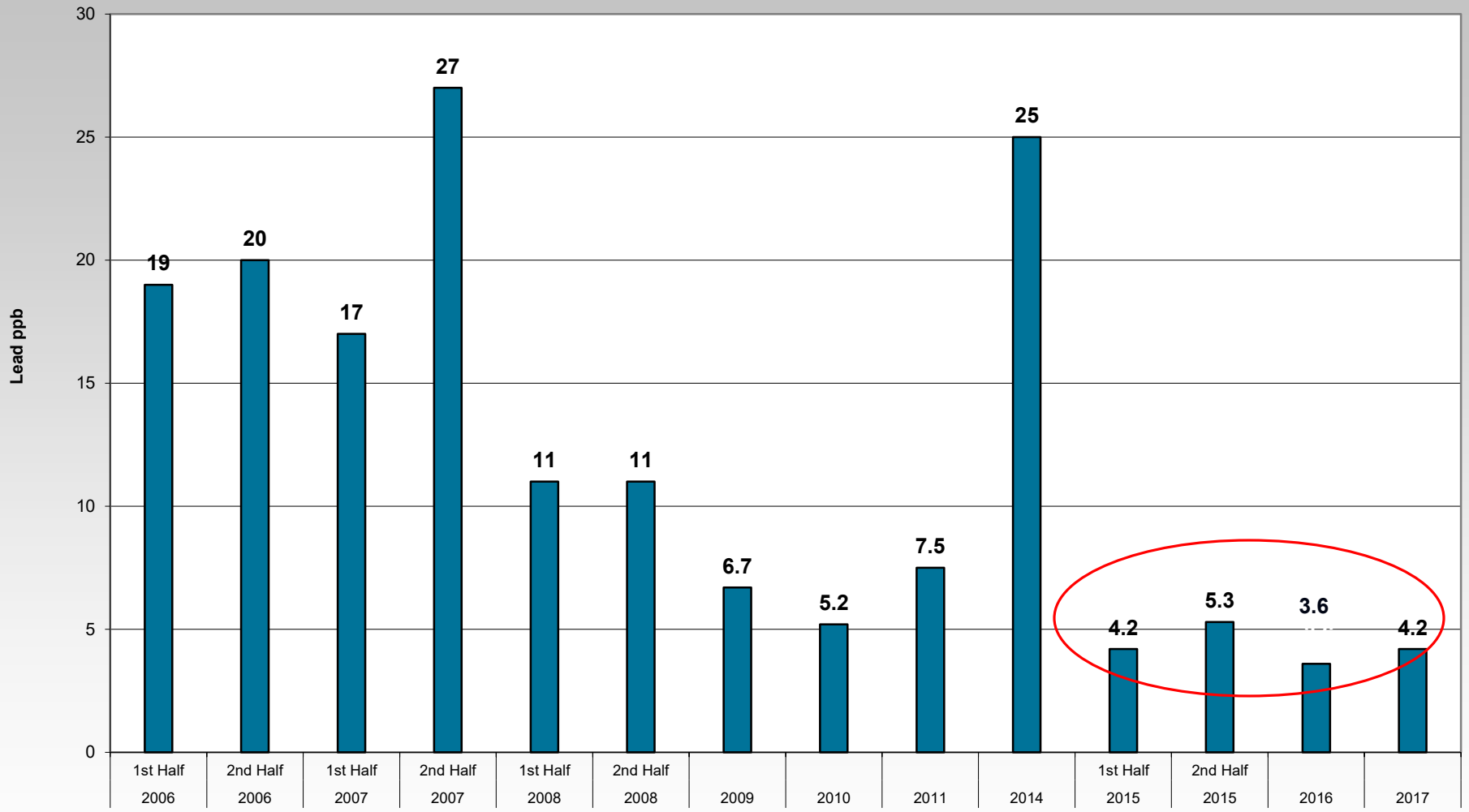
Or visit our website at:

http://www.cityofracine.org/Water.aspx

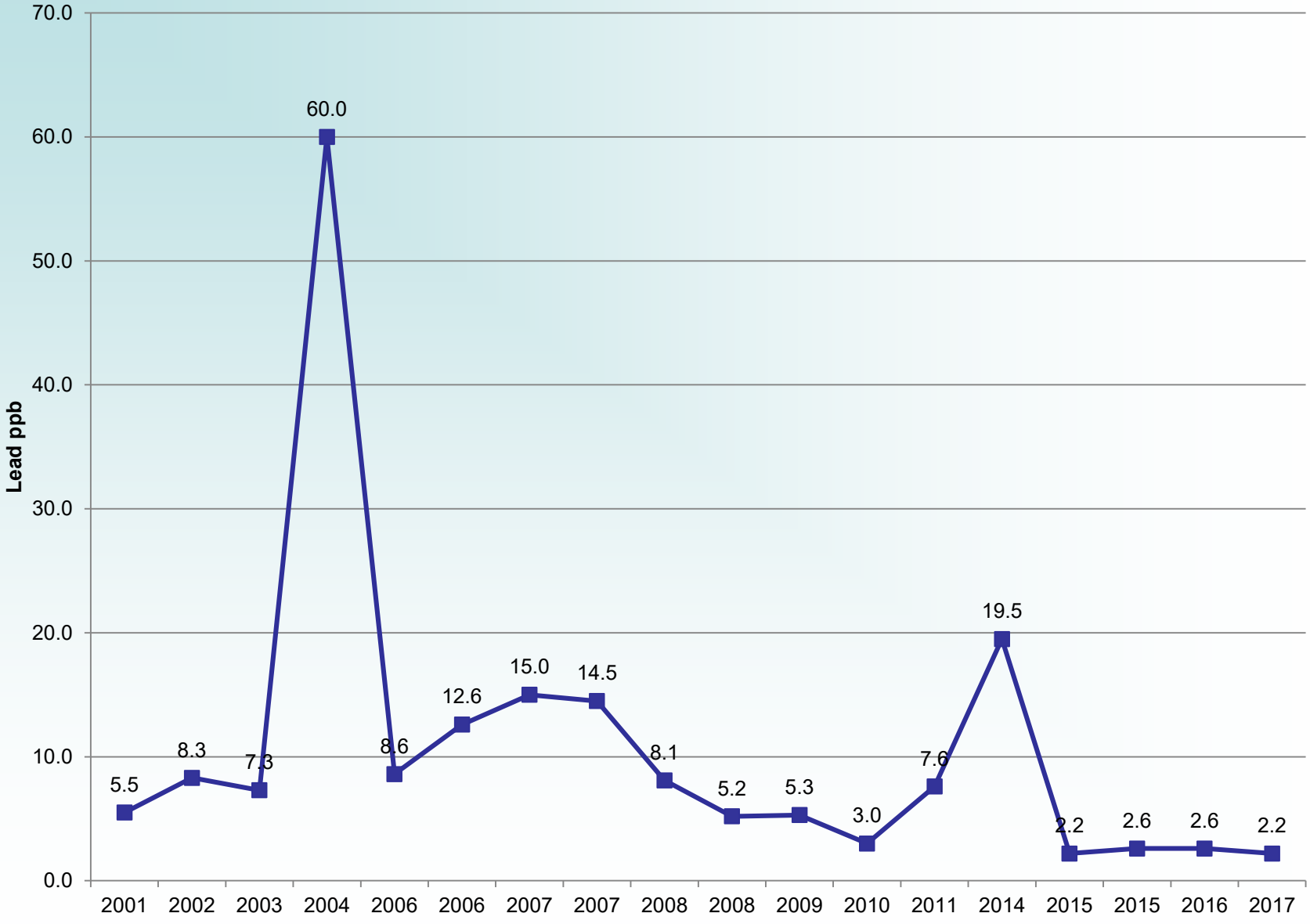
for more information

Thank you again for your help. Information on this year's lead and copper monitoring will be printed in the *Consumer Confidence Report* that will be made available to you by July 1 of next year. We will send you the results within 30 days of receiving them. Contact the Utility if you have any questions.

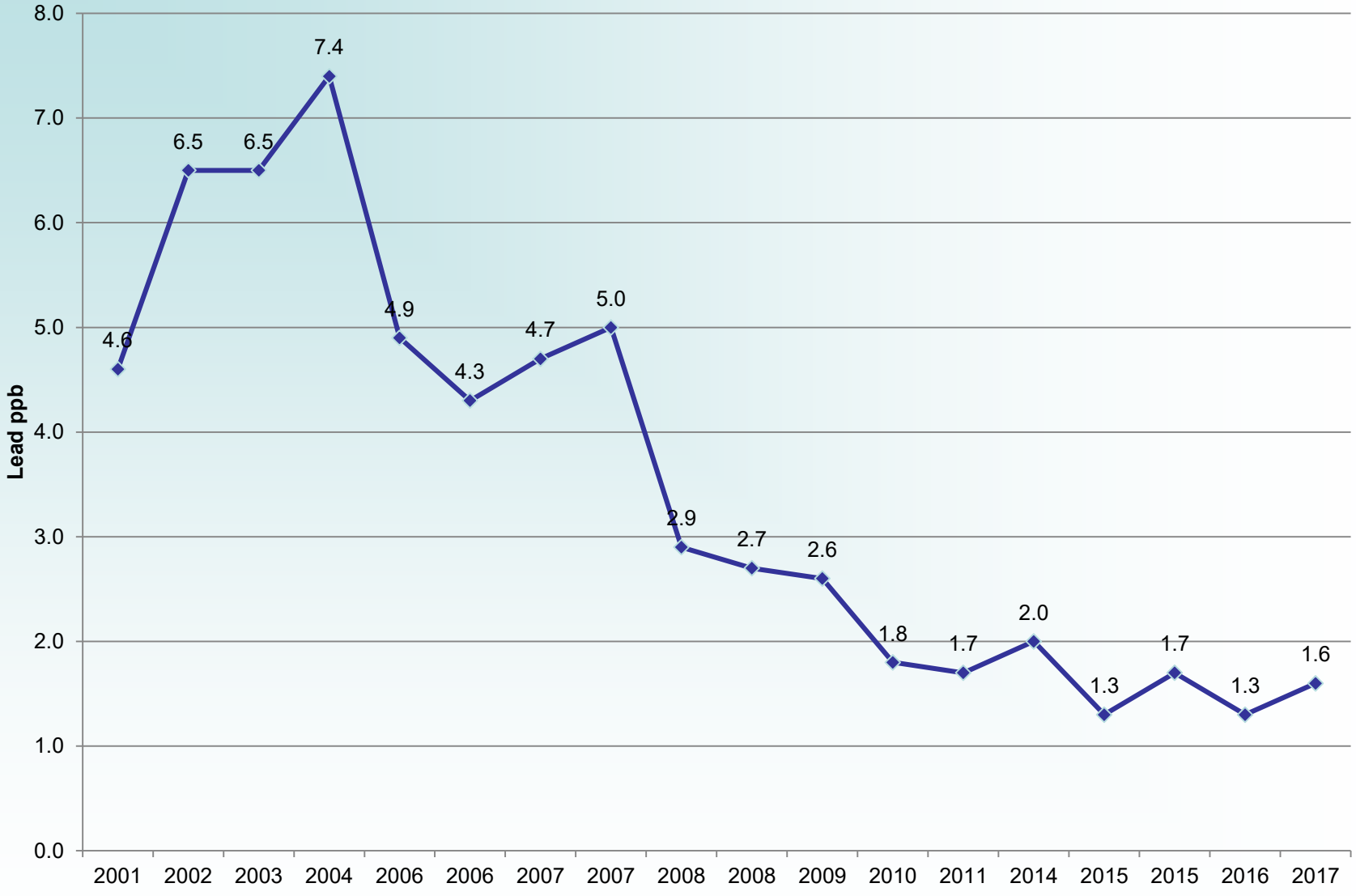
90th % from 1st Draw Lead Sampling



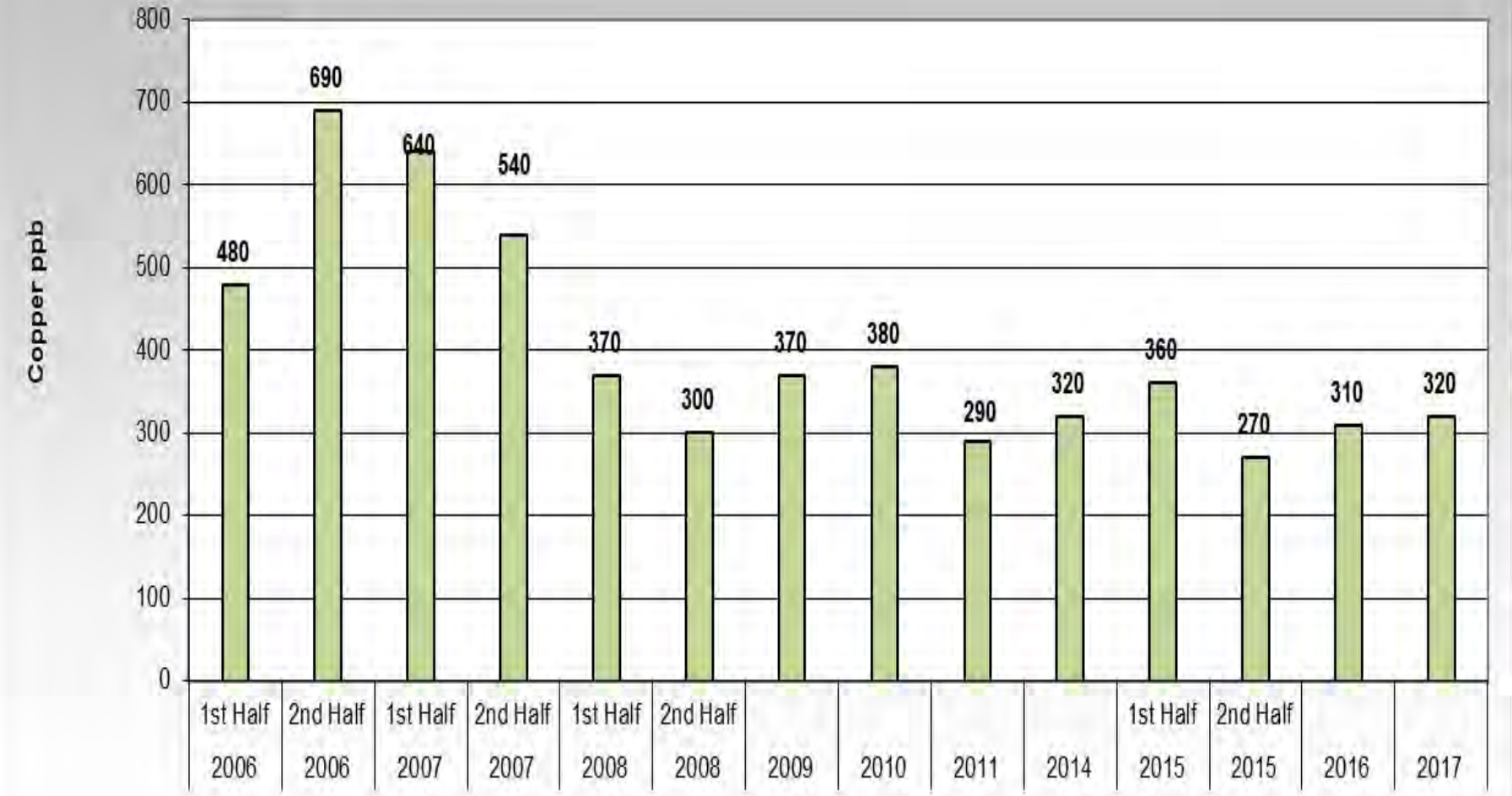
RWU LCR Monitoring - Average Lead Levels



RWU LCR Monitoring - Median Lead Levels



90th % Copper Level From 1st Draw Copper Sampling



2017 Lead & Copper Points of Emphasis

- Lead average, median, and 90th % values continue to be low for monitoring history
- Copper average and median results continue recent (since 2008) low trend
- No samples results exceeded action limits for lead or copper, 1st time for lead

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

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SAFETY DATA SHEET

1. Identification

Product identifier	**CARUS™ 8600 Water Treatment Chemical**
Other means of identification	
SDS number	-
Recommended use	CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company name	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixtures	
Composition comments	The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling	Avoid inhalation and contact with skin and eyes. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate.
Individual protection measures, such as personal protective equipment	
Eye/face protection	If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.

Form	Liquid.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	5.8±0.5
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1.37±0.03 at 25°C
Solubility(ies)	
Solubility (water)	Completely soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization will not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	May cause discomfort if swallowed.
Inhalation	In high concentrations, vapors may be irritating to the respiratory system.
Skin contact	Prolonged or repeated skin contact may cause irritation.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	May cause discomfort if swallowed.
Skin corrosion/irritation	Prolonged contact may cause dryness of the skin.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization No data available.

Skin sensitization Not a skin sensitizer.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity No data available.

Specific target organ toxicity - single exposure No data available.

Specific target organ toxicity - repeated exposure No data available.

Aspiration hazard Not classified.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability The product is not expected to be readily biodegradable.

Bioaccumulative potential No data available for this product.

Mobility in soil Not available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This substance/mixture is not intended to be transported in bulk.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 24-July-2014

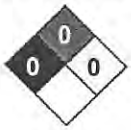
Revision date -

Version # 01

HMIS® ratings

Health: 0
Flammability: 0
Physical hazard: 0

NFPA ratings



References

HSDB® - Hazardous Substances Data Bank

Disclaimer

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CORPORATION DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CORPORATION MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTIABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Corporation, and shall be the sole responsibility of the holder or user of the product.

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

From:	Sarkipato, Ernest (DEQ)
To:	ron@oudbierinst.com; tim@oudbierinst.com
Cc:	Onan, Brandon (DEQ); momalley@cityofbentonharbormi.gov; James Mommers; "Todd Luks"
Subject:	Benton Harbor job
Date:	Friday, January 25, 2019 10:39:04 AM
Attachments:	InkedIMG_2536_LI.jpg InkedIMG_2537_LI.jpg

Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.

Here's the situation – we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.

Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.

Thanks for the consideration – we have high hopes this project can go smoothly and as quickly as possible.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

POTABLE WATER
FINISHED WATER

POTABLE WATER

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Bolf, Michael (EGLE)
Subject:	Benton Harbor treatment oddity
Date:	Wednesday, September 18, 2019 4:35:43 PM
Attachments:	Inspection Photos BH 08092019.pdf

A month ago, I found out the operators at the BH plant have been 'chlorine boosting' at the water plant each morning, evidenced by the attached photo of chlorine residual data. You can note the daily spikes (short in nature) on the chlorine chart. I'm not certain how persistent these spikes are in distribution.

My question is, can we look at whether this practice is effecting the corrosion in the system, specifically related to the ORP? Would we think about using a meter to measure ORP? Your presentation today on the EPA's OCCT document gave me the reminder to check into it further.

At a minimum they should have stopped the practice, and if the metals release goes down maybe it was a contributing factor.

Ernie Sarkipato, P.E.
Drinking Water and Municipal Assistance Division
Michigan Dept. of Environment, Great Lakes, and Energy
616-307-0261 (cell)

From: Sarkipato, Ernest (EGLE)
Sent: Monday, August 12, 2019 10:58 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Lachance, Amy (EGLE) <LACHANCEA1@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Robinson, Krista (EGLE) <RobinsonK24@michigan.gov>
Subject: FW: ACO items
Updates from Friday's inspection in BH.

From: Sarkipato, Ernest (EGLE)
Sent: Monday, August 12, 2019 10:56 AM
To: 'DARWIN WATSON' <dwatson@cityofbentonharbormi.gov>
Cc: 'Darold Harlan' <dharlan@fv-operations.com>; momalley@cityofbentonharbormi.gov
Subject: ACO items
I appreciated the opportunity to spend time at the Benton Harbor water plant last Friday. Below is a summary of observations, also serving as a status update on the improvements at the water plant. Attached are photos taken during the inspection.
Monitoring Violations and CCR: EGLE staff are actively discussing a few outstanding compliance-related items, including missed samples and the recent CCR distribution. Please stay tuned for more on this.
Staffing: I had the chance to meet with Darold, who is the F&V guy for the distribution system. The decision was made recently to have distribution water guys work out of the water plant, which is a really effective way to bring some focus back to the distribution system which has suffered much neglect. Currently, they are focusing initial efforts on pursuing rate collection for accounts that are

past due, starting with the highest amounts. This is essential, as revenue is fundamental. The water plant also has one new staff, giving them more options for completing maintenance activities. I sent a separate email on the cross connection program, which will be a focus in the coming months.

Finished Water Meter: The McCrometer insertion meter is installed as planned, and connected to SCADA along with a totalizer.

Corrosion Treatment: The phosphate feed pump was connected to the meter initially after installation, but two problems arose. First, for this setup all backwash water also passes through the meter, and the city was spending a lot of money on feeding corrosion chemical that was eventually heading for the backwash ponds. In addition, there was a PLC-level issue with the chem pump memory (not exactly sure the nature of the issue here). Currently, the phosphate is back to being fed when a high service pump is running. We will be analyzing the distributing residual data along with coupon testing to assess whether this system is sufficiently accurate. Bear in mind, we will be setting acceptable ranges for phosphate eventually, and the feed system will need to be accurate enough to stay within a specific range. Note, when I was there Doug measured orthophosphate, and it was between 1.4-1.5 mg/L, which is an excellent residual at the water plant tap. I'd like to see a bit more regularity in operators reading the scale twice a day and calculating the ppm dosed as well.

Alum: The bulk tank is now connected to the new day tank, and chemical pumps are installed with piping. The system is not yet running, as the permit application is still under review. Attached is a diagram and photo. The current plan is to have the operators fill the tank manually, and run the pumps manually. This is preferred by the operator.

SCADA: The scada was reviewed to ensure filter turbidity data was trending, as well as chlorine residual. Please note, the system alarms need to be reviewed to ensure low chlorine or high turbidity result in a call-out, particularly after hours in the case of low chlorine. Note, the photo of the turbidity shows some wacky data around 8/5-8/6, but this was during plant shut-down. I'd be curious to know what that was caused by!

CL17: The online chlorine analyzer has been installed and is being trended in SCADA. Note, there appears to be daily variability in plant tap chlorine, confirmed by the cl17 as well as titrations in the lab. Shift operators are in the habit of 'boosting' the chlorine first thing in the day, and this practice should be discontinued. Stable chemical levels, particularly oxidants such as chlorine, are very important in the effort to build a passivation layer in the distribution system and minimize release of metals.

I am generally encouraged to see the staff together at the WTP, and see all the efforts to improve the water system on both the distribution and treatment ends. Thanks for all your hard work in these efforts. We hope to continue to support the city of BH in building a sustainable water system that is most protective of public health.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

EGLE

www.michigan.gov/drinkingwater

Figure 1 - CL17 installed on Plant Tap in Lab

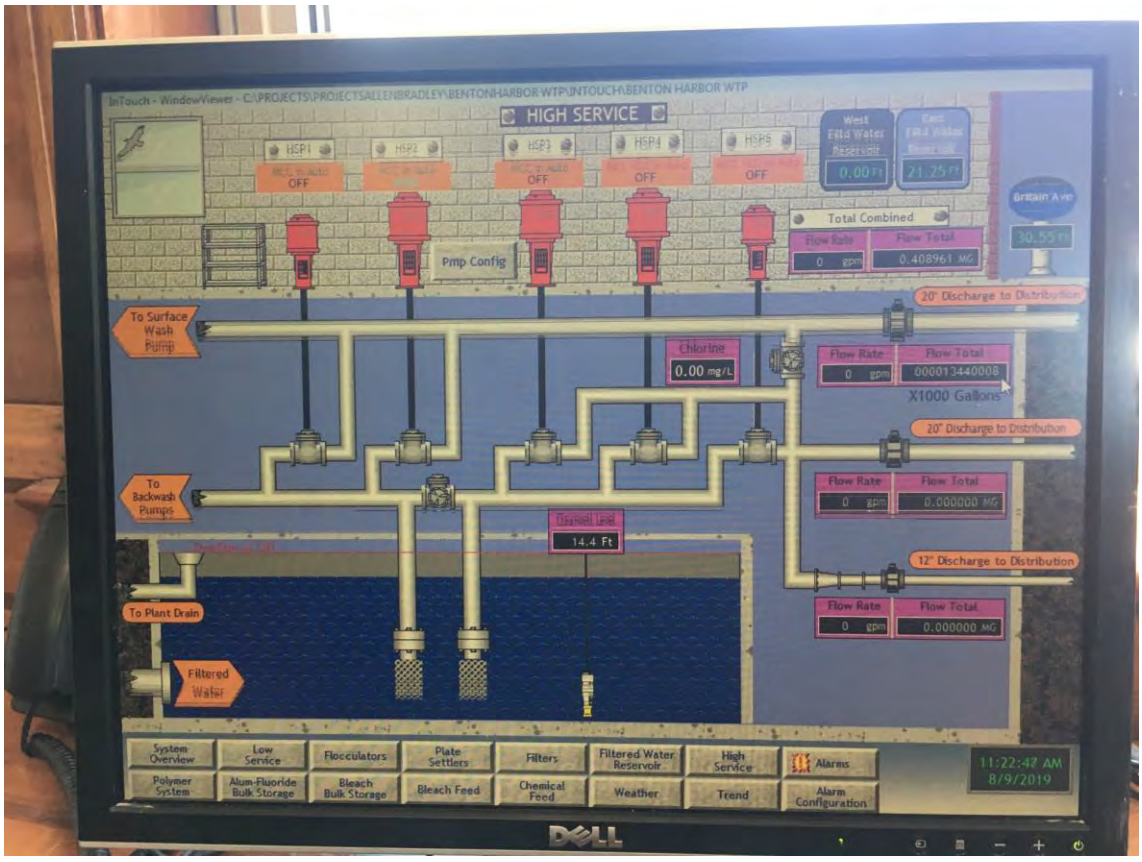


Figure 2 - SCADA with meter and totalizer

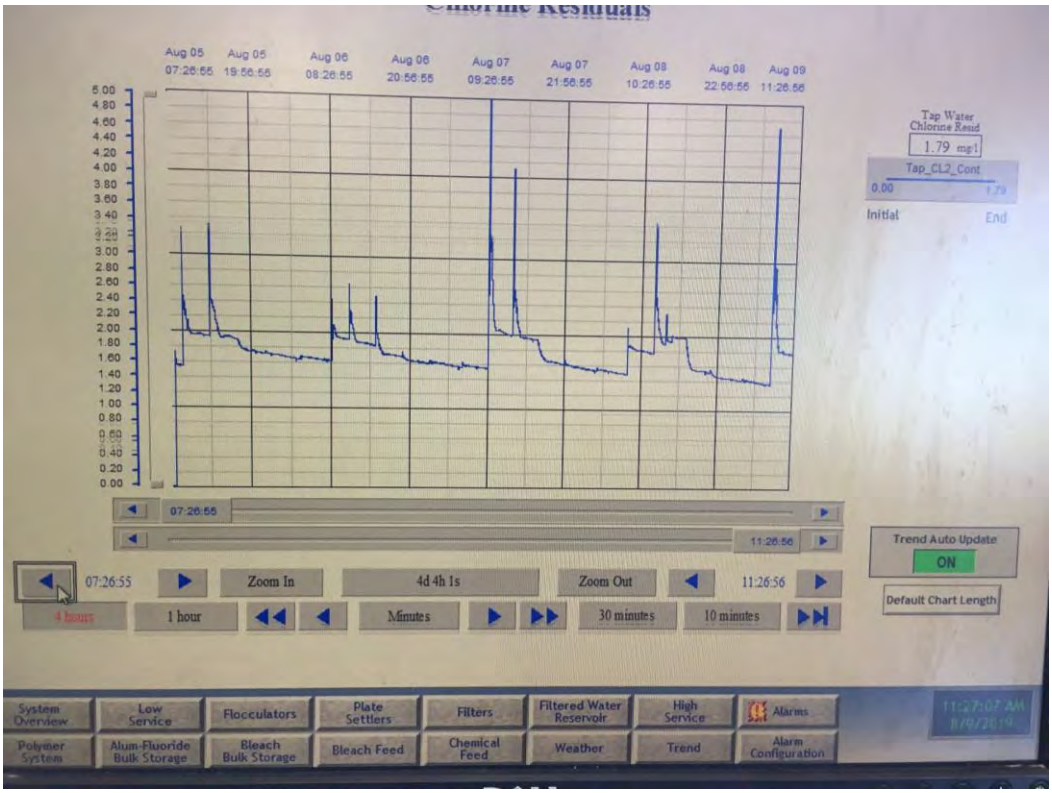


Figure 3a - SCADA with filter turbidity profiles

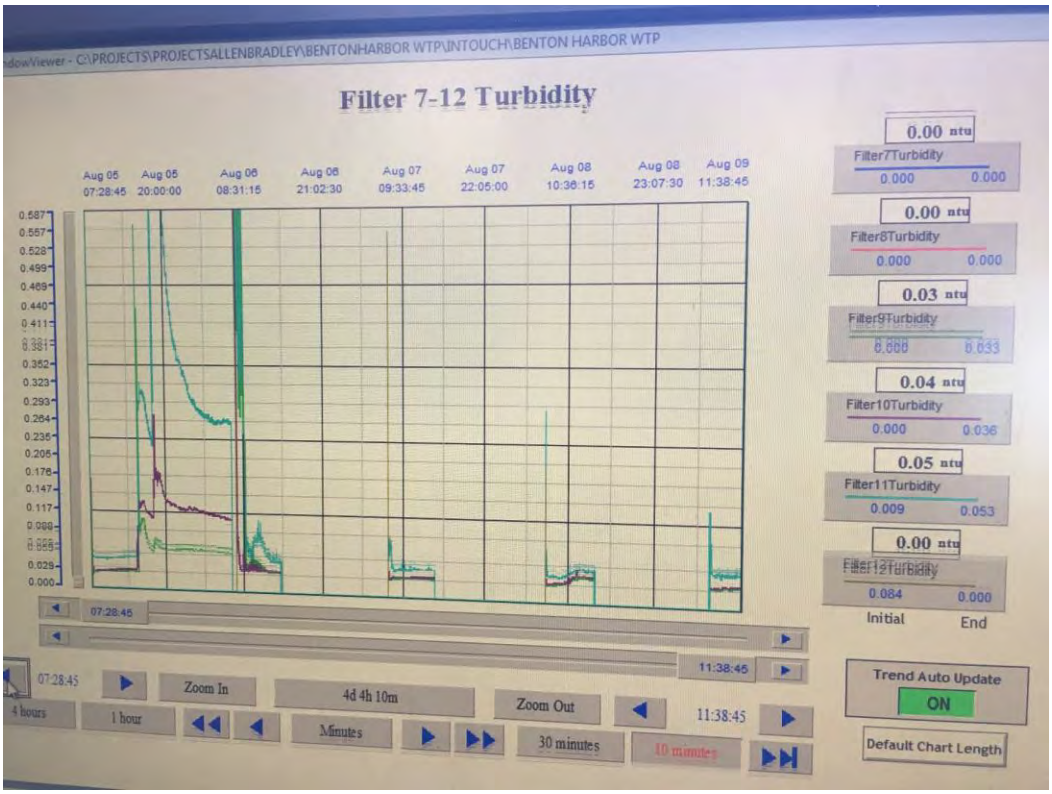


Figure 3b - SCADA with filtered turbidity trends

Figure 4 - Current Alum Feed location

Figure 5 - Phosphate Feed System

Figure 6 - Insertion flow meter

Figure 7 - Meter and PO4 feed location

Figure 8 - Proposed Alum Feed System

From:	Darwin Watson
To:	Kimberly Thompson
Cc:	Marcus Muhammad; Duane Seats; Sharon Henderson; Edward Isom; Juanita Henry; Ruthie Haralson; Ronald Singleton; CF Jones; Mary Adams; Ellis Mitchell; Bolt, Jennifer (EGLE); Lachance, Amy (EGLE); Sarkipato, Ernest (EGLE); Gillian Conrad (gconrad@bchdmi.org); Courtney Davis
Subject:	COBH Press Release/Public Advisory (Lead and Copper)
Date:	Friday, July 26, 2019 4:05:09 PM
Attachments:	Press Release Public Advisory ALE (72619).docx

CC Thompson,
Please send the attached press release to the media outlets.

Thanks

July 26, 2019
For Immediate Release

Contact: Darwin Watson, Director of Public Works/Utility Services
dwatson@cityofbentonharbormi.gov or 269-927-8455

Public Advisory for Drinking Water Customers in the City of Benton Harbor

(Benton Harbor) – The City of Benton Harbor has been conducting ongoing testing of the City's water supply in accordance with the regulations under the Lead and Copper Rule of the Drinking Water Act for the State of Michigan since October 2018. During this ongoing compliance testing, it was found that water samples gathered in 47 residences from January through June 2019 exceeded the Action Level of 15 parts per billion (ppb) for lead within those household samples. The 90th percentile for these samples was 27 ppb for lead, with twelve of the forty-seven samples having lead levels in excess of 15ppb, ranging from 15ppb to 59ppb.

Since October 2018, the City of Benton Harbor, along with many community partners, have been taking several steps to reduce resident's exposure to lead. The City of Benton Harbor has successfully started the replacement of the City's lead service lines, introduced new corrosion controls in the water supply at the City's Water Plant, and provided ongoing support and education for residents for water testing and understanding how they can limit lead exposure. The City is committed to continuing to take all corrective actions necessary to educate residents, improve the community water supply, and replace lead service lines with the goal of eliminating lead exposure in drinking water for residents. Find more information regarding the Action Level Exceedance and the City's drinking water at https://bhcity.us or by contacting the City of Benton Harbor Water Plant Superintendent Mike O'Malley at 269- 363-0575 or momalley@cityofbentonharbormi.gov.

Elevated levels of lead can cause health concerns. All Benton Harbor water customers are reminded to take the following precautionary actions to reduce their exposure to lead in drinking water:

- Public health officials recommend that any household with a child or pregnant woman use a certified lead filter to reduce lead from their drinking water. Look for filters that are tested and certified to NSF/ANSI Standard 53 for lead reduction. If you are not able to afford the cost of a lead filter, please contact the Berrien County Health Department. More information about obtaining a certified water filter and replacement cartridges can be found at www.bchdmi.org or by calling 800-815-5485.
- Residents who do not have a filter and have not used their water for six hours or more should flush their pipes to reduce the amount of lead in their drinking water. Pipes can be flushed by running faucets for at least five minutes, or by taking a shower, running a load of laundry or washing dishes. After flushing, run the water from your faucet until cold before drinking or cooking with the water.
- Use cold tap water for drinking and cooking.
- Use bottled water for preparing baby formula or use Ready-to-Feed formula.
- Do not boil the water, as boiling will not reduce the amount of lead in the water.
- Clean faucets' aerators or screens at least every six months.

Additional information regarding lead in drinking water and how to reduce risk of lead exposure can be found at www.michigan.gov/deqleadpublicadvisory or by calling 1-800-662-9278.

From:	Jason Marquardt
To:	Kimberly Thompson
Cc:	Ellis Mitchell (emitchell@bhcity.us); Roena Rice (rrice@bhcity.us)
Subject:	City of Benton Harbor - Corrosion Control Optimization Study - Addendum # 1
Date:	Monday, May 3, 2021 1:31:43 PM
Attachments:	image001.png image002.png image003.png image004.png image007.png 2021-05-03 BH Corrosion Addendum #1.pdf

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Attached is Addendum # 1 for the City of Benton Harbor's Corrosion Control Optimization Study.
If you would like to be removed from the RFP list, please let me know.
Thanks,

Jason W. Marquardt, PE
Senior Project Manager
D 269.926.4565
O 269.927.2295 ext. 171
C 269.876.9304
abonmarche.com
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ACEC
American Council of Engineering Companies of Michigan
"2021 Firm of the Year"

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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

City of Benton Harbor
Addendum # 1

Project Name: Benton Harbor Corrosion Optimization Study

Date: May 3, 2021

The following items are changes to and/or clarifications to the above reference project. The Bidder will acknowledge receipt of this Addendum in the appropriate space provided below and include this Addendum with their submitted proposal.

1. All proposals must be delivered by May 13 at 10:00 am to:

   City of Benton Harbor
   Attn: City Clerk, Kimberly Thompson
   200 E. Wall Street
   Benton Harbor, MI 49022

   No electronic copies will be accepted. Electronic copies of the proposal may be requested during the proposal evaluation period after May 13th.

2. The proposal selection criteria will be based on the following categories:

   - Qualifications of the Firm 40 points
   - Qualifications of the Staff 10 points
   - Project Understanding 50 points

3. The current proposal holder list has been attached to this addendum.

4. For the purposes of this requested RFP, the City of Benton Harbor does not currently have capacity to assist with harvesting of pipes for potential pipe loops, or construction funding to install pipe loops with sampling and monitoring. These services may be reference and estimated within the study of the selected consultant.

Please acknowledge receipt of this addendum by signing below and attaching to submitted proposal.

_____
DATE

_____
BIDDING FIRM

_____
AUTHORIZED REPRESENTATIVE

PROJECT: City of Benton Harbor Corrosion Study RFP		
BID OPENING DATE: May 13, 2021 @ 10:00am		
PRE-BID MEETING DATE: Friday, April 23, 2021		
PLAN HOLDER	EMAIL	ADD. #1
City of Benton Harbor - Ellis Mitchell	emitchell@bhcity.us	3-May
City of Benton Harbor - Roena Rice	rrice@bhcity.us	3-May
City of Benton Harbor - Kimberly Thompson	kthompson@bhcity.us	3-May
EGLE - Ernie Sarkipato	sarkipatoe@michigan.gov	3-May
EGLE - Brandon Onan	OnanB@michigan.gov	3-May
Cornwell Engineering - Dr. Cornwell	dcornwell@cornwellinc.com	3-May
Cornwell Engineering - Richard Brown	Rbrown@cornwllinc.com	3-May
Cornwell Engineering - Jacob Wagner	Jwagner@cornwellinc.com	3-May
Black & Veetch - Heather Cheslek	cheslekHA@BV.com	3-May
Black & Veetch - Dave Koch	KochDS@bv.com	3-May
Fishbeck - John Willemin	jwillemin@fishbeck.com	3-May
Arcadis - Rebecca Slabaugh	Rebecca.Slabaugh@arcadis.com	3-May
Arcadis - Gwen Kubacki	Gwen.Kubacki@arcadis.com	3-May
Prein & Newhof - Mark Prein	Mprien@newhof.com	3-May
Prein & Newhof - Steve Oosting	soosting@preinnewhof.com	3-May
Abonmarche - Tim Drews	tdrews@abonmarche.com	3-May
Abonmarche - Jason Marquardt	jmarquardt@abonmarche.com	3-May
Black & Veetch - Emily Tummons	TummonsEN@bv.com	3-May
MCA - Paula Brown	pbrown@metroca.net	3-May
MCA - Damon Garrett	dgarrett@metroca.net	3-May
MCA - Kimberly Hoyle	khoyle@metroca.net	3-May
MCA - Jarion Bradley	jbradley@metroca.net	3-May
MCA - Kalaya Thomas	kthomas@metroca.net	3-May

From: Nelson, Maureen (EGLE)
To: Sarkipato, Ernest (EGLE)
Subject: City of Benton Harbor ACO Deadline Reminder
Date: Thursday, September 10, 2020 12:02:29 PM

Hi Ernie,

Requirements from Paragraphs 2.7, 2.14, and 2.17 of the Amended ACO are due no later than **September 30, 2020**:

2.7 **Not later than September 30, 2020**, the City shall formally adopt a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.14 **Not later than September 30, 2020**, The City shall submit to the DWEHD, for review and approval, a project scope for completion of a technical, managerial, and financial capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City of Benton Harbor's water system, in compliance with Act 399. The City shall contract with a qualified consultant to complete the Capacity Study. The Capacity Study scope shall identify the organizational structure, and the required funding, to operate and manage the system, in compliance with Act 399. The Capacity Study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments. Last, the Capacity Study shall identify any technical needs, such as development and storage of water system records to facilitate compliance with Act 399.

2.17 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to the DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter the DWEHD issued to the City.

I'm testing out the delayed delivery function in Outlook. Please let me know when you receive this email. I indicated that it should be delivered no earlier than 10 am on September 10, 2020.

Thanks,

Maureen

--

Maureen Nelson
Enforcement Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-8328 | NelsonM2@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From:	Nelson, Maureen (EGLE)
To:	Sarkipato, Ernest (EGLE)
Subject:	City of Benton Harbor Fully Executed Amended ACO
Date:	Monday, August 10, 2020 10:00:15 AM
Attachments:	00600 City of Benton Harbor Fully Executed Amended ACO - AACO-399-07-2019 Transmittal Letter.docx 00600 City of Benton Harbor Fully Executed Amended ACO - AACO-399-07-2019.pdf

---

Hi Ernie,

Great work on everything! Attached is the fully executed amended ACO, effective 8/7/2020. Also attached is the transmittal letter for your signature dated August 11, 2020.

Please let me know if you have any questions.

Thanks,

Maureen

--

Maureen Nelson
Enforcement Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-8328 | NelsonM2@Michigan.gov

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STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

August 11, 2020

VIA EMAIL

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Mitchell:

SUBJECT: First Amended Administrative Consent Order (ACO) AACO-399-07-2019;
City of Benton Harbor; WSSN: 00600

Attached please find a fully executed Amended ACO between the City of Benton Harbor, and the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division, regarding the City of Benton Harbor's water supply. The compliance schedule in this ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). The effective date of the Amended ACO is August 7, 2020.

If you have any questions regarding the Amended ACO, please contact me at 616-307-0261; or by email at SarkipatoE@Michigan.gov.

Sincerely,

Ernie Sarkipato
Surface Water Treatment Specialist
Drinking Water and Environmental Health
Division

Attachments
cc: Mayor Marcus Muhammad, City of Benton Harbor
Mr. Mike O'Malley, City of Benton Harbor
Ms. Kimberly Thompson, City Clerk, City of Benton Harbor
Mr. Eric J. Oswald, EGLE
Mr. Brian Thurston, EGLE
Mr. Michael Bolf, EGLE
Ms. Maureen Nelson, EGLE

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8457		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
FACILITY OWNER IF NOT IDENTIFIED ABOVE Ellis Mitchell, City Manager			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
COUNTY Berrien			
CONTACT NAME Ellis Mitchell, City Manager	PHONE # 269-927-8457		

Executive Order 2019-06, signed by Governor Gretchen Whitmer on February 20, 2019, renamed the Michigan Department of Environmental Quality (MDEQ) as the Department of Environment, Great Lakes, and Energy (EGLE). Effective April 22, 2019, a reference to the MDEQ will be deemed a reference to EGLE. After April 22, 2019, a reference to the Director of the MDEQ will be deemed to be a reference to the Director of EGLE. The Drinking Water and Municipal Assistance Division (DWMAD) was renamed the Drinking Water and Environmental Health Division (DWEHD). A reference to the DWMAD will be deemed a reference to the DWEHD and a reference to the Director of the DWMAD will be deemed to be a reference to the Director of the DWEHD.

Administrative Consent Order (ACO) ACO-399-07-2019, entered on March 5, 2019, between the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), and the City of Benton Harbor (City), is hereby amended, as follows. Upon the consent of the parties and by the authority granted to EGLE by the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder, it is hereby agreed and ordered:

COMPLIANCE SCHEDULE

Paragraphs 2.1(a & b), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from ACO-399-07-2019. Reference Exhibit A, attached.

A number of the items below refer to a "Capacity Study." In this Amended Consent Order, under Paragraph 2.14, a Capacity Study refers to an assessment of a water system owner's technical, managerial, and financial capacity to consistently provide safe water to the public.

Paragraphs 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.7 **Not later than September 30, 2020**, the City shall formally adopt a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.8 **Not later than August 15, 2020,** the City shall submit the current cross connection program to the DWEHD for review. The DWEHD's review and comments on the current program will assist the City in completing the Capacity Study in paragraph 2.14. **No later than three (3) months following the completion of the Capacity Study**, an updated cross connection program must be submitted to the DWEHD for review to address any implementation changes as a result of the study.

2.10 (a) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to the DWEHD for inventorying and ongoing maintenance of distribution fire hydrants. The plan must address fixing known broken hydrants, as well as preventative maintenance, such as hydrant inspections and flushing.

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2.13 **Not later than December 31, 2020**, the City shall repair filter to waste valves at the water plant, and train operators on their use.

The following paragraphs shall be added to Section II – Compliance Schedule:

2.14 **Not later than September 30, 2020**, The City shall submit to the DWEHD, for review and approval, a project scope for completion of a technical, managerial, and financial capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City of Benton Harbor's

water system, in compliance with Act 399. The City shall contract with a qualified consultant to complete the Capacity Study. The Capacity Study scope shall identify the organizational structure, and the required funding, to operate and manage the system, in compliance with Act 399. The Capacity Study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments. Last, the Capacity Study shall identify any technical needs, such as development and storage of water system records to facilitate compliance with Act 399.

Not later than six (6) months following approval of the project scope, the City shall submit a completed Capacity Study for DWEHD approval.

To address any gaps identified by the Capacity Study, the Capacity Study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and management of the City's water system. **Not later than August 1, 2021 and every six (6) months after the DWEHD approves the Capacity Study, the City shall submit a signed statement describing the City's progress** towards completing the implementation plan to achieve adequate capacity.

Capacity Study Phase	Description	Due Date
1: Project Scope and Outcomes	Submit to the DWEHD for input on the study scope and outcomes	September 30, 2020
2: Study Completion	Complete the Capacity Study based on project scope	Six months after approval of scope
3: Implementation	Progress reports to the DWEHD describing city's progress	August 1, 2021 and every six months thereafter

2.15 (a) **Not later than six (6) months following the completion of the Capacity Study** in Paragraph 2.14, as part of the implementation phase, the City shall submit to the DWEHD, a Staffing Plan to address findings from the Capacity Study. The Staffing Plan must indicate the number of staff, managerial oversight, as well as an outline of each position's duties needed to meet the operational and maintenance needs of the water system.

(b) **Not later than twelve (12) months following the DWEHD approval of the Staffing Plan,** the City shall submit to the DWEHD a certification that the staffing plan has been implemented and adequate staffing and managerial oversight is in place.

2.16 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory or a laboratory certified by the DWEHD, or by the United States Environmental Protection Agency, for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to the DWEHD in a timely manner. MCL §325.1007 also

authorizes the DWEHD to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.17 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to the DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter the DWEHD issued to the City.

Not later than sixty (60) days following DWEHD approval of the corrosion control optimization study scope and completion schedule, the City shall secure a signed contract for the corrosion control optimization study.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this Amended Consent Order, except as specifically prescribed in this document. The effective date of this Amended Consent Order shall be the date upon which the Division Director of EGLE, DWEHD signs this document.

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Eric J. Oswald, Director
Drinking Water and Environmental Health Division

7-August-2020
Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

8/5/2020
Date

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

DWEHD Order No. AACO-399-07-2019

EXHIBIT A

In the matter of the First Amended Administrative Consent Order between the City of Benton Harbor and the State of Michigan Department of Environment, Great Lakes, and Energy, below are listed compliance activities that have been completed and are shown for record of completion.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the Asset Management Plan, dated December 2017, however, the second portion of 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

COMPLETION DATE: December 31, 2017

(b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system, in compliance with Act 399.

COMPLETION DATE: May 18, 2020

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data, including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.3 Install metering capabilities on the finished water (completed as part of corrosion control treatment project).

COMPLETION DATE: August 12, 2019

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.5 Obtain an adequately licensed operator-in-charge, solely dedicated to the water distribution system, no later than April 1, 2019.

COMPLETION DATE: May 7, 2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 30, 2019.

COMPLETION DATE: Treatment installed as of March 25, 2019. Corrosion control study insufficient as of June 2020, see First Amended ACO item 2.17.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

COMPLETION DATE: August 9, 2019

From:	Nelson, Maureen (EGLE)
To:	Sarkipato, Ernest (EGLE)
Cc:	Bolf, Michael (EGLE)
Subject:	City of Benton Harbor Letter, ACO, and Exhibit
Date:	Wednesday, July 29, 2020 10:02:24 AM
Attachments:	00600 City of Benton Harbor Proposed ACO Transmittal Letter.docx 00600 City of Benton Harbor Proposed First Amended ACO-399-07-2019.docx 00600 City of Benton Harbor Proposed First Amended ACO-399-07-2019 Exhibit A.docx 00600 City of Benton Harbor Proposed First Amended ACO-399-07-2019 and Exhibit A.pdf

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Good morning,
Attached you will find the transmittal letter, ACO, and Exhibit A ready to be sent to the City of Benton Harbor. The letter is dated for today. I included a Word version of the three for your reference and a pdf of the ACO and Exhibit A to send.
Please let me know if you have any questions or concerns.
Thanks,
Maureen
--
Maureen Nelson
Enforcement Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-8328 | NelsonM2@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 29, 2020

VIA EMAIL

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Mitchell:

SUBJECT: First Amended Administrative Consent Order (Amended ACO);
City of Benton Harbor; WSSN: 00600

Attached please find a copy of a proposed Amended ACO between the City of Benton Harbor and the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), regarding the water supply at the City of Benton Harbor. The compliance schedule in this Amended ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399).

In accordance with the City of Benton Harbor's passage of the resolution to sign the Amended Administrative Consent Order during the July 20, 2020 City Commission meeting, the DWEHD requests that Mayor Marcus Muhammad print, sign, and return a signed copy to me electronically, as soon as possible. Upon receipt of the signed document via email, I will secure the required authorized signatures, and promptly return one fully-executed original document to you, along with a cover letter. The effective date of the Amended ACO will be the date it is signed by the Director of the DWEHD. Failure to timely enter into a binding compliance schedule, such as contained in the Amended ACO, may result in additional enforcement action.

If you have any questions regarding the Amended ACO, please contact me at 616-307-0261; or by email at SarkipatoE@Michigan.gov.

Sincerely,

Ernie Sarkipato
Surface Water Treatment Specialist
Drinking Water and Environmental Health
Division

Attachments
cc: Mayor Marcus Muhammad, City of Benton Harbor
Mr. Mike O'Malley, City of Benton Harbor
Ms. Kimberly Thompson, City Clerk, City of Benton Harbor
Mr. Eric Oswald, EGLE
Mr. Brian Thurston, EGLE
Mr. Michael Bolf, EGLE
Ms. Maureen Nelson, EGLE

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8457		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
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Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

_____

Eric J. Oswald, Director
Drinking Water and Environmental Health Division

_____

Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

_____

Marcus Muhammad, Mayor

_____

Date

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

DWEHD Order No. AACO-399-07-2019

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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

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The following paragraphs shall be added to Section II – Compliance Schedule:

2.14 **Not later than September 30, 2020**, The City shall submit to the DWEHD, for review and approval, a project scope for completion of a technical, managerial, and financial capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City of Benton Harbor's

water system, in compliance with Act 399. The City shall contract with a qualified consultant to complete the Capacity Study. The Capacity Study scope shall identify the organizational structure, and the required funding, to operate and manage the system, in compliance with Act 399. The Capacity Study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments. Last, the Capacity Study shall identify any technical needs, such as development and storage of water system records to facilitate compliance with Act 399.

Not later than six (6) months following approval of the project scope, the City shall submit a completed Capacity Study for DWEHD approval.

To address any gaps identified by the Capacity Study, the Capacity Study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and management of the City's water system. **Not later than August 1, 2021 and every six (6) months after the DWEHD approves the Capacity Study, the City shall submit a signed statement describing the City's progress** towards completing the implementation plan to achieve adequate capacity.

Capacity Study Phase	Description	Due Date
1: Project Scope and Outcomes	Submit to the DWEHD for input on the study scope and outcomes	September 30, 2020
2: Study Completion	Complete the Capacity Study based on project scope	Six months after approval of scope
3: Implementation	Progress reports to the DWEHD describing city's progress	August 1, 2021 and every six months thereafter

2.15 (a) **Not later than six (6) months following the completion of the Capacity Study** in Paragraph 2.14, as part of the implementation phase, the City shall submit to the DWEHD, a Staffing Plan to address findings from the Capacity Study. The Staffing Plan must indicate the number of staff, managerial oversight, as well as an outline of each position's duties needed to meet the operational and maintenance needs of the water system.

(b) **Not later than twelve (12) months following the DWEHD approval of the Staffing Plan,** the City shall submit to the DWEHD a certification that the staffing plan has been implemented and adequate staffing and managerial oversight is in place.

2.16 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory or a laboratory certified by the DWEHD, or by the United States Environmental Protection Agency, for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to the DWEHD in a timely manner. MCL §325.1007 also

authorizes the DWEHD to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.17 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to the DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter the DWEHD issued to the City.

Not later than sixty (60) days following DWEHD approval of the corrosion control optimization study scope and completion schedule, the City shall secure a signed contract for the corrosion control optimization study.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this Amended Consent Order, except as specifically prescribed in this document. The effective date of this Amended Consent Order shall be the date upon which the Division Director of EGLE, DWEHD signs this document.

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

_____
Eric J. Oswald, Director
Drinking Water and Environmental Health Division

_____
Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

_____
Marcus Muhammad, Mayor

_____
Date

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

DWEHD Order No. AACO-399-07-2019

EXHIBIT A

In the matter of the First Amended Administrative Consent Order between the City of Benton Harbor and the State of Michigan Department of Environment, Great Lakes, and Energy, below are listed compliance activities that have been completed and are shown for record of completion.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the Asset Management Plan, dated December 2017, however, the second portion of 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

COMPLETION DATE: December 31, 2017

(b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system, in compliance with Act 399.

COMPLETION DATE: May 18, 2020

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data, including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.3 Install metering capabilities on the finished water (completed as part of corrosion control treatment project).

COMPLETION DATE: August 12, 2019

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.5 Obtain an adequately licensed operator-in-charge, solely dedicated to the water distribution system, no later than April 1, 2019.

COMPLETION DATE: May 7, 2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 30, 2019.

COMPLETION DATE: Treatment installed as of March 25, 2019. Corrosion control study insufficient as of June 2020, see First Amended ACO item 2.17.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

COMPLETION DATE: August 9, 2019

From:	Williams, Brandon (EGLE-Contractor)
To:	Sasy, Ninah (EGLE); Wisinski, Courtney (DHHS); Courtney Davis; emitchell@cityofbentonharbormi.gov; Mathies, Cartyea (DHHS-Contractor); Nshimyimana, Jean Pierre (DHHS); Jeffery Sims; Roena Rice; Sarkipato, Ernest (EGLE); Rev Pinkney; Powell-Denson, Lakecia (DHHS); "padma@andrews.edu"; madams@bhcity.us; "murrayd@andrews.edu"; Brandon Tyus; Crider, Steven (DHHS); micleanwaterLD@gmail.com; rjones@fv-operations.com; p tobias; alexis@freshwaterfuture.org; Darel Rice; Lesia Osler; Sweeney, Daniel (DHHS-Contractor); Jason Marquardt
Subject:	Community Forum Presentations and Videos
Date:	Friday, April 16, 2021 1:06:23 PM
Attachments:	BH townhall EGLE.pdf City of Benton Harbor Community Forum Construction Presentation.pdf

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Hello everyone!

Thank you again for your contributions to making the first Community Forum a success! Attached are the presentations that were made during the forum as well as a link to the recording of the forum:

Community-Forum Trimmed Video.mp4

I am proud of what we were able to accomplish together, and I look forward to increasing the impact of our work among the residents of Benton Harbor.

All the best,

Brandon Williams
Water Leak Pilot Assistant
Office of the Clean Water Public Advocate/
City of Benton Harbor
P: 269-519-0413

Benton Harbor Water Update

Ernie Sarkipato, Engineering Unit

Michigan Department of Environment, Great Lakes, and Energy

Water System Public Information

- Water customers need to be informed
- Regulations require information be sent to the public
- Rebuild trust in water system

What is lead?

- Naturally Occurring Metal (“Pb”)
- Exposures:

Gasoline (outlawed)

Paint (common in older homes)

Plumbing

Corrosion is a two-way street

All water is corrosive

- Depends on chemistry

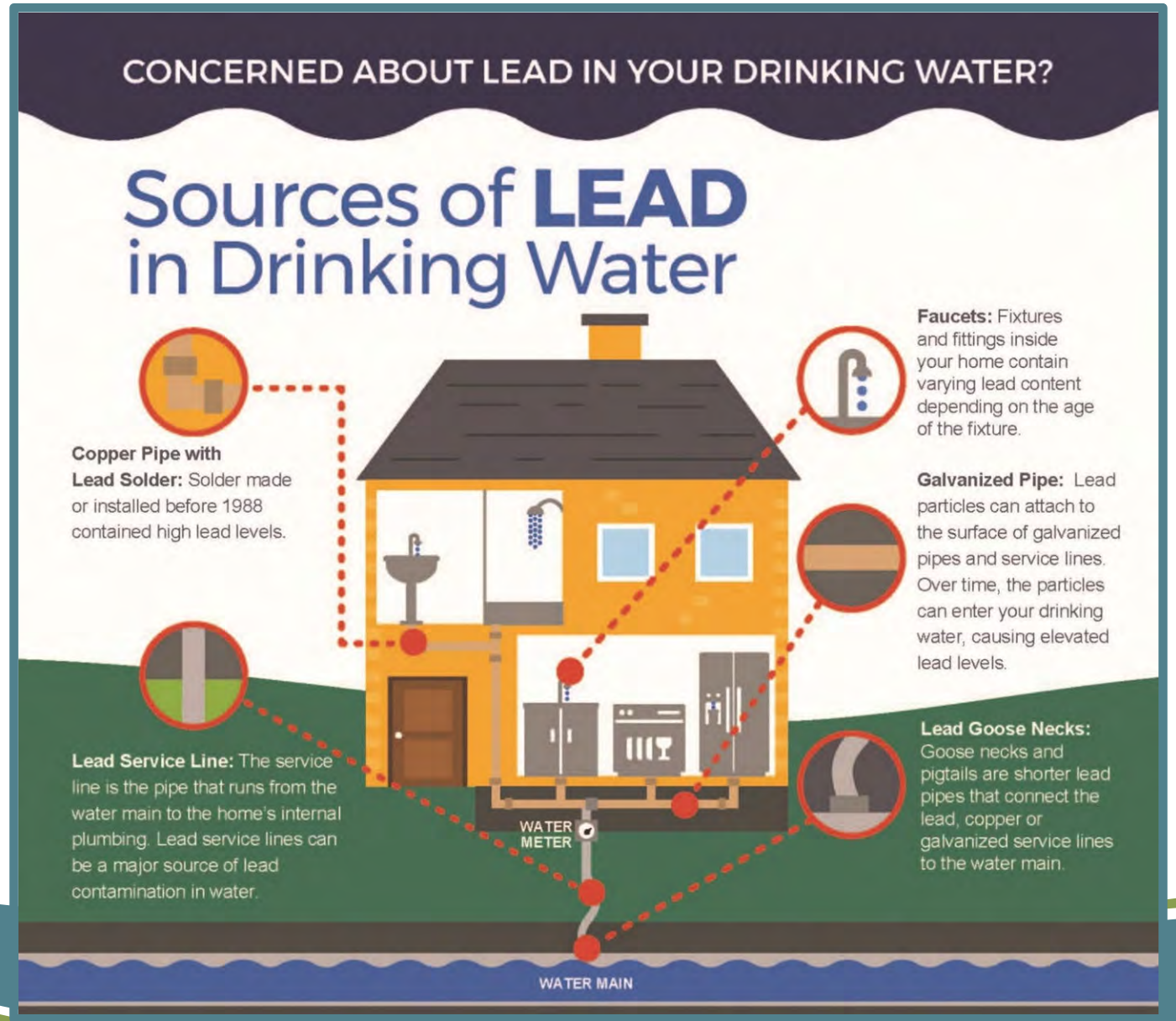
Plumbing materials

Flowing or Sitting?

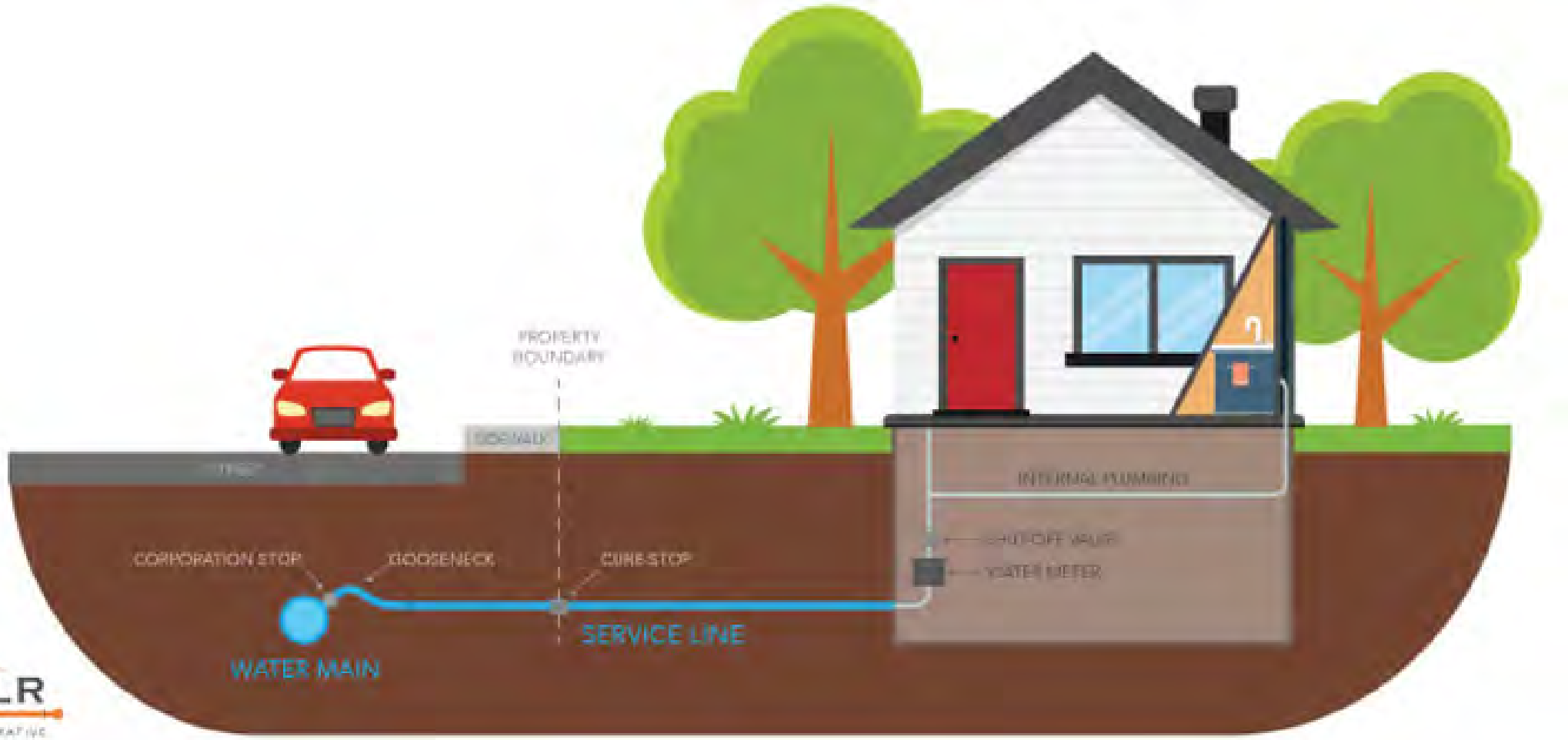
Disturbances?

EGLE

Sources of Lead in Drinking Water



Service Line Diagram



Compliance Sampling Procedures

Lead Service Lines

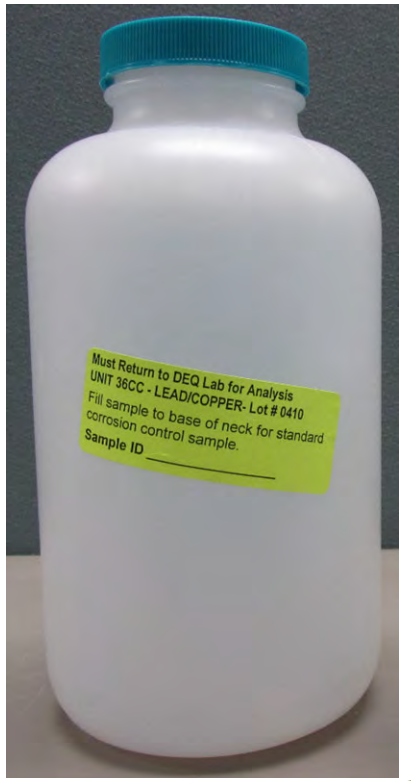
Five 1-liter bottles

- Tier 1, Single-family residence
- Tier 2, Business or other building

No Lead Service Lines

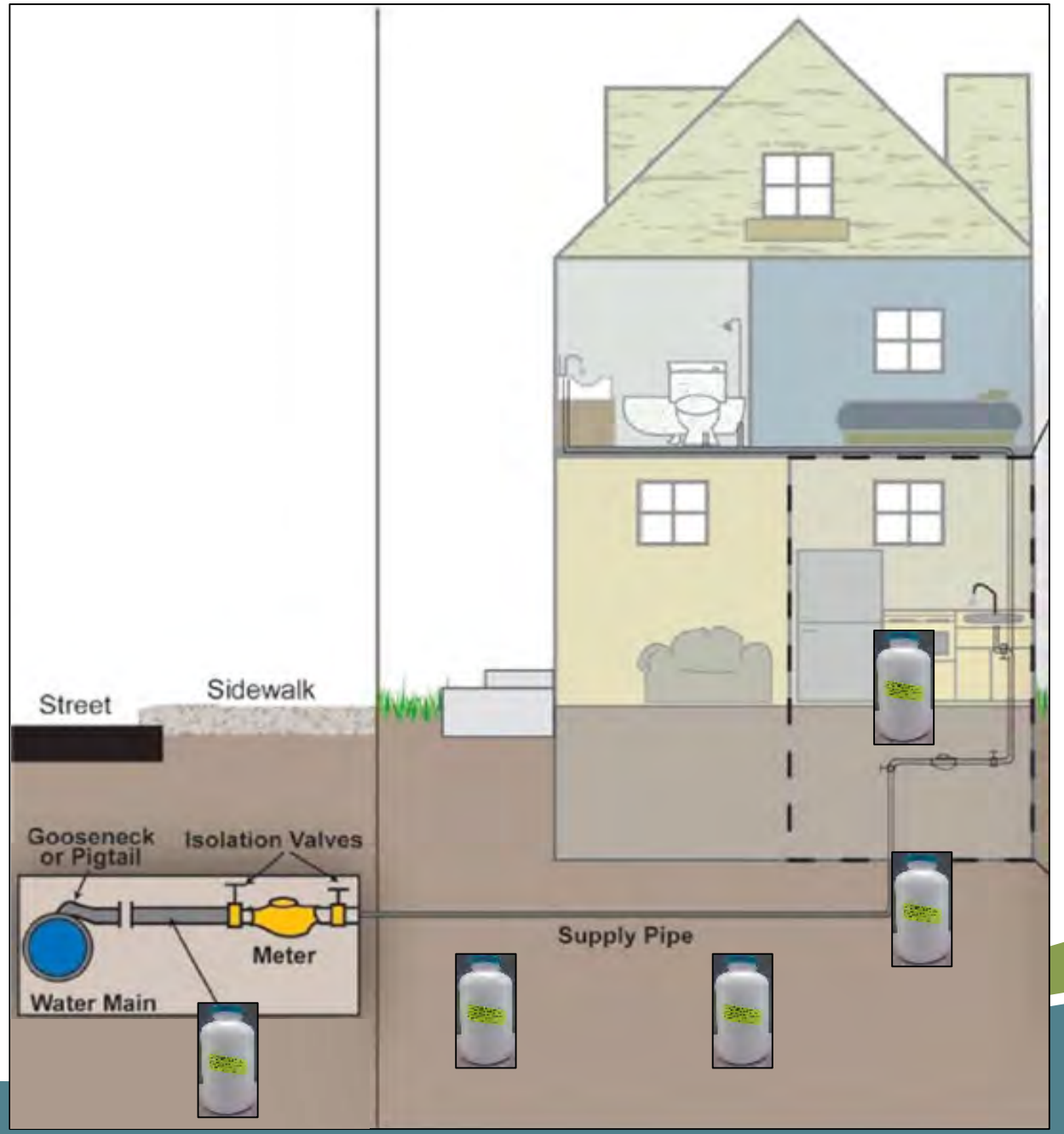
One 1-liter bottle

- All other sites



Why the 5th liter?

- Why collect a second sample?
  - The first draw sample does not always represent the highest risk to public health for a site with an LSL
- Why the fifth liter?
  - Chosen based on the average home configuration.



Sampling for Lead

1-10ppb
2-
3-
4-
5-12ppb

12ppb

1-5ppb
2-
3-
4-
5-7ppb

7ppb

1-2ppb
2-
3-
4-
5-5ppb

5ppb

1-0ppb
2-
3-
4-
5-25ppb

25ppb

1-6ppb
2-
3-
4-
5-2ppb

6ppb

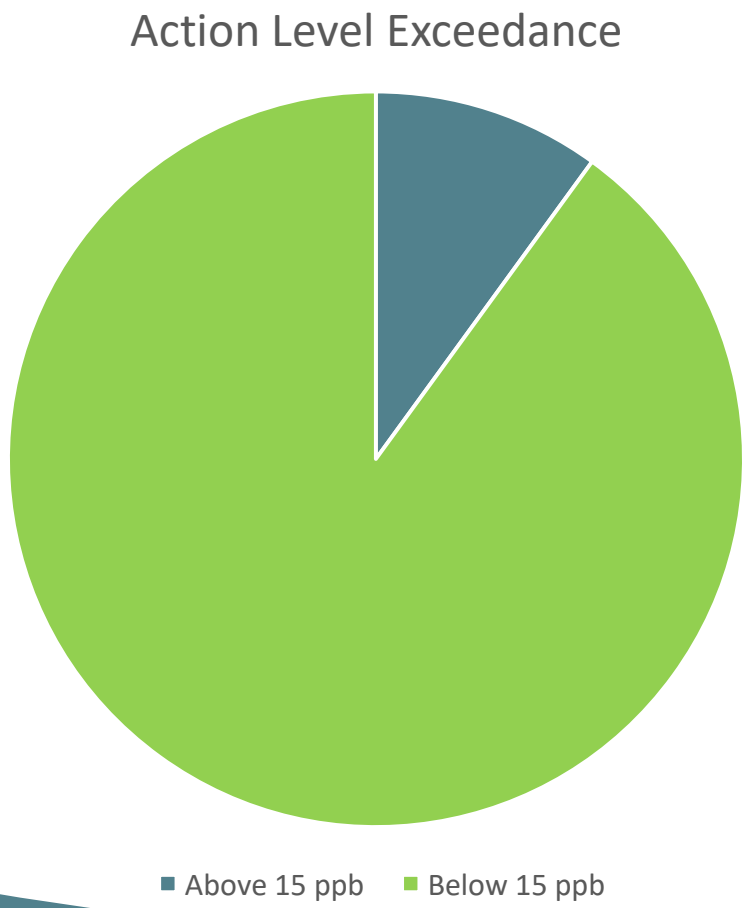
1-2ppb
2-
3-
4-
5-0ppb

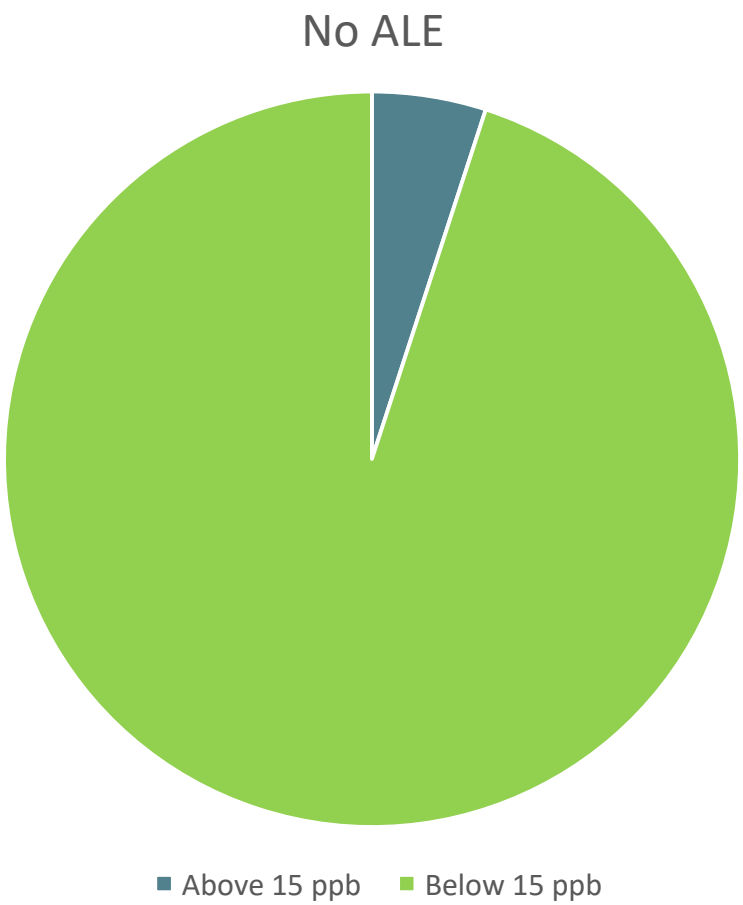
2ppb

1-0ppb
2-
3-
4-
5-3ppb

3ppb

Action Level: 90% below 15 ppb





Timeline

Treatment Installed March 2019

Treatment Increased March 2020

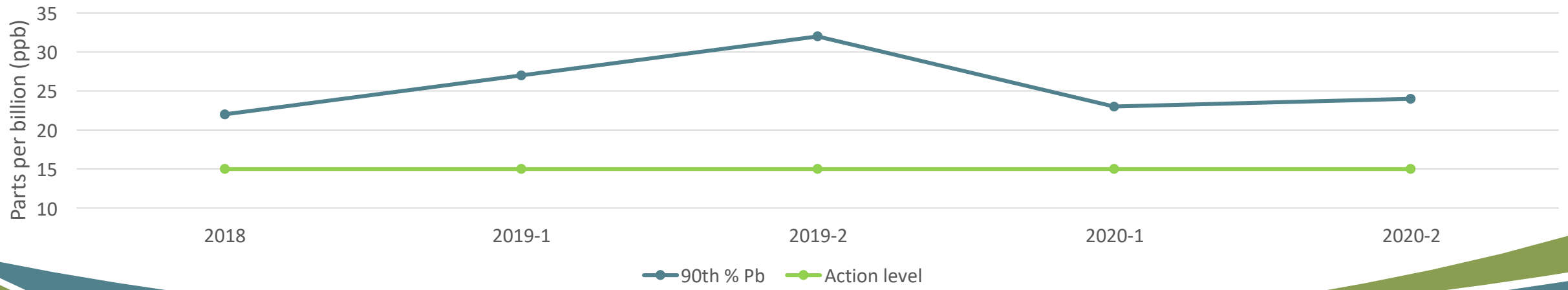
Oct 2018
30
samples

July 2019
46
samples

Dec 2019
39
samples

July 2020
63
samples

Dec 2020
67
samples

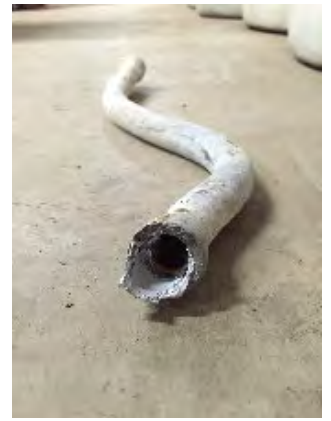


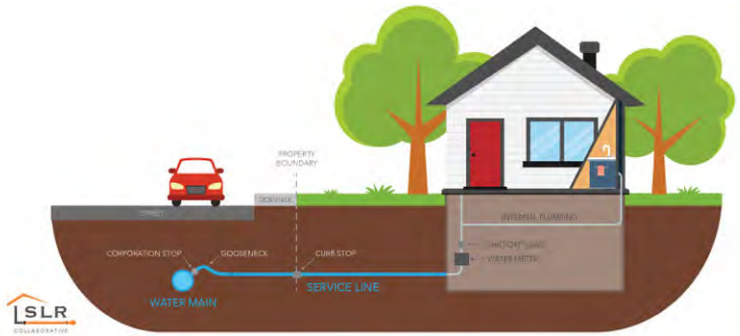
What's Been Done?

- **Work closely with partners to communicate to public**
- Big increase in sampling
- Installed treatment to help corrosion
- Increased treatment to help corrosion
- Started identifying lead service lines
- Started replacing lead service lines

What's coming up

- Continued Sampling – **need volunteers!**
- Engineering study of corrosion study
- Identification of LSL's
- Removal of LSL's
- Updates to Public





Ernie Sarkipato, Engineering Unit

Michigan Department of Environment, Great Lakes, and Energy

616-307-0261

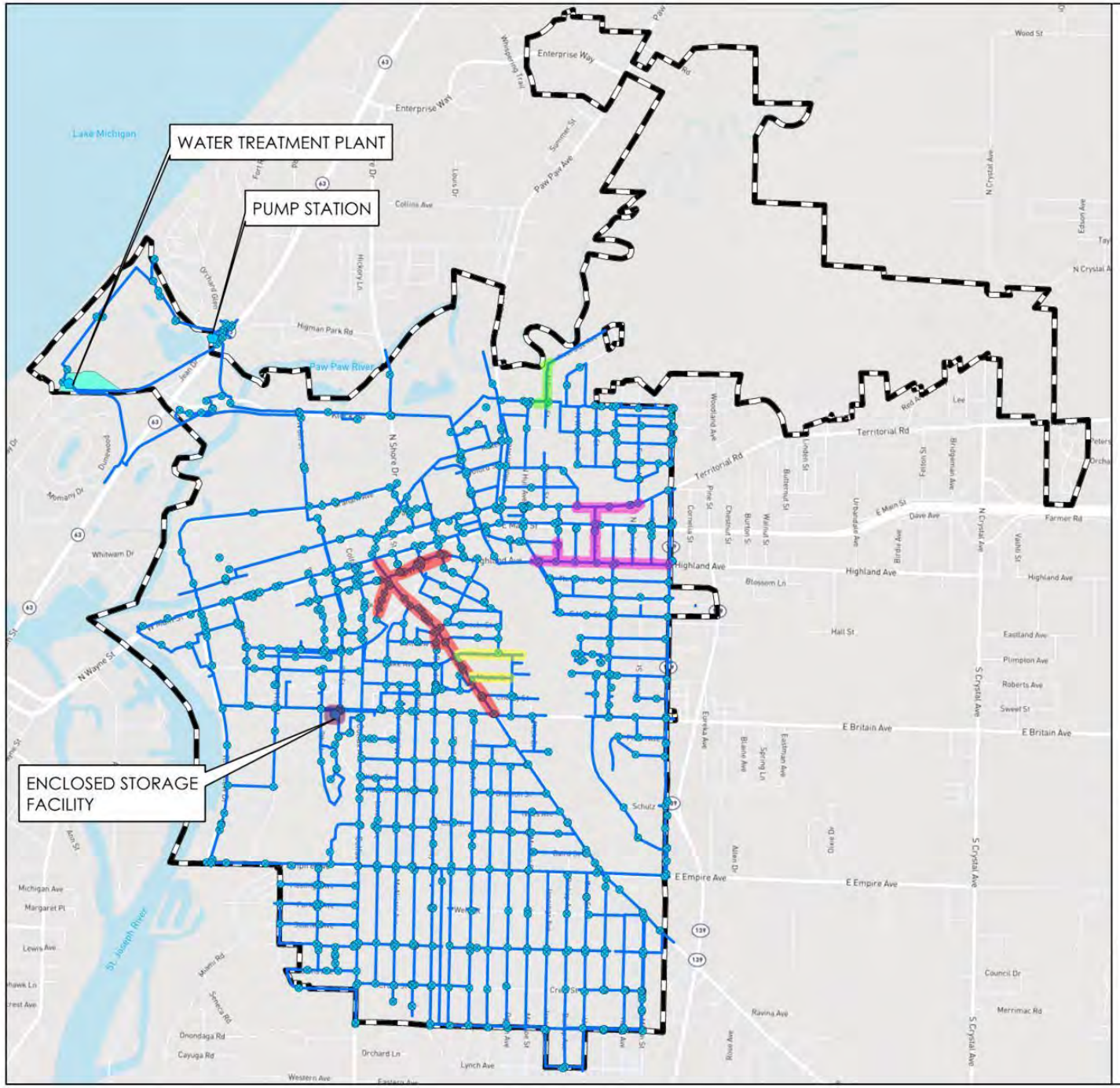
sarkipatoe@michigan.gov

BENTON HARBOR
Port of Opportunities

City of Benton Harbor Community Forum

Current and Upcoming Construction Projects

ABONMARCHE



Water System

City of Benton Harbor
CWSRF & DWSRF

BENTON HARBOR
Port of Opportunities

Legend

- City of Benton Harbor
- Water Network Structures
- Water System Valves
- Water Mains
- Water Treatment Plant

Project Limits

- Contract 1 - Pipestone Corridor
- Contract 2 - Vineyard Ave & Maple St
- Contract 3 - Northeast Section Reconstruction
- Contract 4 - Stevens St
- Contract 5 - Water Tower

N

0 0.13 0.25 0.5 0.75 1 Miles

1 Inch = 1,750 Feet

Prepared March 2021 by:
ABONMARCHE

Pipestone Street Corridor Project

- 5800 feet of new Water Main
- 25 Water Service Replacements
- New valves and hydrants
- 5130 feet of new Storm Sewer
- 1875 feet of Sanitary Sewer
- Roadway and sidewalks to be replaced

Pipestone Street Corridor Project (continued)

- Current Progress
  - Construction currently in Phase 2
  - All sanitary sewer in Phase 1 and 2 compete
  - All water main in Phase 1 and 2 complete
    - Working on replacing water services in Phase 2
  - Storm sewer in Phase 2 underway
- Total Projected Construction Costs:
  - $4,758,761
- Expected Completion:
  - November 15, 2021

Pipestone Street Corridor Project (cont.)

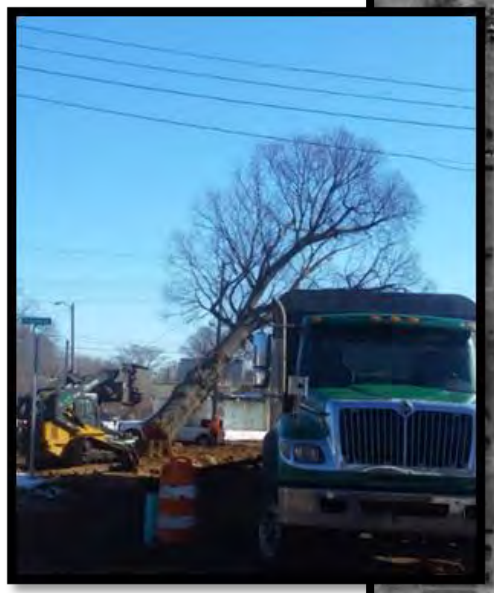
Maple St and Vineyard Ave Reconstruction

- 2140 feet of new Water Main
- 34 Water Service Replacements
- New valves and hydrants
- 1900 feet of new Storm Sewer
- 1875 feet of Sanitary Sewer
- Roadway and sidewalks to be replaced

- Project Progress
  - Construction to start April 5th, 2021
    - Tree removals have occurred

- Total Projected Construction Costs:
  - $1,396,152

- Expected Completion:
  - November 15, 2021

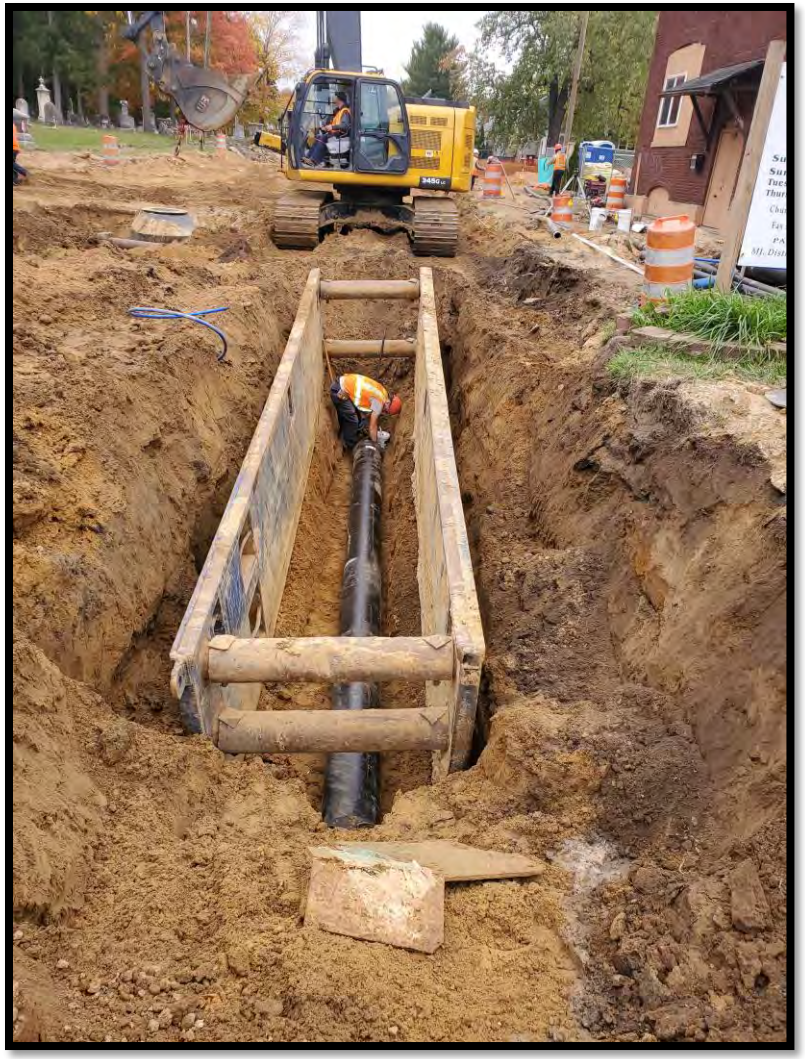


Northeast Section Reconstruction Project

- 5385 feet of new Water Main
- 77 Water Service Replacements
- New Valves and Hydrants
- 4220 feet of new Storm Sewer
- 4472 feet of new Sanitary Sewer
- Roadway and sidewalks to be replaced

Northeast Section Reconstruction Project (cont.)

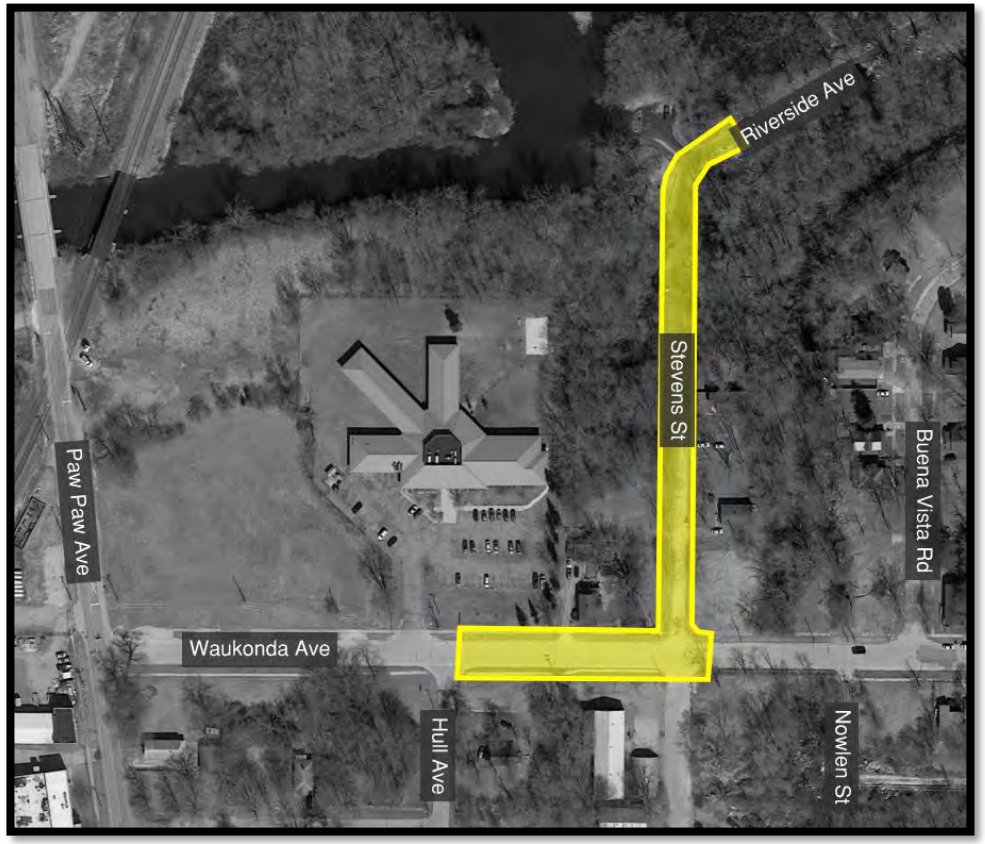
- Current Progress
  - Construction currently in Phase 2
  - All sanitary sewer in Phase 1 is completed
  - All water main in Phase 1 completed
- Total Projected Construction Costs:
  - $4,487,152
- Expected Completion:
  - June 30, 2021



Northeast Section Reconstruction Project (cont.)

Stevens Street Reconstruction Project

- 950 feet of new Water Main
- 3 Water Service Replacements
- 1110 feet of Storm Sewer replacement
- 940 feet of Sanitary Sewer Replacement
- 655 feet of Forcemain Replacement
- Roadway to be replaced



Stevens Street Reconstruction Project (cont.)

- Current Progress
  - All underground utility work complete
  - Final HMA pavement and project cleanup and restoration on Stevens Street to be completed this spring
- Total Projected Construction Costs:
  - $1,372,721
- Expected Completion:
  - June 18, 2021

Stevens Street Reconstruction Project (cont.)

Water Tower Project

- Exterior and Interior Repainting
- Piping Repainting
- Mixer, Valve, and Fence Improvements

- Soon a containment tarp will be placed around the tower for painting

- Total Projected Construction Costs:
  - $781,600

- Expected Completion:
  - August 20, 2021

Upcoming Project: Clay Street Water Main Replacement

- 1000 ft of new Water Main
- 18 Water Service Replacements
- Storm Sewer Improvements
- Sidewalk along both sides of Clay Street to be reconstructed

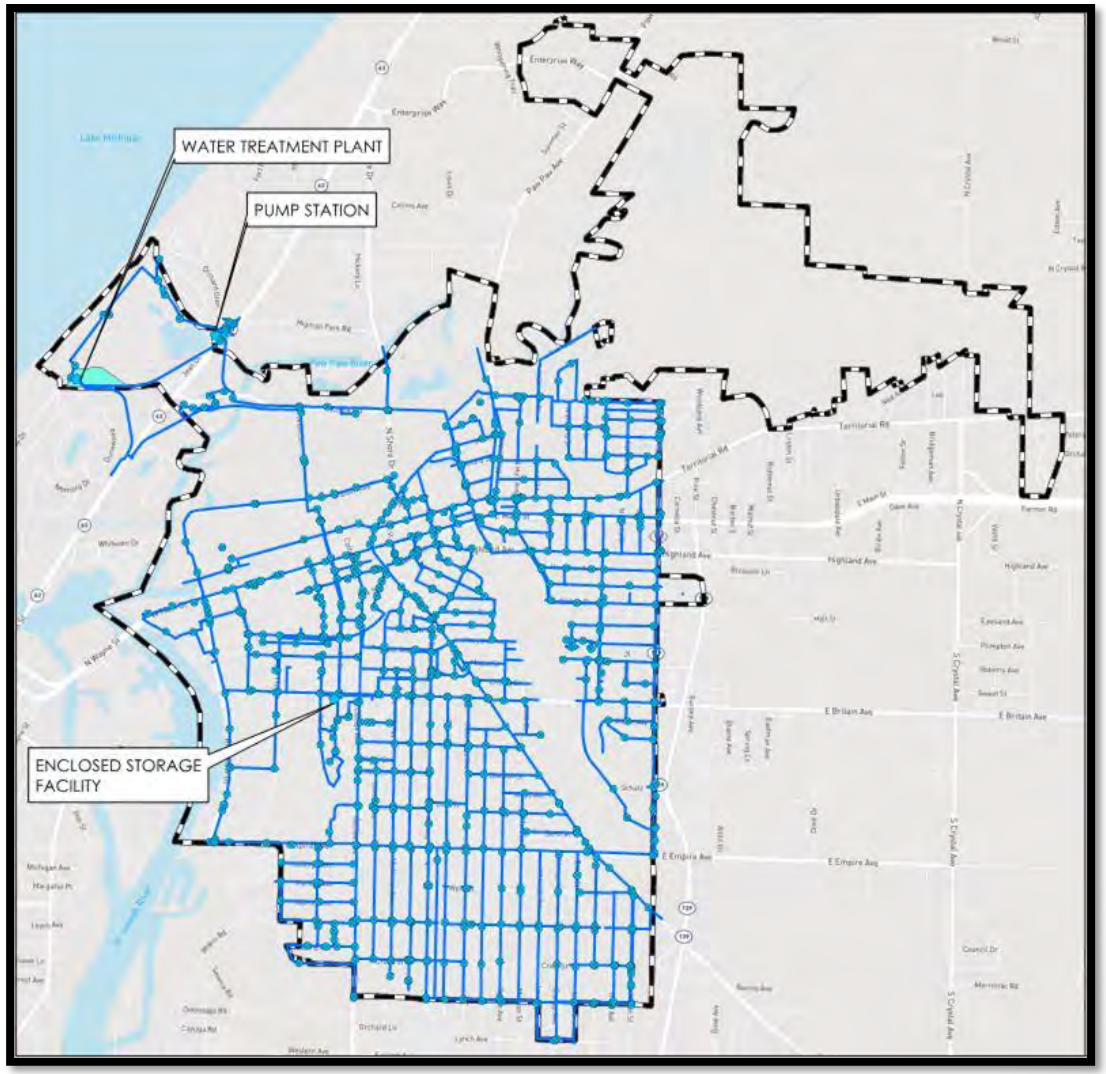
- Bid Opening:
  - April 8, 2021

- Total Estimated Construction Cost:
  - $450,000

- Expected Completion:
  - October 15, 2021

Upcoming Project: EPA Lead Service Replacement Project/Grant

- City of Benton Harbor working to finalize EPA Grant agreement for $6.1 million for Lead Service Line Replacements
- Approximately 900 lead service lines to be replaced, depending on service replacement costs
- Investigation work including "pot holing" will begin later in 2021 extending into 2022 to update City's inventory of service materials
- Grant includes Corrosion Control Optimization Study within the system
- Expected Completion:
  - April 2025



From: Sarkipato, Ernest (DEQ)
To: Lachance, Amy (DEQ)
Subject: Compliance Status
Date: Wednesday, January 23, 2019 1:01:57 PM
Attachments: Compliance Status.docx
Benton Harbor Compliance History.pdf

See what you think. Run the passivation layer dates past brandon to ensure accuracy, I just used 30 days or so.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

City of Benton Harbor

Regulatory Status Update

1/23/2019

Action Level Exceedance (ALE) for Lead

The city has conducted public advisories and education as required by Act 399. They have offered free sampling to residents, and have to date received 335 sample results for lead and copper. So far, 54 are above the action level of 15 ppb for lead (no elevated copper levels). A number of actions have been taken to investigate the source of the lead and/or reasons for lead release in the city. The DEQ has also been working with the City and Elhorn Engineering to begin design and permitting of a phosphate corrosion inhibitor system to help build a passivation layer in the system.

Best Case: Phosphate system installed 2/15/19, passivation layer significantly improved 3/15/19.

Worst Case: Phosphate system installed 3/29/19, passivation improved 4/30/19.

Significant Deficiencies and Administrative Consent Order (ACO)

The DEQ has been working with the city since the summer of 2018 to conduct a sanitary survey, and address concerns found in the survey (significant deficiencies). We have proposed a draft ACO to allow for a corrective action schedule, which the city has verbally agreed to ***but not yet signed***. Our deadline for approval is 1/31/19. A non-inclusive list of significant deficiencies for correction follows:

-Move chemical feed point to proper location (design underway)

-Conduct a Rate Study, and streamline the Rate Collection Process

-Install metering capabilities on the finished water (design underway)

-Obtain adequate staffing levels at the water plant and distribution system

-Update cross connection program, consider hiring contractor for inspections/testing

-Install functioning chlorine analyzer at water plant

Next Steps

By January 31, 2019: enter into ACO for an alternative compliance schedule to significant deficiencies

By March 31, 2019: collect lead and copper sample from the entry point to distribution system

By March 31, 2019: submit a proposal for optimal corrosion control treatment or a corrosion control study.

2018 Violations

The city also accrued a number of violations of Act 399 in the 2018 calendar year, suggesting a lack of ability to operate the water system in compliance with the law and remain protective of public health. *See the attached Compliance History timeline.*

City of Benton Harbor

Water Supply Compliance Summary

2/9/15 Disinfection Byproduct MCL violation for HAA5

6/15/16 TOC sample missed

10/26/17 Missed samples: VOC, Cyanide

2/25/18 Near violation of turbidity limits

3/10/18 Missed E Coli sample

4/17/18 Violation for lack of DBP Precursor (TOC) Removal

4/30/18 - Lead Pilot Grant Awarded $284k

8/1/18 E Coli reporting violation

8/9/18 Violation for TOC removal

8/17/18 Invalidated 3 TOC samples

9/1/18 Invalidated 1 TOC Sample

10/11/18 Missed samples: cyanide, VOC, SOC

11/1/18 Invalidated Sample but August THM>80ppb

11/20/18 Violation TOC removal (3rd Quarter)

2015 *July 16*

Sanitary Survey

Findings of Deficiency for:

-lack of valves in distribution

-poor cross connection program

2016 *April 4*

SS Follow-up

Letter to follow-up, referencing:

-lack of valves, ongoing leaks

-Capital Improvement Plan overdue

2018 *April 16*

Compliance Communication

-Move alum feed point

-VFDs for low lift

-SCADA upgrades

-Filter to Waste

-Coagulant feed model

-High service pumps

2018 *October 3*

Sanitary Survey

Nine Significant Deficiencies Identified, requiring a compliance schedule. See Draft Administrative Consent Order

2018 *October 22*

Lead Exceedance

90th Percentile of 22 parts per billion of lead.

Follow-up sampling confirms corrosive water leaching metals from plumbing materials.

11.30.2018

MDEQ - DWMAD

From:	Vincent, Courtney (EGLE)
To:	emitchell@cityofbentonharbormi.gov
Cc:	momalley@cityofbentonharbormi.gov; dharlan@fv-operations.com; "elhorneng@aol.com"; Onan, Brandon (EGLE); nbritten@bchdmi.org; Oswald, Eric (EGLE); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE)
Subject:	Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)
Date:	Thursday, February 13, 2020 1:38:27 PM
Attachments:	00600_Benton Harbor OCCT update_20200203_FINALIZED.pdf

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Hi Mr. Mitchell,
Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding water system corrosion treatment for the city of Benton Harbor (WSSN: 00600). A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, Drinking Water and Environmental Health Division, by email at OnanB@Michigan.gov or by phone at 616-307-6736.
Thank you,

Courtney Vincent, Secretary
Technical Support Unit
Community Water Supply Section
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-284-5424 | VincentC4@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit for installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system. The treatment chemical permitted, based on a recommendation by Elhorn Engineering, was Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was 1.5 milligrams per liter (mg/L) as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City concludes the treatment is not achieving desired results quickly enough. The most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment.

The City met with representatives from EGLE on January 15, 2020, to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting and outline next steps for the City to pursue designation of optimized corrosion control treatment as required by Rule 604f of the administrative rules promulgated under Act 399.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60 certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This

designation is being made under R325.10604f(3)(d). The reason for this change is to speed up treatment effectiveness. EGLE's intent is to quickly put into place treatment that will more efficiently lower corrosion rates in the distribution system for greater protection of public health. This decision is based on corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system but, without further study, it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third-party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c) of the administrative rules promulgated under Act 399. This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immediately verify in writing to the department the valve has been closed according to the permit.

TRANSITION AND TIMELINE

Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

From:	Onan, Brandon (EGLE)
To:	Bailey, Kristin (EGLE); Huttinger, Sue (EGLE); Kaiser, Rebecca (EGLE); Reinke, Joseph (EGLE); Sylvester, Matthew (EGLE); Conradson, Scott (EGLE); Thurston, Brian (EGLE); Vail, Amy (EGLE); Wade, Jamie (EGLE); Weir, Robert (EGLE); Bolf, Michael (EGLE); Henderson, Shannon (EGLE); Johnson, Stephanie (EGLE); London, Bob (EGLE); Sarkipato, Ernest (EGLE); Chooi, Wood (EGLE); Dehtiar, Luke (EGLE); Esparsa, Brian (EGLE); Klein, Jeremy (EGLE); Pierce, Coulton (EGLE); Bates, Caitlin (EGLE); Brennan, Patrick (EGLE); Brown, Sean (EGLE); Simon, Taryn (EGLE); Velzy, Olivia (EGLE); Bishop, Heather (EGLE); Masud, Md Abdullah Al (EGLE); Reyes, Katelyn (EGLE); Varma, Mohit (EGLE); Wilson, Stacy (EGLE); Yutzy, Nathan (EGLE); Joseph, Mark (EGLE); Lemmer, Kevin (EGLE); Rennaker, Joanne (EGLE); Skinker, Bethel (EGLE); Swendsen, Kurt (EGLE); VanDerWoude, Ryan (EGLE); Bolf, Michael (EGLE); Douville, Amy (EGLE); Flaminio, Tom (EGLE); Schultz, Lori (EGLE); Westra, Michael (EGLE); Aden, Joshua (EGLE); Disser, William (EGLE); Donaldson, Kristina (EGLE); Islam, Abuzoha (EGLE); Yusko-Kotimko, Tiffany (EGLE)
Cc:	Bolt, Jennifer (EGLE); Jackson, Heather (EGLE); Philip, Kris (EGLE); Pennington, Stephen (EGLE); Robinson, Krista (EGLE)
Subject:	Corrosion Control Treatment Facilities
Date:	Thursday, September 5, 2019 11:03:38 AM
Attachments:	CCT SDWIS Check.xlsx

As promised/warned yesterday, attached is a spreadsheet of all the systems that we believe have CCT and how that compares to SDWIS.

Please follow the instructions in the first worksheet labeled “Instructions”.

Thanks and let me know if you have any questions.

Let’s try and get this done by September 19th.

Thanks,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

Instructions for District Staff

The systems that are listed on the district tabs are those systems that SDWIS identified as having Corrosion Cc
Treatment (CCT) or are listed because we have verified them as having CCT (even though SDWIS Does not refl

The intent of this spreadsheet is to update SDWIS with all the proper CCT information.

Please take the time to go to your district tab and verify the information listed. If the system field is green the
saying that SDWIS is correct.

If the system field is red then we are saying SDWIS needs to be changed.

If the system field is yellow then we are saying we need to look into something further (for example: the type
phosphate being used).

If the system field is orange then they have CCT but SDWIS does not reflect it.

When you are reviewing this information, if you agree with what we are saying please use the drop box and se
"agree". Otherwise, select "disagree" and add a comment in the field to the right of the drop box.

We will be making all the changes to SDWIS centrally once each district has been reviewed.

Good as is
Needs to be fixed
Needs to be added
Needs to be checked

ontrol
ect it).

n we are

of

elect

From:	Sarkipato, Ernest (DEQ)
To:	momalley@cityofbentonharbormi.gov; dwatson@cityofbentonharbormi.gov; "Marcus Muhammad"
Cc:	Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Crider, Steven (DHHS); "Nicki Britten"; Lachance, Amy (DEQ); Bolt, Jennifer (EGLE); mike@michonline.net; "Todd Luks"; "tim@oudbierinst.com"; Oswald, Eric (EGLE)
Subject:	Corrosion Inhibitor Permit
Date:	Monday, February 25, 2019 3:40:32 PM
Attachments:	bh phosphate permit 199015.pdf 2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf

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Attached please find a DEQ permit to construct a corrosion inhibitor feed system at the water plant. This is a result of lots of effort from all parties involved. We believe the interim installation of the phosphate feed system is close at hand (see special conditions page 6), with the permanent installation occurring within the next couple months. My words of encouragement for the city are, keep juggling those balls but remember this one is the heaviest! The sooner this feed system is installed, the sooner public health protection is improved.

For your reference, the initial Action Level Exceedance (ALE) letter is attached as well. Please note, the timeline is mapped out for the City with some due dates coming up. A corrosion control treatment study is due to the DEQ by March 31, 2019, which will help optimize this installation to best prevent release of lead. In addition, please be prepared to conduct Lead and Copper tap sampling by June 30, 2019, and water quality parameters as noted in the letter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

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Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

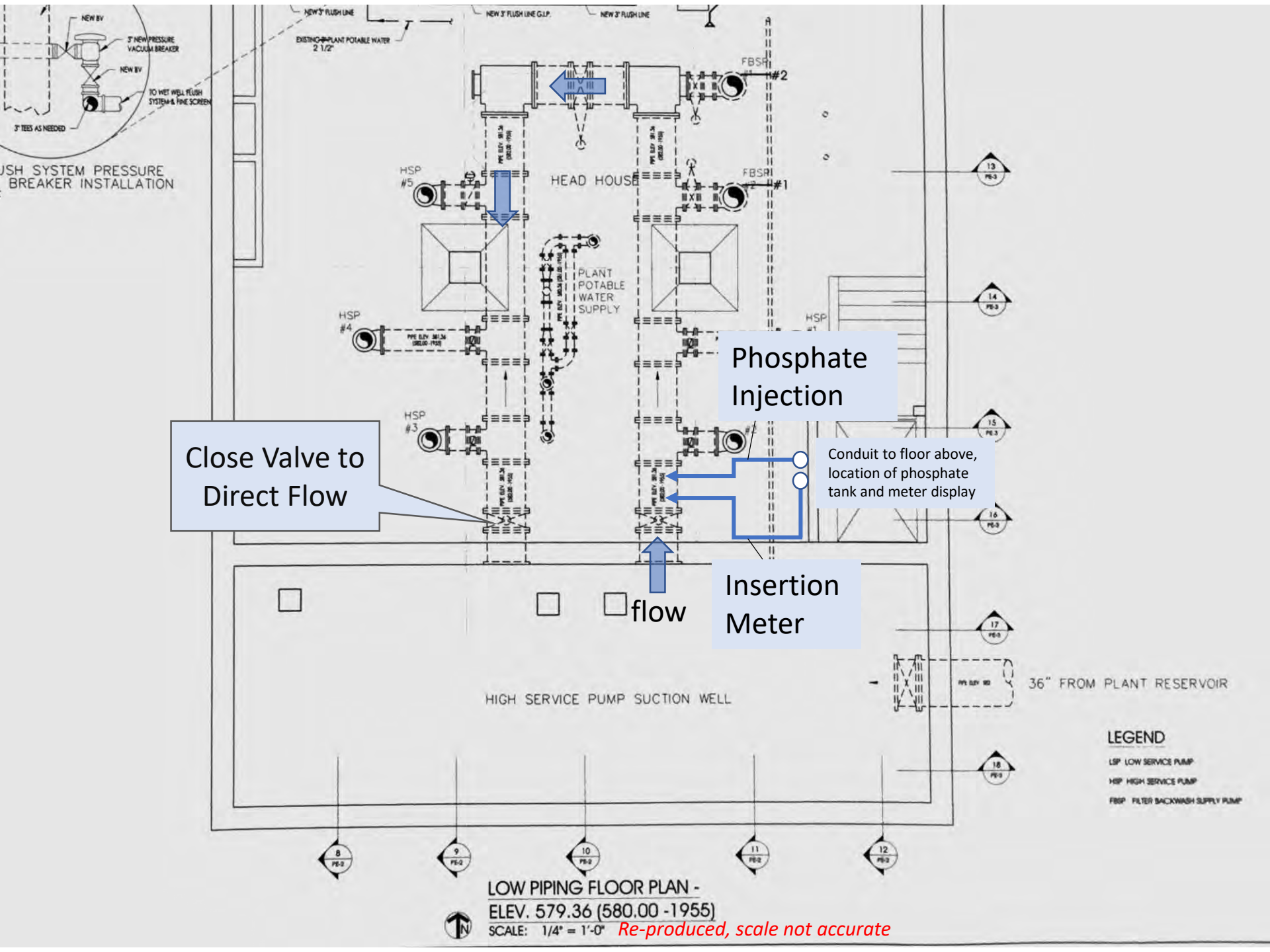
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

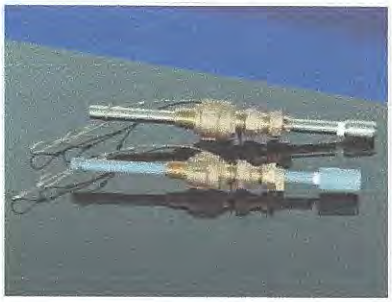
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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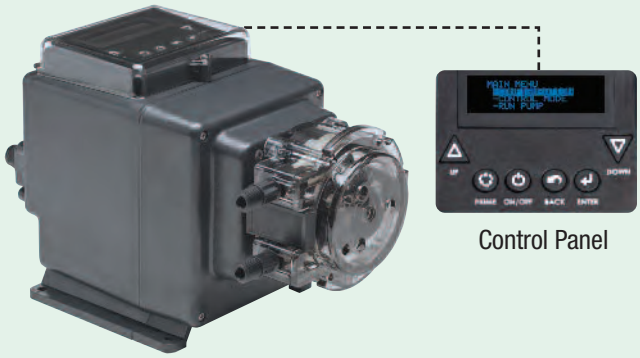
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

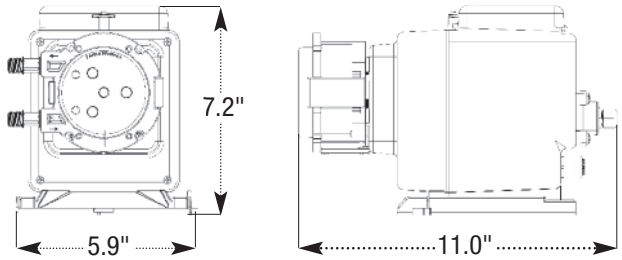
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

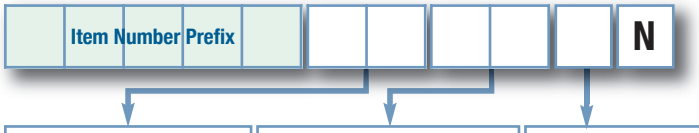
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

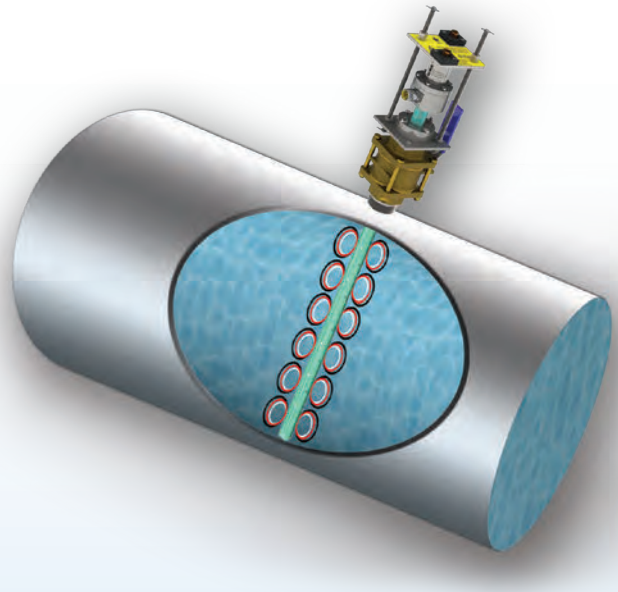
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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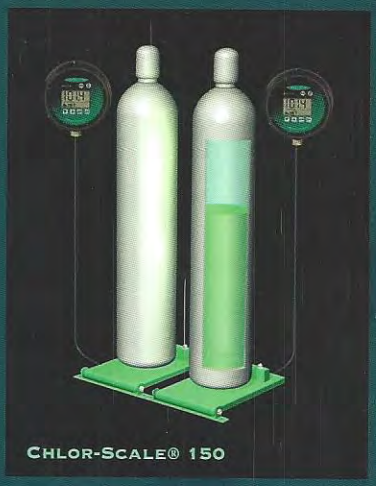
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

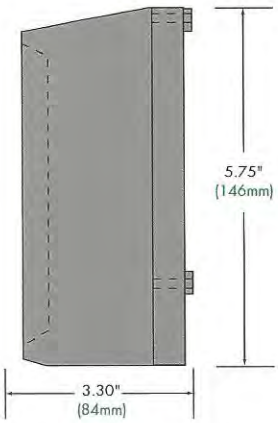
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

From:	Sarkipato, Ernest (DEQ)
To:	momalley@cityofbentonharbormi.gov; dwatson@cityofbentonharbormi.gov; Marcus Muhammad
Cc:	Onan, Brandon (DEQ); Bolf, Michael (DEQ); Thurston, Brian (DEQ); Crider, Steven (DHHS); Nicki Britten; Lachance, Amy (DEQ); Bolt, Jennifer (DEQ); mike@michonline.net; "Todd Luks"; tim@oudbierinst.com; Oswald, Eric (DEQ)
Subject:	Corrosion Inhibitor Permit
Date:	Monday, February 25, 2019 3:40:32 PM
Attachments:	bh phosphate permit 199015.pdf 2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf

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Attached please find a DEQ permit to construct a corrosion inhibitor feed system at the water plant. This is a result of lots of effort from all parties involved. We believe the interim installation of the phosphate feed system is close at hand (see special conditions page 6), with the permanent installation occurring within the next couple months. My words of encouragement for the city are, keep juggling those balls but remember this one is the heaviest! The sooner this feed system is installed, the sooner public health protection is improved.

For your reference, the initial Action Level Exceedance (ALE) letter is attached as well. Please note, the timeline is mapped out for the City with some due dates coming up. A corrosion control treatment study is due to the DEQ by March 31, 2019, which will help optimize this installation to best prevent release of lead. In addition, please be prepared to conduct Lead and Copper tap sampling by June 30, 2019, and water quality parameters as noted in the letter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

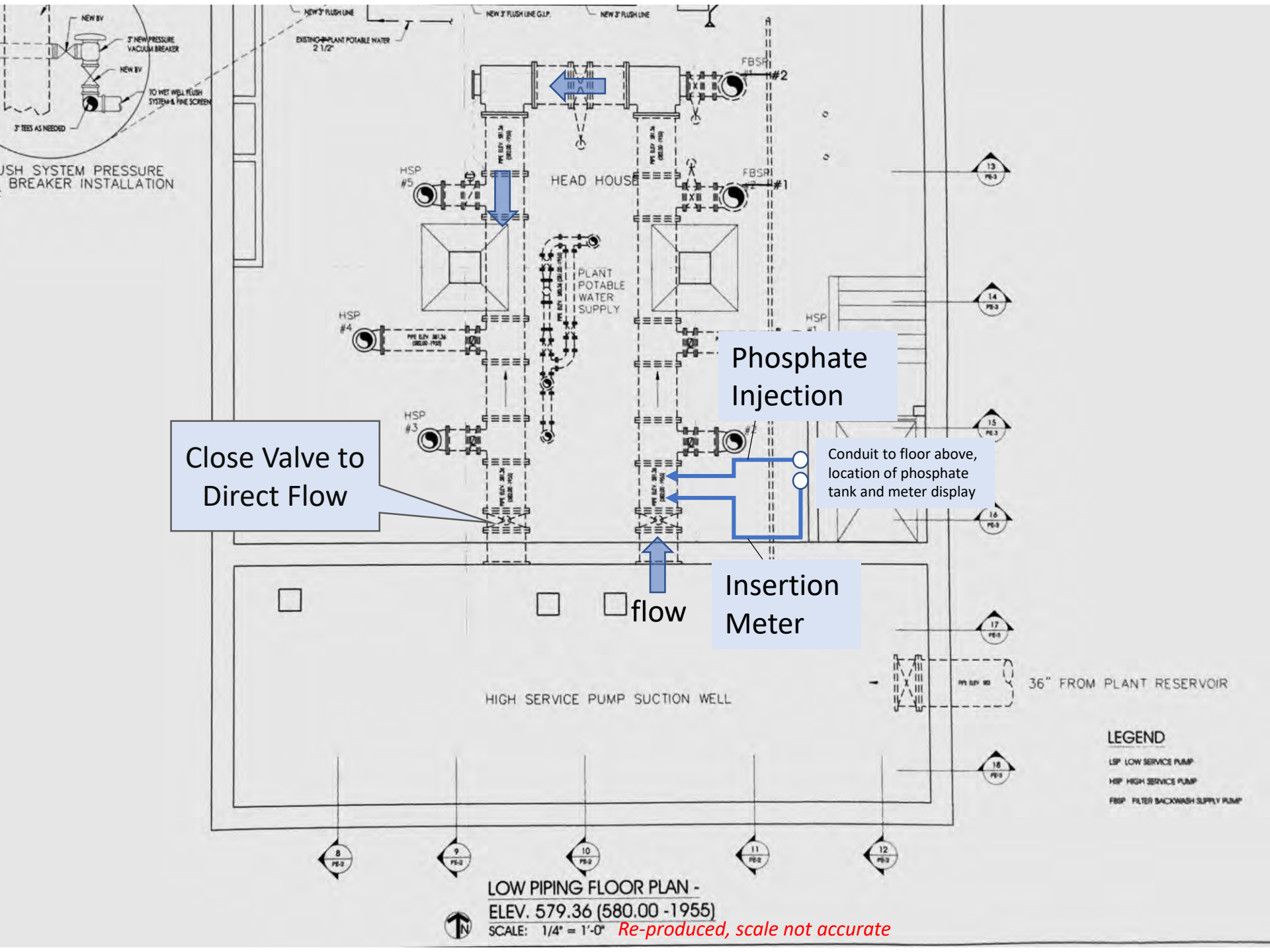
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

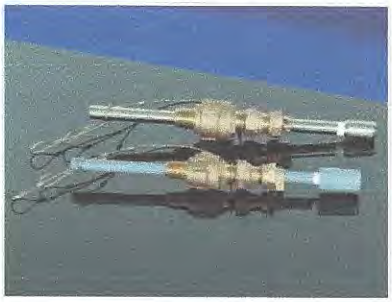
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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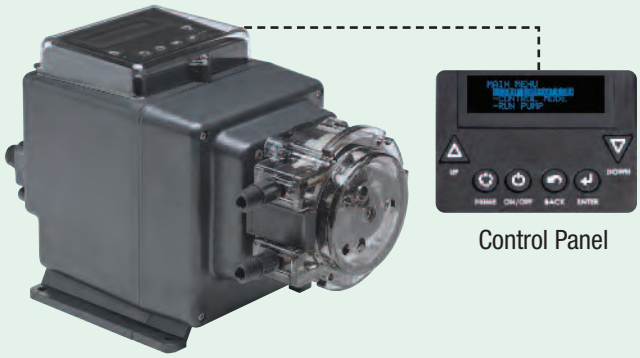
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

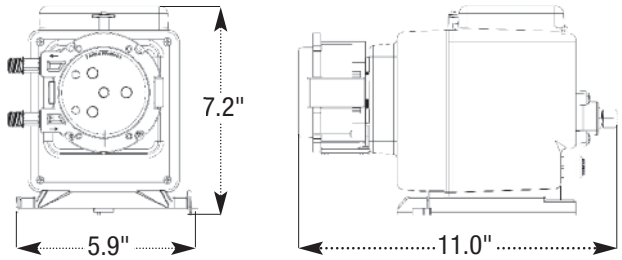
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

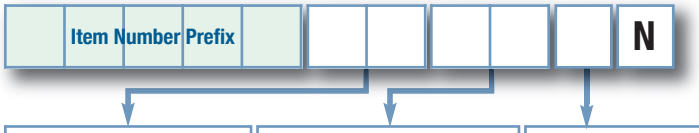
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

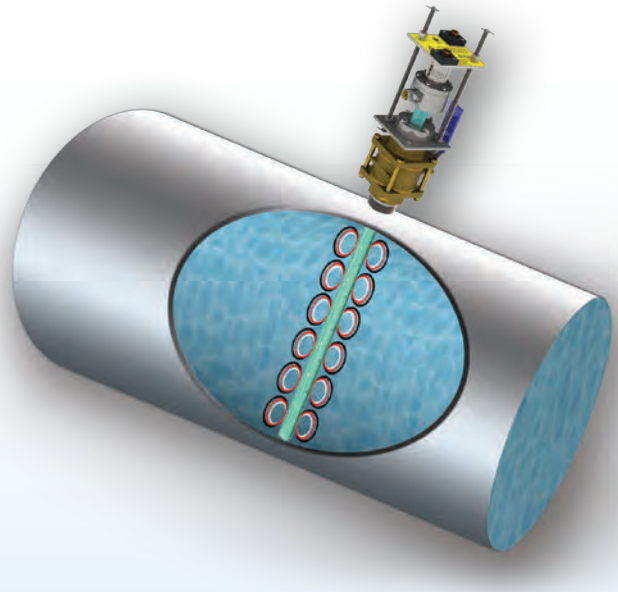
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

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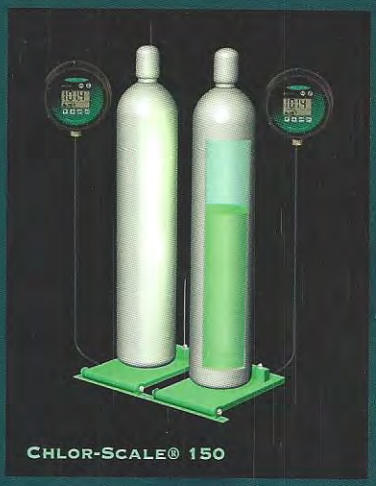
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

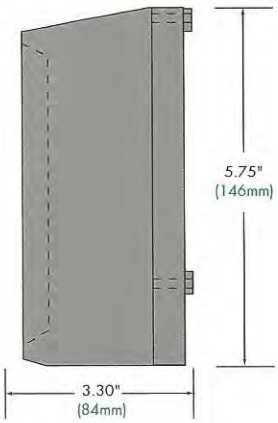
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

From:	Sarkipato, Ernest (DEQ)
To:	momalley@cityofbentonharbormi.gov; dwatson@cityofbentonharbormi.gov; Marcus Muhammad
Cc:	Onan, Brandon (DEQ); Bolf, Michael (DEQ); Thurston, Brian (DEQ); Crider, Steven (DHHS); Nicki Britten; Lachance, Amy (DEQ); Bolt, Jennifer (DEQ); mike@michonline.net; "Todd Luks"; tim@oudbierinst.com; Oswald, Eric (DEQ)
Subject:	Corrosion Inhibitor Permit
Date:	Monday, February 25, 2019 3:42:54 PM
Attachments:	bh phosphate permit 199015.pdf 2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf

---

Attached please find a DEQ permit to construct a corrosion inhibitor feed system at the water plant. This is a result of lots of effort from all parties involved. We believe the interim installation of the phosphate feed system is close at hand (see special conditions page 6), with the permanent installation occurring within the next couple months. My words of encouragement for the city are, keep juggling those balls but remember this one is the heaviest! The sooner this feed system is installed, the sooner public health protection is improved.

For your reference, the initial Action Level Exceedance (ALE) letter is attached as well. Please note, the timeline is mapped out for the City with some due dates coming up. A corrosion control treatment study is due to the DEQ by March 31, 2019, which will help optimize this installation to best prevent release of lead. In addition, please be prepared to conduct Lead and Copper tap sampling by June 30, 2019, and water quality parameters as noted in the letter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

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Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

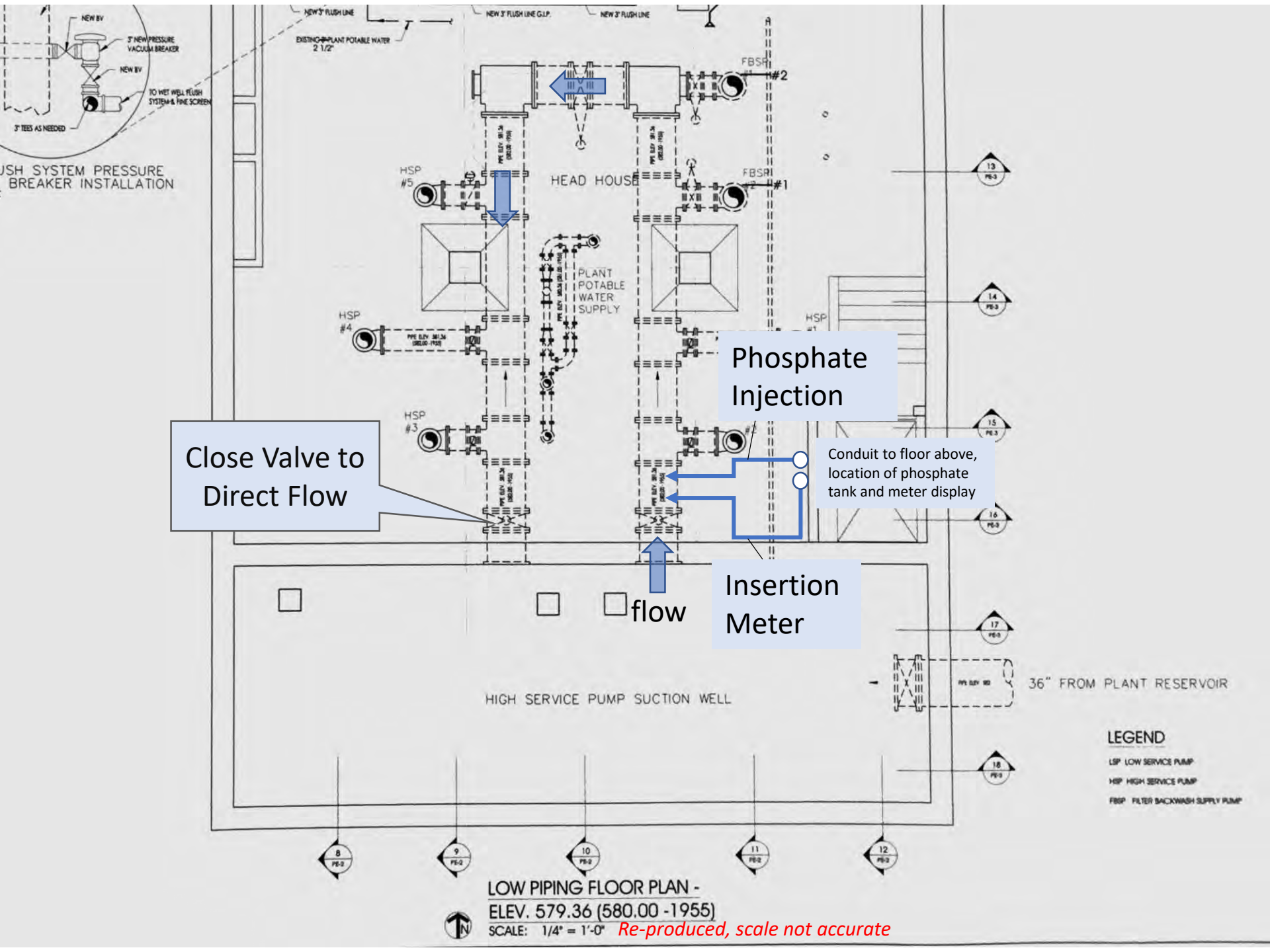
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

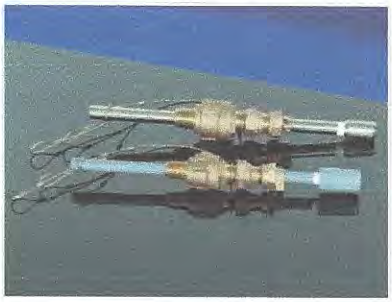
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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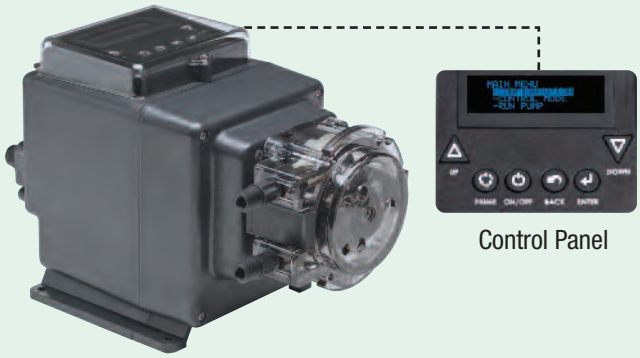
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

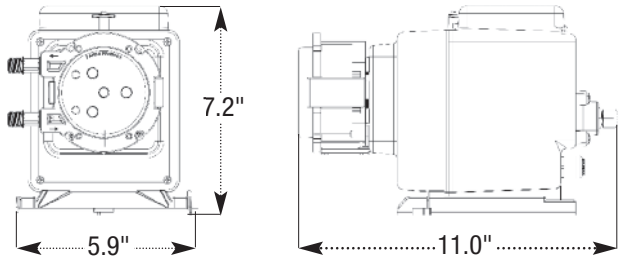
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

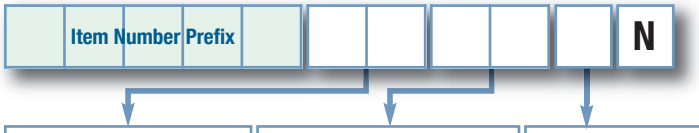
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

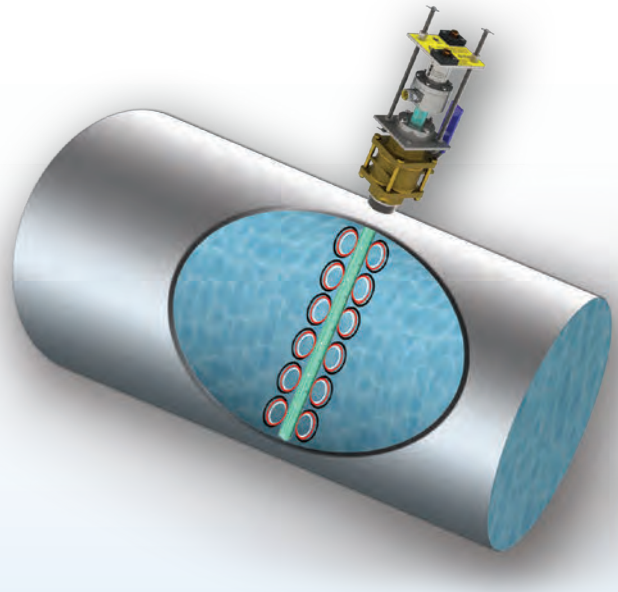
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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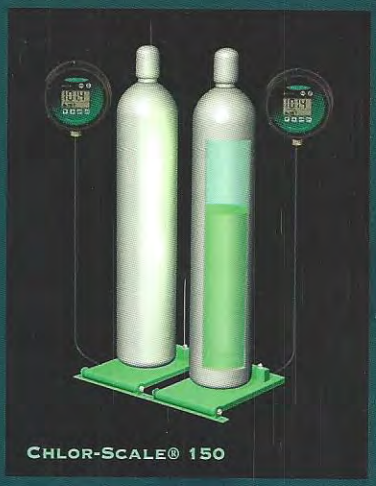
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

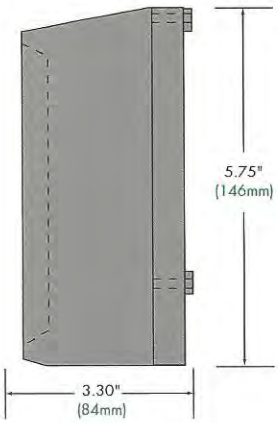
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; elhorneng@aol.com; Onan, Brandon (EGLE)
Cc:	Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE); mike@michonline.net; Bolt, Jennifer (EGLE)
Subject:	Corrosion Plan update, and miscellaneous
Date:	Tuesday, April 30, 2019 7:47:17 AM
Attachments:	deq-dwmad-cws-tsu-NonLSL_Sampling_Infographic_649018_7.pdf deq-dwmad-cws-tsu-LSL_Sampling_Infographic_649015_7.pdf MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

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Thank you for the quick phone call yesterday to discuss Elhorn's proposed corrosion control treatment plan for Benton Harbor (attached). Here's a summary of that, and the rest of our chat:
Corrosion Plan: Todd mentioned the attached corrosion treatment plan is a generic version he uses. We talked through the proposed series of events. Soon, sampling for water quality and lead and copper will begin at the racks. The next step is, the coupons will be pulled and tested after 90 days. Treatment adjustments will be made in-situ based on these initial results (assuming a good enough baseline is established), and this process should repeat for continued optimization. Currently, coupon racks are installed at the water plant and at city hall, both of which are treated tap water. We identified the benefit of having a treated water, pre-phosphate addition baseline rack installed at the water plant. Todd will look at options on Friday of this week when he is at the water plant. There was agreement on the phone this plan is acceptable.
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We recommend using the attached infographics to help residents sample the 5th liter correctly.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment Great Lakes and Energy
616-307-0261 mobile
www.michigan.gov/drinkingwater

1ST DRAW LEAD/COPPER SAMPLING INSTRUCTIONS

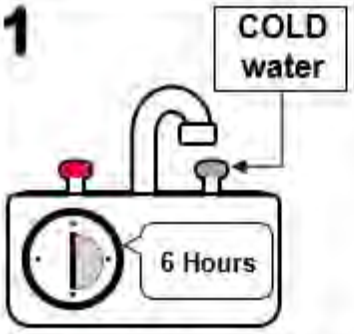
For Compliance Sampling at Sites Without Lead Service Lines

READ ALL INSTRUCTIONS BEFORE OPENING YOUR SAMPLE BOTTLE.

Please note: These sampling instructions are generic; the procedure and included materials may vary depending on which certified laboratory your water supply is using.

- The sample kit you will receive from your water supply may include various materials. Do not throw anything away unless otherwise instructed.
- Do not use any water in your house for at least six hours before you collect samples. The best time to sample may be first thing in the morning or after you return home from work.
- Only use a **cold-water** faucet in the **kitchen** or **bathroom** that is routinely used for drinking.
- If the faucet has a faucet-mounted filter, the device **must** be bypassed or removed before sampling.
- If your home has a water softener, iron removal filter, reverse osmosis system or other treatment device, contact your water supplier before sampling.

1

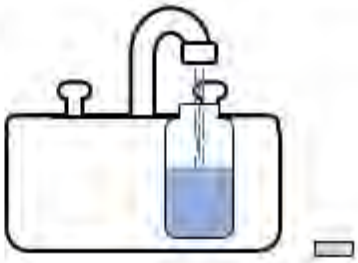


- Do not use any water in your house for at least 6 hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Open the bottle and do not touch the inside of the bottle or cap.

3



- Place bottle under the faucet.
- Turn on the **COLD water**.
- Fill the bottle to the neck, turn off the water, and tightly place the cap back on the bottle.

4

- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork please contact your water supply.

5

- Attach the form(s) to the bottle and arrange pick-up according to instructions provided by your water department.

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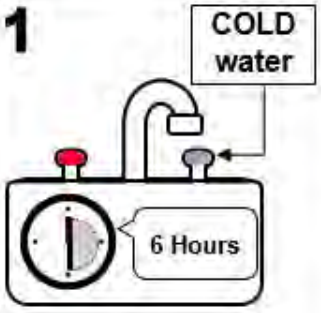
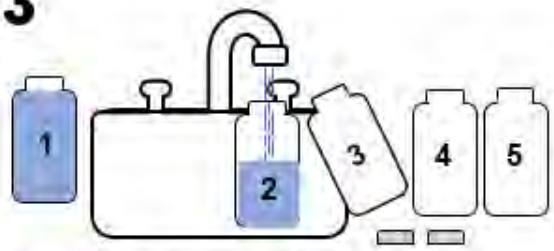


- Do not use any water in your house for at least six hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Set the bottles in order next to the kitchen or bathroom sink.
- Open the bottles and do not touch the inside of the bottle or cap.

3

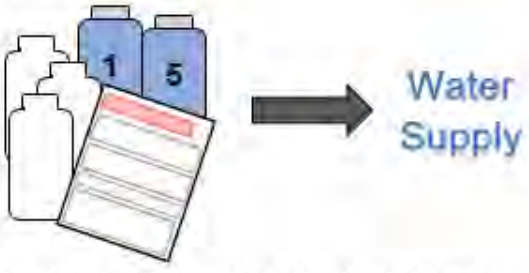


- Place Bottle 1 under the faucet.
- Turn on the **COLD water**.
- While Bottle 1 is filling, hold Bottle 2 next to Bottle 1.
- When Bottle 1 is **filled to the neck**, immediately move Bottle 2 under the stream of water.
- Repeat until all bottles are full. **Do not turn off water while filling the bottles**.

4

- Tightly cap Bottles 1 and 5 and pour out the remaining bottles.
- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork, please contact your water supply.

5



- Attach the form(s) to the bottle(s) and arrange pick-up according to instructions provided by your water department.

NOTE: Under the Michigan Safe Drinking Water Act, 1st and 5th liter samples are required for water supply compliance sampling at sites served by a lead service line.

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; elhorneng@aol.com; Onan, Brandon (EGLE)
Cc:	Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE); mike@michonline.net; Bolt, Jennifer (EGLE)
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Attachments:	deq-dwmad-cws-tsu-NonLSL_Sampling_Infographic_649018_7.pdf deq-dwmad-cws-tsu-LSL_Sampling_Infographic_649015_7.pdf MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

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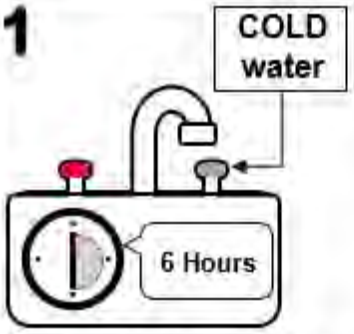

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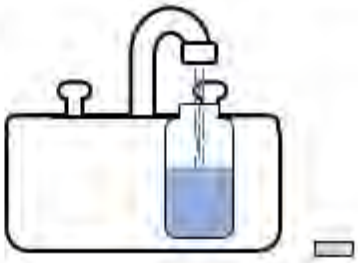
2

- Open the bottle and do not touch the inside of the bottle or cap.

3



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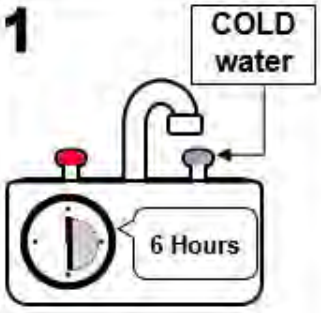

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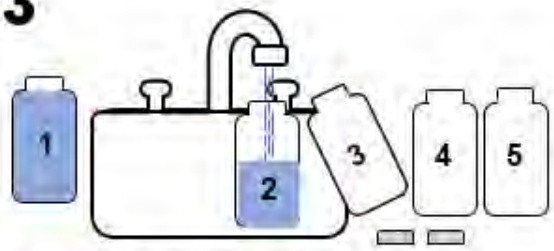

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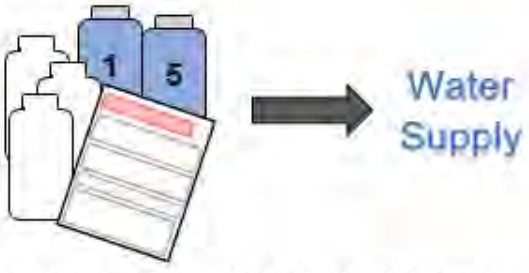

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MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

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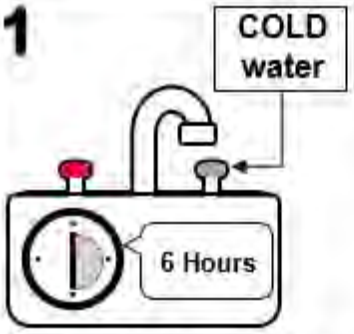

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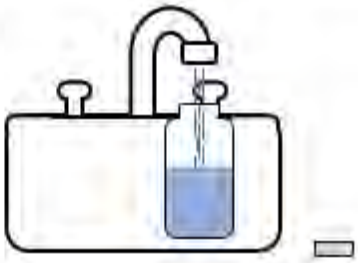

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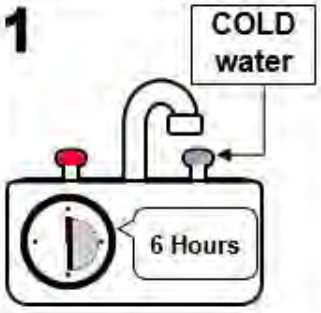

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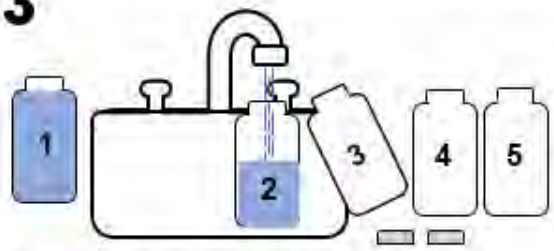

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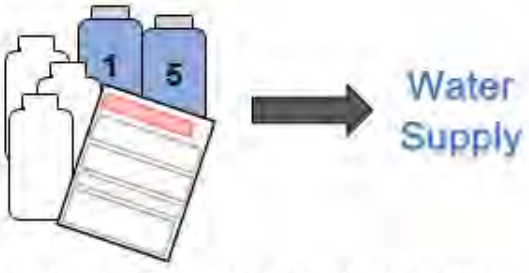

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MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

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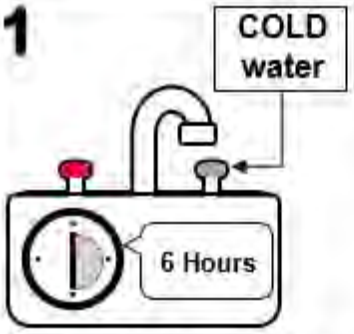

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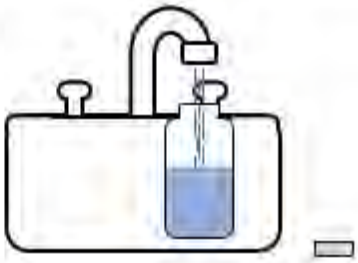

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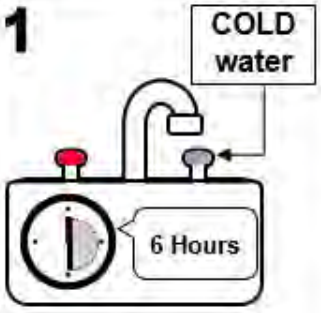

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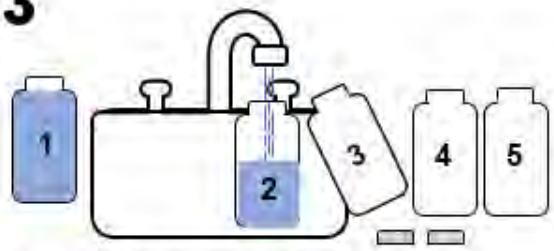

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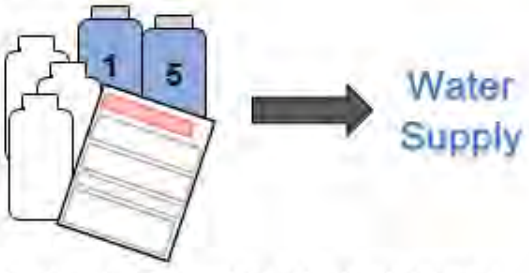

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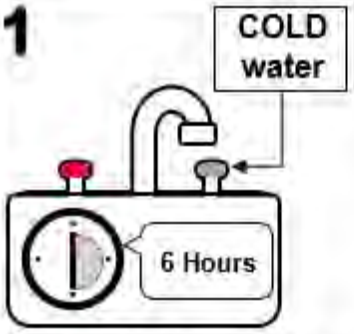

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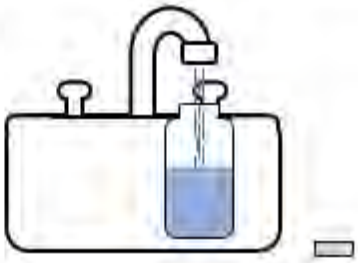

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1ST AND 5TH LITER LEAD/COPPER SAMPLING INSTRUCTIONS

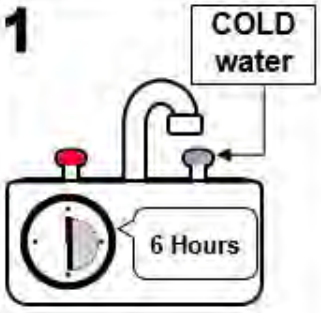
For Compliance Sampling at Sites with Lead Service Lines

READ ALL INSTRUCTIONS BEFORE OPENING YOUR SAMPLE BOTTLES.

Please note: These sampling instructions are generic; the procedure and included materials may vary depending on which certified laboratory your water supply is using.

- The sample kit that you will receive from your water supply may include various materials. Do not throw anything away unless otherwise instructed.
- Do not use any water in your house for at least six hours before you collect samples. The best time to sample may be first thing in the morning or after you return home from work.
- Only use a cold-water faucet in the kitchen or bathroom that is routinely used for drinking.
- If the faucet has a faucet mounted filter, the device must be bypassed or removed before sampling.
- If your home has a water softener, iron removal filter, reverse osmosis system or other treatment device, contact your water supplier before sampling.

1

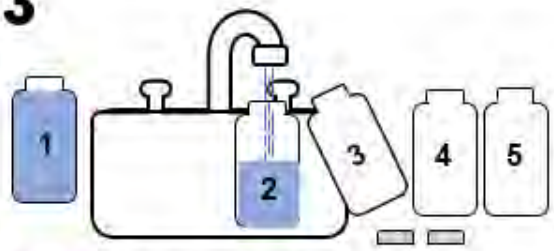


- Do not use any water in your house for at least six hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Set the bottles in order next to the kitchen or bathroom sink.
- Open the bottles and do not touch the inside of the bottle or cap.

3

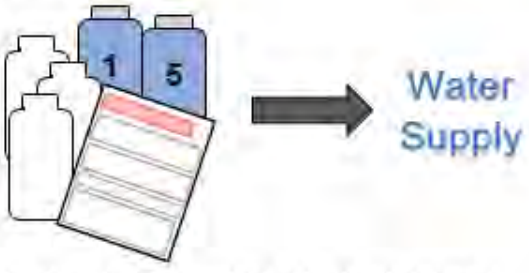


- Place Bottle 1 under the faucet.
- Turn on the **COLD water**.
- While Bottle 1 is filling, hold Bottle 2 next to Bottle 1.
- When Bottle 1 is **filled to the neck**, immediately move Bottle 2 under the stream of water.
- Repeat until all bottles are full. **Do not turn off water while filling the bottles**.

4

- Tightly cap Bottles 1 and 5 and pour out the remaining bottles.
- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork, please contact your water supply.

5



- Attach the form(s) to the bottle(s) and arrange pick-up according to instructions provided by your water department.

NOTE: Under the Michigan Safe Drinking Water Act, 1st and 5th liter samples are required for water supply compliance sampling at sites served by a lead service line.

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE); Onan, Brandon (EGLE); emitchell@bhcity.us; Mike O"Malley; elhorneng@aol.com; Darold Harlan; Lesia Osler
Cc:	Thurston, Brian (EGLE); rrice@bhcity.us
Subject:	Corrosion Study Plan Discussion
Date:	Friday, September 11, 2020 1:32:09 PM

Per the City's request, we agree to cancel this meeting to ensure the city manager can attend.

Roena, please confirm new date of Monday, September 14 at 1:00PM works for the City Manager and water team?

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Google Calendar on behalf of momalley@bhcity.us
To: dharlan@fv-operations.com; Bolf, Michael (EGLE); elhorneng@aol.com; Onan, Brandon (EGLE); momalley@bhcity.us; Sarkipato, Ernest (EGLE); Thurston, Brian (EGLE); rrice@bhcity.us; losler@bhcity.us; emitchell@bhcity.us
Subject: Corrosion Study Plan Discussion
Date: Friday, September 11, 2020 11:33:31 AM

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Ellis Mitchell cannot make this call and does not want to miss it.
I suggested we just cancel it.

This meeting is cancelled.

Enjoy your weekend!

Mike O'Malley
Benton Harbor Operator IN Charge.

Corrosion Study Plan Discussion

When: Fri Sep 11, 2020 2pm – 3pm Eastern Time - New York

Where: Microsoft Teams Meeting (map)

Who:
- Sarkipato, Ernest (EGLE) - organizer
- momalley@bhcity.us - creator
- elhorneng@aol.com
- emitchell@bhcity.us
- Lesia Osler
- Bolf, Michael (EGLE)
- Darold Harlan
- Onan, Brandon (EGLE)
- rrice@bhcity.us - optional
- Thurston, Brian (EGLE) - optional

Attachments: MI 0600 Benton Harbor Water Corrosion Plan for ACO (detailed).pdf

We would like to request a discussion with the City and Mr. Luks with Elhorn, regarding the detailed corrosion study plan (attached).

Join Microsoft Teams Meeting
+1 248-509-0316 United States, Pontiac (Toll)
Conference ID: 536 789 180#
Local numbers | Reset PIN | Learn more about Teams | Meeting options

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From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); emitchell@bhcity.us; elhorneng@aol.com
Cc:	Thurston, Brian (EGLE); rrice@bhcity.us; Bolf, Michael (EGLE); Mike O"Malley; Darold Harlan; Lesia Osler
Subject:	Corrosion Study Plan Discussion
Attachments:	MI 0600 Benton Harbor Water Corrosion Plan for ACO (detailed).pdf

Ms. Rice, please confirm this new date and time works for the City Manager.

Join Microsoft Teams Meeting <https://teams.microsoft.com/l/meetup-join/19%3ameeting_NjFkYjA4ZDItMTI0NC00MDRkLWE2MTItNTFjZTdjMjg2NDA2%40thread.v2/0?context=%7b%22Tid%22%3a%22d5fb7087-3777-42ad-966a-892ef47225d1%22%2c%22Oid%22%3a%22561a1a99-9d5a-4472-997b-f1120d804079%22%7d>

+1 248-509-0316 <tel:+1%20248-509-0316,,536789180#> United States, Pontiac (Toll)

Conference ID: 536 789 180#

Local numbers <https://dialin.teams.microsoft.com/95e14c4b-c14d-430f-a556-75831bdf54bf?id=536789180> | Reset PIN <https://mysettings.lync.com/pstnconferencing> | Learn more about Teams <https://aka.ms/JoinTeamsMeeting> | Meeting options <https://teams.microsoft.com/meetingOptions/?organizerId=561a1a99-9d5a-4472-997b-f1120d804079&tenantId=d5fb7087-3777-42ad-966a-892ef47225d1&threadId=19_meeting_NjFkYjA4ZDItMTI0NC00MDRkLWE2MTItNTFjZTdjMjg2NDA2@thread.v2&messageId=0&language=en-US>

MI 0600 Benton Harbor ACO 8/14 Corrosion Study (1)

7/28/20

CITY OF BENTON HARBOR-CORROSION STUDY PLAN

Purpose:

The purpose of this study is to determine optimum corrosion control treatment for the City of Benton Harbor water treatment plant. This study will utilize harvested Lead & Galvanized service line material from the cities distribution system and new copper in order to replicate lead service line replacement activities. The study will focus on "not only Lead" but all aspects of optimum corrosion control treatment. The study will be ran for a minimum of 6 months for initial result data to be compiled and a treatment technic plan be developed. A additional 6 month period will follow.

Pipe Loops:

Example of pipe loops attached. Five Test Loops will utilized. Each pipe loop will consist of 36" sections of Lead, Galvanized & Copper pipe. A 3/4" flow meter, 24 hour timer, solenoid switch, phosphate feed pump w/injection, tubing, valves and sample taps.

Pipe Loop Operation:

Each pipe loop will be run from a 24 hour timer to be used for 6 hour on/ 6 hours off operation. Flow will be maintained using valving set to less than 0.5 gpm when solenoid valve is opened.

Source Water Feed:

The water used will be from the finished water clear well prior to any phosphate feed on (4)four of the test loops. The fifth test loop will test finished water with current phosphate feed.

Products to be Tested:

The products to be tested and there particular blends are as follows:

1-TEST LOOP-SK-7661 Blended 10% Polyphosphate/ 90% Orthophosphate Current feed rate.
1-TEST LOOP-SK-7661 " " " @1.0-1.5ppm PO4
1-TEST LOOP-Carus 8600 Blend 30% Polyphosphate/ 70% Orthophosphate@1.0-1.5ppm PO4
1-TEST LOOP-Carus 8600 " " " @2.5-3.0ppm PO4
1-TEST LOOP-Carus 4105 36% Phosphoric Acid @2.5-3.0ppm PO4

Operation:

Daily oversight will be provided by the City of Benton Harbor staff. Oversight should consist of checking test loops daily for proper operating conditions; leaks, pipe failure, pump failure, electrical problems etc. Any failures of operation should be reported directly to Elhorn Company @517-676-3786. Minor issue's can be discussed for correct repair instructions.
Weekly visits from Elhorn Staff will commence upon study system startup.

Sample/Testing Schedule:

Benton Harbor staff to provide daily PO4 residual testing on all test loops! Reagents will be provided by Elhorn Company for additional testing. Elhorn Company will collect weekly WQP samples & First Draw L/C samples from each test loop. Samples will be delivered to Carus Corporation for analysis. Each sample will be tested for: Hardness, Orhtophosphate, Iron, Manganese, pH, Langelier, Temperature, Alkalinity, Calcium, Chloride, Conductivity, TDS, Sulfate, Polyphosphate & Total phosphate, Lead, Copper.

Section Pieces:

The section pieces will be individually weighed prior to installation on the pipe loop. The pieces will consist of 2 sections each of lead, galvanized & copper pipe. Rubber fernco style fittings will hold pieces in place during operation. After a minimum of 90 days 1 section of each type of material will be carefully removed from the loop system. A unknown drying time will be determined for each piece and then re-weighed upon dried weight. Section pieces will then be sent to Carus Lab for analysis of film development.

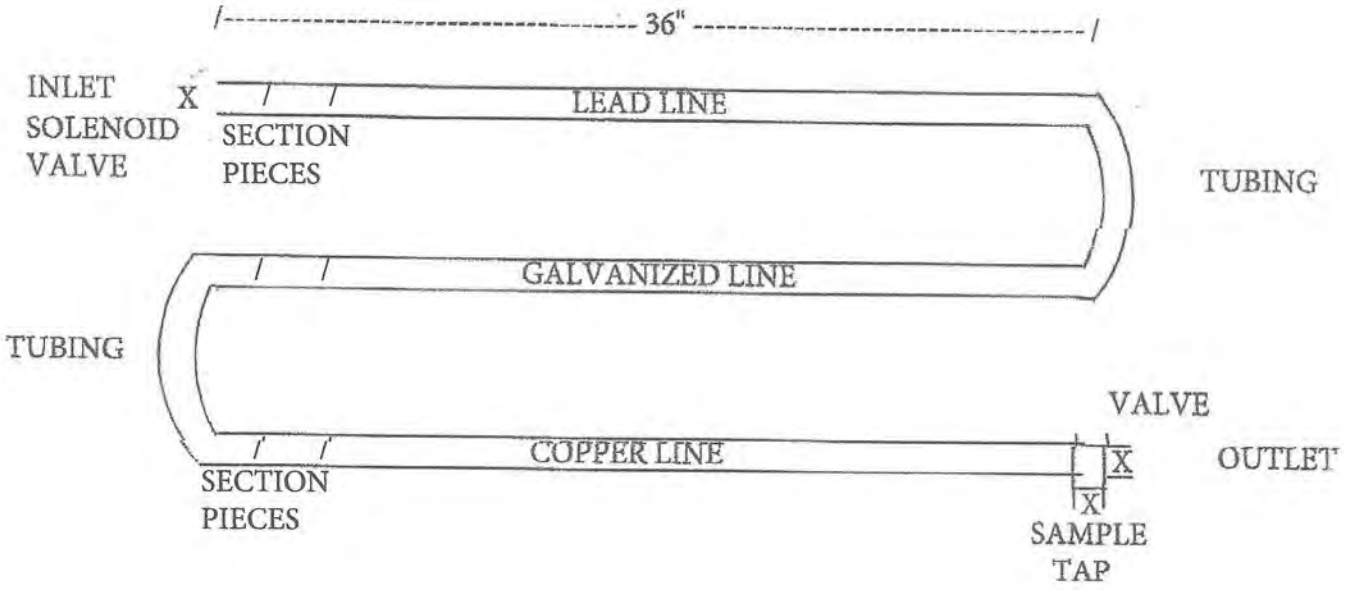
This same procedure will take place with the 2nd section piece of each material after a minimum of 180 days.

Completion of Results:

All results will be compiled into several spread sheets and graphs to determine a optimal corrosion treatment plan. The plan will depict the best overall treatment product and dosage rates concerning the City of Benton Harbor Water Treatment Plant.

Acc Reply Corrosion study (3)

PIPE LOOP LAYOUT



Inlet will consist of 3/4" water meter and solenoid valve for on & off operation. Flow will be 0.5 gpm for 6 hours on / 6 hours off. 24 hour timers will be used for on/off operation. Timers will be setup based on operator scheduling for weekly sampling requirements.

From:	Elin Betanzo
To:	Oswald, Eric (EGLE); Krisztian, George (EGLE); Philip, Kris (EGLE); Thurston, Brian (EGLE); Cyndi Roper; Nicholas.Leonard; Charlotte Jameson
Subject:	DW Quarterly Meeting follow up
Date:	Monday, March 15, 2021 8:01:20 AM

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hi Eric, George, Kris, and Brian,

Thank you so much for the informative quarterly meeting that you hosted on March 5. The updates from your department were helpful, and the time for open dialogue was great.

There were a few items that we discussed at the meeting where you said you'd be able to follow up with information, so I wanted to summarize that here to make it easy for you. Here are a few things that we discussed that I'm looking forward to seeing:

- a list of communities that have asked for a LSLR time extension
- a copy of the RFP for the statewide corrosion control guidance contract, the number of applicants, and if awarded, the company who got the award
- a redacted copy of MDHHS sequential sampling data from a LALE community
- a copy of the Benton Harbor Corrosion Control study RFP
- a copy of the TMF guidance that you shared on the call but Teams was causing problems

Also, I'm trying to find where EGLE advertises these RFPs, but I haven't had any luck yet. Can you please share this information? I know there are more coming up that I'm interested in seeing.

--
Elin Warn Betanzo
Safe Water Engineering, LLC
@SafeWaterEng, www.safewaterengineering.com
248-326-4339

From:	Elin Betanzo
To:	Oswald, Eric (EGLE); Krisztian, George (EGLE); Philip, Kris (EGLE); Thurston, Brian (EGLE); Cyndi Roper; Nicholas.Leonard; Charlotte Jameson
Subject:	DW Quarterly Meeting follow up
Date:	Monday, March 15, 2021 8:02:05 AM

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--
Elin Warn Betanzo
Safe Water Engineering, LLC
@SafeWaterEng, www.safewaterengineering.com
248-326-4339

From: Shawn Glynn
To: Sarkipato, Ernest (EGLE); Ellis Mitchell
Cc: Blair Selover
Subject: EGLE Benton Harbor Minutes 2021 03 23.pdf
Date: Tuesday, March 30, 2021 3:04:39 PM
Attachments: EGLE Benton Harbor Minutes 2021 03 23.pdf

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The information contained in this message and any attachment may be proprietary, confidential, and privileged or subject to the work product doctrine and thus protected from disclosure. If the reader of this message is not the intended recipient, or an employee or agent responsible for delivering this message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify me immediately by replying to this message and deleting it and all copies and backups thereof. Thank you.

MEETING MINUTES

Project Name:	Benton Harbor — Water Distribution System Services
Project Number:	712320
Meeting Date:	March 23, 2021
Re:	Benton Harbor Operations
Copy:	Michigan Department of Environment, Great Lakes, and Energy (EGLE) Ernest Sarkipato, Michael Bolf City of Benton Harbor Ellis Mitchell, Alex Little, Angela Story, Benton Harbor City Commission, Daniel McGinnis, Darel Rice, Darlene Jones, Demetris Meeks, Kimberly Thompson, Lesia Osler, Lisa Golliday, Michael Clark, Roena Rice Plante Moran Rhonda Hildebrand Abonmarche Chris Cook, Jason Marquardt F&V Operations and Resource Management, Inc. (FVOP) Blair Selover, Robert Jones, Darold Harlan, George Regan, Catherine Winn, Bill Dustin, Shawn Glynn

1. Issued an NOV; likely missed a sampling during the O'Malley transition; get low detects from Lake Michigan
2. March 22, had a small leak in the NE Highland area from normal construction activity
   - **2.1.** Leak was adjacent to main yet to be replaced
   - **2.2.** Unsure if services were on line
     - **2.2.1.** Residents were notified when they were back in service
     - **2.2.2.** Need to be extra diligent on resident communications if there is an interruption in service
     - **2.2.3.** Residents need to flush systems once repairs are complete
     - **2.2.4.** There will be less forgiveness when the tower is down
3. Darold Harlan will attend meeting with Watts Water March 24
   - **3.1.** Discussed start of valve turning
   - **3.2.** Should postpone until tower is back on line
   - **3.3.** John Marquardt: Isolated hydrant repairs, flow testing, valve repairs
   - **3.4.** Should wait until tower is back on line

2960 Lucerne Drive SE; Ste. 100
Grand Rapids, MI 49546
P: 616.588.2900
F: 616.977.1005
www.fv-operations.com

3.5. Darold will discuss concerns; Seven Brothers indicated back on line at end of April the earliest

3.6. Ernie needs to see details to see if there is an overlap of the Sanitary Survey, some items may justify closing some of the ACO

3.7. Jim will send details to Ernie

4. Need an electrician on site for the 4160

4.1. Darold to confirm details

4.2. Rob Jones spoke with Power by Peerless in preparation

4.2.1. Will be the City's responsibility to coordinate the electrician

4.2.2. Water tower project is growing and becoming more in depth

4.3. Darold not sure who typically does electrical

4.3.1. Ellis to check with Meeks

4.3.2. Rufus may have subcontractor pay history

4.3.3. Ellis to assign point person

4.3.4. Meeks to look into Bowden

4.3.5. Ernie found Mead and White from O'Malley's email history

4.3.6. Tom doing flow pace integration on site last week with the 4160

4.3.7. Cannot have just anyone; must be properly insured

4.3.8. Check with Jason M

5. Roof Leaks

5.1. Jason to call Ernie with 2009 roofing contract/old plan information

5.2. Third leak discovered

5.2.1. Lack of signal back to Operators

5.2.2. Darold found an inch of water at the bottom of the panel; hoping to have fixed before March 25

5.2.3. This is in newest portion of the building; one of many leaks

5.2.4. Roof may still be under warranty

5.2.5. Ellis to have Lisa follow up with insurance; Jason to check on warranty

6. Intake Crib

6.1. Jason sent drawings to Ernie

6.2. Video of the intake and crib relevant/sent back

6.2.1. Diver comments make sense based on plans

6.2.2. City could shop for diver/repair contractors or use the current diver

6.2.3. Default would be to hire current diver and move forward

6.2.4. Cath could get other quotes

6.2.5. Ellis thinks it may be best to have the current diver complete the repairs

6.2.6. Ellis to have current diver move forward

6.2.7. Jason will set up meeting and formally request his services

6.2.8. Jason to ask about changing materials out

- **6.2.9.** Worth the $400; plastic or fiber that muscles cannot stick to
- **6.2.10.** Emergency risers and check valves
- **6.2.11.** Need clarification from Ellis to install one-way relief valve on emergency risers
- **6.2.12.** Provide info/locate emergency risers
- **6.2.13.** Summary during intake work
- **6.2.14.** Evaluate valve topic at later date

7. FVOP Site Visits

- **7.1.** FVOP to provide staffing update to Ernie
- **7.2.** Rob Jones currently M-T
- **7.3.** Cath Winn
- **7.4.** Darold Harlan M-F
- **7.5.** Ernie to provide list of certified F-1 operators to Blair
- **7.6.** EGLE supervisors are protective of staff; Blair would like home addresses
- **7.7.** Ernie losing Shannon to the wastewater group/internal poaching

8. Ernie would like to prevent amended SOP

- **8.1.** Need Doug and Denny to look at to understand

9. Lead and Copper Sampling

- **9.1.** Exceedance
- **9.2.** Certified that documents were sent properly to inform public
- **9.3.** Ernie to send documents to Lisa or Ellis to certify
- **9.4.** Making headway on corrosion study

10. EPA Grant Meeting March 24

- **10.1.** Need to get bid out for proposals
- **10.2.** EPA to clarify and issue bid
- **10.3.** Corrosion Optimization Study
- **10.4.** Kevin Kazinksy going into homes to sample lead and copper
- **10.5.** Seeing much lower numbers in recent testing
- **10.6.** Must have two successful samples below action level to lift the sampling requirements
- **10.7.** Would be great if that could be accomplished by second half of 2021

11. Alum Sludge Disposal

- **11.1.** Ellis needs Ernie's assistance with sludge testing before the landfill will accept the sludge
- **11.2.** At the mercy of the landfill — if they request testing, we must comply
  What tests are they requiring
- **11.3.** Ellis to send Meeks' land fill contact information to Ernie
- **11.4.** Sludge removal
  - **11.4.1.** Darold thinks removal could take place while tower is down
  - **11.4.2.** Possible that Benton Harbor staff could remove the sludge

12. Floc Rehab

- **12.1.** Sludge valve on south side has been ordered
- **12.2.** Plate separator/mixer was approved for purchase
- **12.3.** Waiting for quote for installation
- **12.4.** Have quote from Grand Rapids Cummings dealer to examine generator
  - **12.4.1.** Diesel fuel treatment
  - **12.4.2.** Battery check
  - **12.4.3.** $700 to condition diesel fuel to make useable for running generator
- **12.5.** Electrical
  - **12.5.1.** Can it run under a load
  - **12.5.2.** $2,000 for maintenance, check
  - **12.5.3.** Thinks the generator ran under load previously
  - **12.5.4.** Designed to run all five pumps
  - **12.5.5.** Needs load test
  - **12.5.6.** Motors and pumps need to sync with the generator

13. March 24 EPA Meeting

- **13.1.** Ernie to attend
- **13.2.** Wants to confirm the flow of information with Abonmarche and Blue Conduit
- **13.3.** Jason planning update call with Blue Conduit next week
- **13.4.** Group update planned for week of April 12
- **13.5.** Jason to coordinate meeting with Blue Conduit for update
- **13.6.** EPA wants to ensure Benton Harbor isn't double dipping
- **13.7.** Blue Conduit role is to fill out systems
- **13.8.** Abonmarche and Benton Harbor have enough information to satisfy EPA
- **13.9.** Per Jason, not combining funds for any reason
- **13.10.** 864 Pipestone
- **13.11.** Different contractors/contracts run differently
- **13.12.** Ernie will support regulatory side
- **13.13.** Clarify with EPA regarding money in the City's accounts

14. Community Forum Meeting

- **14.1.** Zoom, March 31, 3:00 p.m.
- **14.2.** Discussing water leak pilot grants
- **14.3.** Lisa Ozler will be managing
- **14.4.** Abonmarche discussing construction
- **14.5.** Lead, ACOs, and treatments will be discussed
- **14.6.** Operator from FVOP should attend
- **14.7.** Less likely to be grandstanding during Zoom

14.8. Chance to give a 2-minute rant

14.9. Agenda

14.9.1. Welcome

14.9.2. Nina

14.9.3. Abonmarche

14.9.4. Reverend Pinkney/lead sampling

14.9.5. Berrien County Health Department

14.9.6. State Health Department

14.9.7. Q&A (20 minutes)

14.10. Ernie concerned about lack of public participation

14.11. Jason attending Friday planning meeting

14.12. Commissioner is on the invitation

14.12.1. Engaged and active

14.12.2. Not usurping groups' ability to progress

14.13. Ellis planning to attend planning meeting

15. Cath working on status of lab this week

16. Intake Inspection

16.1. Not broad supporter/denied

16.2. Did not bother with chlorine feed for muscles

16.3. Hired yearly cleaning service

16.3.1. Effective at keeping muscles at bay

16.3.2. Big expense

16.3.3. Concerns regarding water quality

16.4. Can pipe be sized for either chemical

16.5. What are the other chemical options

16.5.1. Sodium Hypochlorite

16.5.2. Phosphate to prevent plating

16.5.3. New line on outside of pipe would be expensive

16.5.4. 24-inch line may be able to do an internal line

16.5.5. Line is clooged, not broken

16.5.6. Halo falling apart

These minutes are my understanding of the items discussed and the decisions made. Please notify me of any comments, concerns and/or corrections within five business days, otherwise these minutes will be considered an accurate record of the meeting.

F&V OPERATIONS AND RESOURCE MANAGEMENT, INC.

Blair Selover
Group Manager | Principal

Cc: All Attendees

From:	Sarkipato, Ernest (EGLE)
To:	mmuhammad@cityofbentonharbormi.gov
Cc:	emitchell; momalley@cityofbentonharbormi.gov; rrice; Darold Harlan; nbritten@bchdmi.org; Sasy, Ninah (EGLE); Strong, Regina (EGLE); Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Oswald, Eric (EGLE); Ruch, Suzann (EGLE); Thurston, Brian (EGLE); Krisztian, George (EGLE); Crider, Steven (DHHS)
Subject:	EGLE Letter to Benton Harbor - Amended ACO
Date:	Wednesday, March 25, 2020 9:21:24 AM
Attachments:	00600 City of Benton Harbor Transmittal Letter-Amended ACO-extensions -03-20-20-FINAL-signed.pdf 00600 City of Benton Harbor First Amended ACO-399-07-2019-final.pdf Exhibit A - Extensions Summary.pdf

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Mr. Mayor,

I hope this email finds you well, during this trying and difficult time for our society as a whole. I had a chance to speak with Mr. Mitchell this week amid the chaos, regarding EGLE's intention to renew the Administrative Consent Order with the City of Benton Harbor. While the city's progress thus far has been largely due to the operations staff significant efforts, many of the remaining items cannot be resolved through their effort alone and require coordination and collaboration at the highest levels of City government. We are committed to pursuing those discussions, and are full partners in the goal of improving the city's capacity to operate the water system independently and in compliance with Act 399.

The letter and amended ACO are now accompanied by a timeline presenting the history of extensions for completion (not sent last week). We encourage your staff to meet internally to discuss this and reach out to request a phone meeting to discuss the matter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE)
Sent: Friday, March 20, 2020 4:57 PM
To: mmuhammad@cityofbentonharbormi.gov
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; momalley@cityofbentonharbormi.gov; rrice@cityofbentonharbormi.gov; Darold Harlan <dharlan@fv-operations.com>; nbritten@bchdmi.org; Ninah Sasy (EGLE) (SasyN@michigan.gov) <SasyN@michigan.gov>; Strong, Regina (EGLE) <StrongR1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Ruch, Suzann (EGLE) <RuchS@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>
Subject: EGLE Letter to Benton Harbor - Amended ACO

Dear Mayor Muhammad,

Please find attached a letter that is intended to provide an update on the Administrative Consent Order (ACO) between the State of Michigan and the City of Benton Harbor, and seek a renewed effort to address remaining items. Your staff has accomplished much over the last 18 months, especially considering the additional challenges they have faced. At this time, we would like to open discussion around a revised ACO to address the remaining items, as you will see in the enclosed

documents.
We sincerely appreciate any opportunity to discuss with matter with you and your staff, and expect to fully participate in the search for resolutions to the remaining ACO items. Given our restrictions on meeting in person, it may be best to schedule a group phone call after you've discussed the letter internally. With that said, this matter is of extreme importance to us as well as you, and we are committed to also meeting in person when the time comes.

A hard copy of the letter and attachment will follow next week, although due to reduced staffing levels in the office due to COVID-19, it may be delayed some time. Please do not hesitate to reach out with your initial questions and concerns,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

March 20, 2020

VIA EMAIL

The Honorable Marcus Muhammad, Mayor
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

Dear Mayor Muhammad:

SUBJECT: Water System Administrative Consent Order Progress, Failure to Meet Deadlines, Proposed First Amended Administrative Consent Order
WSSN: 00600

The city of Benton Harbor (City) entered into an Administrative Consent Order (ACO) with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on March 5, 2019, as a result of a 2018 sanitary survey of the City's water system. EGLE discovered numerous Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), deficiencies and noted a lack of financial and managerial capacity to maintain a water system according to the requirements of Act 399. The compliance schedule of the ACO contained 14 action items, outlined in 13 separate paragraphs, and a schedule for completion of these items, which were mutually agreed to upon entering the ACO. As the signatory of the ACO for the City, this letter provides an update of the City's progress on meeting the compliance requirements.

As shown in the attached Exhibit A, ACO Compliance Timeline Progress Summary, seven (7) of fourteen (14) items have been completed. The progress is a result of significant effort and funding required to make these necessary improvements. EGLE applauds the City for its effort in closing these deficiencies. Among the items completed were hiring a distribution operator, installing a chlorine analyzer, and moving the feedpoint location of a critical treatment chemical (coagulant). These items have improved the protection of public health in the City's drinking water system.

Many of the items have, however, also been delayed (some multiple times) and seven (7) remain incomplete. EGLE understands the need for extensions and has given City staff ample opportunity for input on the compliance schedule. Extensions of the timeline are allowed under Section 4.14 of the ACO, which outlines the process for requesting extensions. The remaining items include submitting a rate collection plan, implementing rate adjustments, updating and implementing the cross-connection control program, additional water plant improvements, and general maintenance of the water distribution system including valves, hydrants, and the elevated storage tank.

These outstanding deficiencies have significant implications on public health protection. For example, EGLE found the City's cross-connection control program to be marginal in 2011,

deficient in 2015, and significantly deficient in 2018. There has not been adequate progress in this program to protect public health from the risk of accidental backflow. Another example, the financial ability of the City to operate the water system in compliance with Act 399, is fundamentally dependent on having adequate rates. Further, collection of rates requires an organized plan and persistent effort. A rate collection plan was recently submitted and determined to be insufficient, and the rate study conducted in 2017 has demonstrated a significant need for more revenue to fund water system operations and necessary upgrades.

A factor likely contributing to the slow progress addressing the ACO activities is the management structure of the water system. The repeated monitoring violations for lead and copper, internal and external communication challenges, and inactive cross-connection control program could be improved with an enhanced management structure such as the addition of a Utility Services Director. An effective water system management structure enables the identification of priorities, the establishment of an annual budget, the allocation of resources, a communication link between operations and city management, and the oversight of the water system works to ensure successful projects. To help address continued concerns over managerial capacity, EGLE is requesting the City to conduct an independent study of the City's technical, managerial, and financial (TMF) capacity, including the organizational structure and staffing levels of the water system. This study should identify needs for the water system staffing, and an implementation plan to improve the managerial capacity and the City's ability to return to compliance with Act 399. In the interim, EGLE requests that the City make efforts to fill the position of Utility Services Director. This position will be an interface with the City manager's office and water department, and can help coordinate the above TMF study, as well as meeting the ACO compliance timeline.

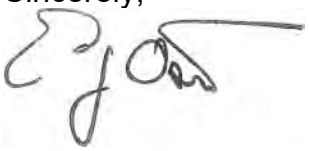
In order to provide protection of public health and restore the necessary TMF capacity to operate the water system, **EGLE requests the City submit a final compliance timeline for EGLE's approval by April 30, 2020**. In order to ensure there is proper support and funding for the remaining items and to ensure full disclosure and support from all City officials, the timeline must be adopted by resolution of the City commission. Please accept EGLE's offer to present information to the City commission as necessary to support this effort. Until a resolution is passed and the associated compliance schedule is proposed, no further extensions will be granted. A proposed amended ACO is attached to this letter, which eliminates completed requirements of Section II - Compliance Schedule, of the ACO, and incorporates some additional issues that have arisen since the original ACO was entered. EGLE looks forward to meeting with the City to work out a schedule to bring the City back into compliance as soon as possible.

There is one (1) item from Section II, Compliance Schedule, of the ACO that was recently submitted past the compliance schedule deadlines. The rate collection plan submitted by electronic communication on January 29, 2020, was determined to be inadequate to satisfy the ACO compliance requirement and was twenty-nine (29) days past the twice-extended deadline of December 31, 2019. As a result, **the City is being assessed a civil fine of $500 under Section 1.3 of the ACO for failure to complete corrective actions. EGLE is**

willing to allow the application of the fine to go toward completing the work required in the ACO, subject to EGLE approval.

EGLE understands the difficult nature of correcting some of these deficiencies, and all the efforts made thus far to maintain and improve the public water supply for the city of Benton Harbor. We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me below, or contact Ernie Sarkipato by telephone at 616-307-0261; by e-mail at SarkipatoE@Michigan.gov; or EGLE, Drinking Water and Environmental Health Division, 350 Ottawa Avenue N.W., Unit 10, Grand Rapids, Michigan 49506.

Sincerely,



Eric J. Oswald, Director
Drinking Water and Environmental Health Division
517-284-6544
OswaldE1@Michigan.gov

Attachment
cc: Mr. Mike O'Malley, Water Superintendent, City of Benton Harbor (via email)
Mr. Ellis Mitchell, City Manager, City of Benton Harbor (via email)
Mr. Darold Harlan, Distribution Operator, Fleis & Vandenbrink (via email)
Ms. Nicki Britten, Health Officer, Berrien County Health Department (via email)
Ms. Ninah Sasy, Clean Water Public Advocate, EGLE (via email)
Ms. Regina Strong, Environmental Justice Public Advocate, EGLE (via email)
Mr. Mike Bolf, EGLE (via email)
Mr. Ernie Sarkipato, EGLE (via email)
Ms. Maureen Nelson, EGLE (via email)

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8408		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
FACILITY OWNER IF NOT IDENTIFIED ABOVE Ellis Mitchell, City Manager			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
COUNTY Berrien			
CONTACT NAME Ellis Mitchell, City Manager	PHONE # 269-927-8408		

Executive Order 2019-06, signed by Governor Gretchen Whitmer on February 20, 2019, renamed the Michigan Department of Environmental Quality (MDEQ) as the Department of Environment, Great Lakes, and Energy (EGLE). Effective April 22, 2019, a reference to the MDEQ will be deemed a reference to EGLE. After April 22, 2019, a reference to the Director of the MDEQ will be deemed to be a reference to the Director of EGLE. The Drinking Water and Municipal Assistance Division (DWMAD) was renamed the Drinking Water and Environmental Health Division (DWEHD). A reference to the DWMAD will be deemed a reference to the DWEHD and a reference to the Director of the DWMAD will be deemed to be a reference to the Director of the DWEHD.

Administrative Consent Order (ACO) ACO-399-07-2019, entered on March 5, 2019, between EGLE, the DWEHD, and the city of Benton Harbor (City), is hereby amended as follows. Upon the consent of the parties and by the authority granted to EGLE by the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder it is hereby agreed and ordered:

COMPLIANCE SCHEDULE

Paragraphs 2.1(a), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from AACO-399-07-2019:

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the submittal of the Asset Management Plan, dated December 2017; however, the second portion of Paragraph 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

2.2 Upgrade the water plant supervisory control and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water. (This requirement was completed as part of the corrosion control treatment project).

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 31, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

Paragraphs 2.1(b), 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.1 (b) **Not later than December 31, 2020**, the City shall **begin** implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system in compliance with Act 399.

2.7 **Not later than May 1, 2020**, the City shall submit to EGLE an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.8 **Not later than March 31, 2020,** the City shall submit to EGLE, for review and approval, an updated cross-connection program. The updated cross-connection program shall incorporate the City's plan to include residential accounts in the program, and a notification schedule to EGLE of the City obtaining adequate personnel to implement the City's cross-connection control program.

2.10 **Not later than July 31, 2020**, the City shall submit to EGLE, for review and approval, a plan for inventorying and ongoing maintenance of distribution valves and hydrants. The plan must address fixing known broken valves and hydrants, as well as preventative maintenance of valves and hydrants.

2.11 **Not later than December 31, 2020**, the City shall conduct professional inspections of the City's water system's elevated tank, or complete the repairs and upgrades recommended during the 2008 Dixon inspection as included in the City's asset management program dated December 2017.

2.12 **Not later than August 1, 2020**, the City shall complete installation of a working mussel feed control system at the intake.

2.13 **Not later than December 31, 2020**, the City shall repair filter to waste valves at the water plant, and train operators on their use.

The following paragraphs shall be added to Section II, Compliance Schedule:

2.14 **Not later than September 30, 2020**, the City shall submit to EGLE, for review and approval, a complete technical, managerial, and financial (TMF) capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City's water system. In compliance with Act 399. the City shall contract with a qualified consultant to complete the TMF study. The TMF study scope shall include identification of the necessary staffing structure, and the required funding, to operate the system in compliance with Act 399. The TMF study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments.

To address any gaps in the necessary staffing levels identified by the TMF study and the current staffing levels, the TMF study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and enforcement of the City's water system. **Beginning every six (6) months from the date EGLE approves the TMF, the City shall submit a signed statement describing the City's progress** toward completing its plan to achieve TMF capacity.

2.15 **Not later than June 1, 2020,** the City shall post a position to hire a Utility Services Director for the City. The City shall notify EGLE of the posting within forty-eight (48) hours of it being posted.

2.16 **Not later than August 3, 2020**, the City shall fill the position of Utility Services Director, either by hiring a contractor or an employee of the City.

2.17 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory, or a laboratory certified by EGLE, or by the United States Environmental

Protection Agency for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to EGLE in a timely manner. MCL §325.1007 also authorizes EGLE to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.18 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this First Amended Administrative Consent Order, except as specifically prescribed in this document. The effective date of this First Amended Administrative Consent Order shall be the date upon which the DWEHD Division Director of EGLE signs this document.

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

_____
Eric J. Oswald, Director
Drinking Water and Environmental Health Division

_____
Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

_____
Marcus Muhammad, Mayor

_____
Date

EXHIBIT A

ACO Compliance Timeline Progress Summary for City of Benton Harbor

Item	Initial Deadline	Extended Deadline	Extension History
Submit a rate study	4/1/19	(completed)	
Upgrade SCADA system for data access and storage	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Install continuous chlorine analyzer on WTP tap	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Corrosion Treatment Study	4/1/19	(completed)	
Distribution Operator in charge	4/1/19	(completed)	1-from 4/1/19 to 5/1/19 2-from 5/1/19 to 5/22/19
Permit and Construct coagulant feed to existing rapid mix	6/1/19	(completed)	1-from 6/1/19 to 8/2/19
Submit plan to implement rate increases	4/1/19	7/1/20	1-from 4/1/19 to 9/30/19 2-from 9/30/19 to 7/1/20
Install flow meter on finished water	4/1/19	12/15/2019 (completed)	1-from 4/1/19 to 6/15/19 2-from 6/15/19 to 9/30/19 3-from 9/30/19 to 12/15/19
Submit updated rate collections plan	5/1/19	12/31/19	1-from 5/1/19 to 9/30/19 2-from 9/30/19 to 12/31/19 ***Deadline not met***
Updated cross connection program including residential accounts	6/1/19	3/31/20	1-from 6/1/19 to 12/31/19
Submit maintenance plan for valves and hydrants	6/1/19	6/30/20	1-from 6/1/19 to 9/30/19 2-from 9/30/19 to 6/30/20
Conduct professional inspection of water tower, or conduct cleaning and repaint interior	6/30/19	12/31/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 12/31/20
Install/repair mussel control system at intake	6/30/19	4/1/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 3/1/20
Repair filter to waste valves	1/31/20	9/1/20	1-from 1/31/20 to 9/1/20

From: MI Dept. of Environment, Great Lakes, and Energy
To: Thurston, Brian (EGLE)
Subject: EGLE Office of the Clean Water Public Advocate launches Benton Harbor Water Outreach Task Force
Date: Friday, March 26, 2021 2:18:12 PM

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FOR IMMEDIATE RELEASE
March 26, 2021
EGLE Media Office, EGLE-Assist@Michigan.gov, 517-284-9278

EGLE Office of the Clean Water Public Advocate launches Benton Harbor Water Outreach Task Force

State, local, and community partners continue to work together to provide additional outreach opportunities in Benton Harbor

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) Office of the Clean Water Public Advocate announced today the creation of the Benton Harbor Water Outreach Task Force. The task force will provide regular updates about water outreach efforts and work to identify and remove lead service lines.

On March 31, 2021, the Benton Harbor Water Outreach Task Force will host a virtual Community Forum. Task force partners will provide updates about water testing, availability of free water filters to City of Benton Harbor residents and lead service line replacement, as well as other resources available to residents, including the Water Leak Pilot.

Members of the task force include a representative from the City of Benton Harbor, the Benton Harbor Community Water Council, Berrien County Health Department, Andrews University, Freshwater Future, and the Benton Spirit Community Newspaper. The task force will be supported by the Office of the Clean Water Public Advocate, EGLE, and the Michigan Department of Health and Human Services. Additional community partners will also be added in the future to help support the work of the task force.

“Through the efforts of the task force, we will continue to build a mechanism for collaboration benefiting Benton Harbor residents and ultimately serving as a roadmap for other communities impacted by water quality concerns,” Sasy said. “I’m looking forward to a number of additional outreach events this year to ensure that Benton Harbor residents have access to water filters, updates about lead service line replacement and access to additional water resources like our Water Leak Pilot.”

The Water Leak Pilot in Benton Harbor is part of the Office of the Clean Water Public Advocate’s Focus on Water Initiative that brings together multi-sector partners to support community efforts and connect resources to address water concerns. Approximately 100 Benton Harbor residents will be the first in the state to benefit from the new initiative and receive free in-home plumbing repairs as well as free WaterSense faucet fixtures donated by KOHLER Co. and distributed by ETNA Supply, a Michigan family-owned business.

Michigan residents can find information about communities with current lead action level exceedances (ALE) by visiting Michigan.gov/MILeadSafe. Elevated lead levels were first discovered in Benton Harbor during routine testing in 2018 and residents were advised how to protect themselves by taking actions ranging from running their water in the mornings prior to first use to obtaining a lead reducing water filter. The Berrien County Health Department has been providing free filters to residents with funding from the Michigan Department of Health and Human Services.

Although Benton Harbor has constructed updates at its water treatment plant, much of the city’s water distribution system is around 100 years old. Several water mains and lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents.

Benton Harbor installed corrosion control treatment technology at its water plant in March 2019 to reduce the amount of corrosivity in the water and has begun the process of replacing an estimated 3,000 lead service lines still in service. The city has also increased the monitoring of lead and copper in drinking water. Benton Harbor is

now sampling twice as many homes as it did previously and has increased the testing frequency to every six months instead of every three years. The increased testing will help measure the effectiveness of the corrosion control treatment in lowering lead levels.

“It’s important that we work together to make sure to get this work done,” said Reverend Pinkney who leads the Benton Harbor Community Water Council. “I am happy to be part of the task force and continue to serve Benton Harbor community residents.”

Residents interested in participating in the Community Forum should visit Michigan.gov/CleanWater for a link to the virtual webinar. Residents interested in the Water Leak Pilot should visit Michigan.gov/WaterLeakPilot. For more information about the Office of the Clean Water Public Advocate visit Michigan.gov/CleanWater.

###

Mask Spread Hope

EGLE COVID-19 RESPONSE:
For details on EGLE's work during the pandemic, visit our COVID-19 response webpage. Follow state actions and guidelines at Michigan.gov/Coronavirus.

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This email was sent to thurstonb@michigan.gov using GovDelivery Communications Cloud on behalf of: Michigan Department of Environment, Great Lakes, and Energy · Constitution Hall · 525 West Allegan Street · PO Box 30473 · Lansing, MI 48909 · 800-662-9278

From:	Sarkipato, Ernest (EGLE)
To:	emitchell@bhcity.us; Joelle Regovich; Chris J Cook; Mike O"Malley; Courtney Davis; Darold Harlan; Darel Rice; Lesia Osler; tjennings@bhcity.us; Michael McDaniel; Sasy, Ninah (EGLE)
Cc:	Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Subject:	EPA Grant for BH
Date:	Thursday, October 29, 2020 2:55:00 PM
Attachments:	image001.png 2020-05-29 Complete Submitted Application Package.pdf

Good afternoon all,

Congrats on the successful grant application for EPA-OW-OGWDW-19-01! It seemed like a good time to touch base on various ongoing efforts by different groups that might intersect with this project. Overall, I'll make the observation that the full request amount of $15M was only partially awarded, so many activities will need to drop off. Moving forward, I'm happy to volunteer to participate in meetings to help plan this work and coordinate efforts.

LSL removal – The city is required to begin replacing LSL per Michigan Lead and Copper Rule starting in 2021, and we also have a deadline of a verified DSMI by 1/1/2025.

-Suggest we utilize the efforts underway by Mike McDaniel to help with the inventory process in the application. A proper inventory will be very important, especially with ongoing sampling requirements for the ALE.

-Suggest we coordinate with the water leak pilot and energy conservation study ongoing with Ninah Sasy's office of Clean Water Public Advocate

Corrosion Treatment – The city has selected Todd Luks and Elhorn engineering to conduct the required corrosion optimization study, the cost of which was included in the grant application. EGLE has been in conversations directly with Mr. Luks, which are ongoing.

Private Property Sign-offs – Abonmarche and Kalin Construction appear to be going through this right now for the ongoing WM construction. Their experience will help inform the future LSL removals under this grant, as this can be a significant hurdle especially for rental properties.

Filter Distribution – BCHD/Courtney Davis have been doing an excellent job of accomplishing filter distribution, even during a pandemic!

Outreach and education – A group of folks has organized to meet and discuss aspects of public outreach and information, including BCHD and Ninah's office.

Thanks for reading, I'm sure we are all excited to see this project get going in the planning phase!

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

LET'S STAY SAFE TOGETHER

www.michigan.gov/drinkingwater

LET'S **STAY SAFE** TOGETHER

Joelle Regovich

From: Tracy Jennings <tjennings@cityofbentonharbormi.gov>
Sent: Friday, May 29, 2020 2:04 PM
To: Joelle Regovich
Subject: Fwd: GRANT13119222 Grants.gov Agency Tracking Number Assignment for Application

Here you go

---------- Forwarded message ---------
From: <DoNotReply@grants.gov>
Date: Fri, May 29, 2020 at 1:44 PM
Subject: GRANT13119222 Grants.gov Agency Tracking Number Assignment for Application
To: <mclark@cityofbentonharbormi.gov>
Cc: <tjennings@cityofbentonharbormi.gov>

Grantor agency has assigned the following Agency Tracking Number to your application: fdaaeca1-96fa-4d72-b4c8-8214a6c6d400GRANT13119222.

You will need the Agency Tracking Number when corresponding with the Grantor agency about your application.

Use the Grants.gov Tracking Number at Grants.gov to check your application's status and to review your Agency Tracking Number.
Type: GRANT
Grants.gov Tracking Number: GRANT13119222
UEI: 0589621920000
AOR name: michael r clark
Application Name: City of Benton Harbor Lead Service Lines Replacement Project
Opportunity Number: EPA-OW-OGWDW-19-01
Opportunity Name: Reduction in Lead Exposure Via Drinking Water
https://apply07.grants.gov/apply/login.faces?cleanSession=1

Thank you.
Grants.gov
If you have questions please contact the Grants.gov Contact Center:
support@grants.gov
1-800-518-4726
24 hours a day, 7 days a week. Closed on federal holidays.

PLEASE NOTE: This email is for notification purposes only. Please do not reply to this email for any purpose.

--
PLEASE NOTE the NEW telephone number

Tracy-Ann Jennings | tjennings@cityofbentonharbormi.gov
Director, Community and Economic Development
City of Benton Harbor | 200 E. Wall St. | Benton Harbor, MI 49022
P:(269) 204-2776 (Direct) or (269) 927-8400 ext. 8472 | F: (269) 927-0480
www.bhcity.us

U.S. Environmental Protection Agency (EPA)
Office of Water, Office of Ground Water and Drinking Water
Funding Opportunity: Reduction in Lead Exposure Via Drinking Water
Funding Opportunity Number: EPA-OW-OGWDW-19-01
Catalog of Federal Domestic Assistance (CFDA) Number: 66.443

Project Title: City of Benton Harbor Lead Service Lines Replacement Project

National Priority Area: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements

Name of Applicant: City of Benton Harbor

Key Personnel and Contact Information:

Ellis Mitchell, City Manager, emitchell@cityofbentonharbormi.gov, 269-927-8457

Mike O'Malley, Benton Harbor Water Superintendent, momalley@cityofbentonharbor.gov 269-927-8471, option 2

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Project Cost:

Federal Fund Grant Request: $14,842,995.30

Non-Federal Match: $1,649,221.70

Total Project Cost: $16,492,217.00

B. Executive Summary

The project will address EPA National Priority Area One: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements.

Benton Harbor's water distribution system is about 100 years old with much of the original infrastructure still in use, including water mains and service lines. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents. The City of Benton Harbor triggered an action level exceedance (ALE) for lead when the regularly scheduled testing in 2018 discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the action level of 15 parts per billion (ppb) for lead in water. Follow-up sample rounds in 2019 confirmed the presence of lead, and the ALE continues to present. To reduce lead exposure to residents, the city will replace all residential lead service lines within the City of Benton Harbor, estimated to be 2,383 lines. Service lines will be replaced with ¾" to 1" copper piping from the main to the home's service connection (both public and private portions).

Replacing known lead hazards in Benton Harbor drinking water will significantly improve the health and safety of over 9,800 residents in a listed disadvantaged community. It will modernize and update aging water infrastructure, providing safe and reliable water delivery for all ages and future generations.

The city has also installed corrosion control treatment following the 2018 ALE, however an optimization study has not yet been completed. A study to optimize the corrosion treatment will help ensure long term stability and reduction of lead throughout the water system. This project includes funding for an optimization study.

As part of public outreach regarding the project, an increased number of residents will have information about lead in drinking water, its harmful effects and steps to take to mitigate risk. A group of state and local stakeholders was recently formed to develop strategies for public outreach on issues regarding drinking water in the city.

The project will create a trackable, accurate GIS database of city infrastructure materials not previously recorded, which will update and upgrade the existing materials inventory.

Project outcomes include an overall reduction in lead exposure and associated health risks in the community through reduction of sources of lead in drinking water systems via infrastructure improvements.

C. Work Plan

1. National Priority Area

a. Approach. The project will address National Priority Area One: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements.

A recent Pilot grant assessment of service line material in the city indicated 87% of residential lines had lead either at the city-owned or privately-owned side. To reduce lead exposure to residents, the proposed project will replace all residential lead service lines within the City of Benton Harbor, estimated to be 2,383 lines. Service lines will be replaced with ¾" to 1" copper piping from the main to the home's service connection (both public and private sides).

The project will also complete an Optimization Study for the existing corrosion control treatment (CCT) to minimize dissolution of lead and copper into drinking water without compromising other health-related water quality goals.

The City of Benton Harbor Water Department provides service to over 9,800 city residents, who are predominately low income. 2018 ACS data for the community indicates a demographic profile of 10.4% White, 85.6% Black, 4.9% Hispanic or Latino, and 0.2% Asian. Neighboring communities of Benton Harbor Township and City of St. Joseph have their own, separate water supplies.

At the beginning of the 20th century, the City of Benton Harbor was a thriving commercial center and popular recreation destination. Over 54 industries provided manufacturing jobs in the region. By the 1950 census, the city population had reached 18,796 residents, nearly double the city's current number. Between 1970 and 1985, thousands of jobs were lost due to closing or downsizing of local manufacturing plants. The city unemployment rate consistently exceeded twenty-five percent during that period and more than twenty percent of families were living below the established poverty level. Absentee landlords and low-income residents combined to result in deteriorating neighborhoods. Retail activity downtown evaporated. Businesses closed or left the city, drastically reducing its tax base. Beginning in 1982, the Michigan Department of Commerce ranked Benton Harbor as the state's most distressed community.

The city continued to struggle financially throughout the 1990s to early 2000s. In February 2010, Michigan Governor Granholm declared a financial emergency in Benton Harbor and in March, a state panel named an emergency financial manager to run the city. State officials reported that Benton Harbor's financial troubles included a deficit that had been growing by double digits, a pension plan underfunded by $10 million, and the city requesting an emergency infusion of cash from the state to make its payroll.

In order to reduce deficits, the city workforce was roughly halved, shrinking from roughly 120 employees in 2010 to 60 in 2014. This was achieved through a mixture of layoffs, service outsourcing and budget cuts. In 2014, the City's finances had improved to a point

where the emergency financial manager could recommend transition to a state-appointed receivership advisory board. The City's accumulated deficit had been eliminated, expenditures were reduced substantially, and the City made 100-percent of its annual pension payments for the first time in a decade.

In July 2016, the state of Michigan fully relinquished oversight of Benton Harbor, following a recommendation from a state-appointed receivership transition advisory board. This now allows the City to manage operations and finances without oversight.

This long financial struggle for the area continues to have impact. 2018 census.gov figures list Benton Harbor MHI at $20,232, with 46.9% of persons in poverty. Rental homes make up 68% of housing in the city, making its rental percentage the highest of all surrounding communities. The 2017 median home value in the city was $49,200. Many neighborhoods have vacant properties and/or blighted homes. With a limited tax base, and many areas to improve, the cost burden of replacing all lead service lines in the city per Michigan Lead and Copper rules is high. The health burden of replacing them only as limited funds allow, under known Action Level Exceedance (ALE) conditions, is even higher.

The state of Michigan has demonstrated that the City of Benton Harbor meets their disadvantaged affordability criteria as determined by its Drinking Water State Revolving Fund program as shown in its 2020 Intended Use Plan. The City has included a letter requesting a reduced cost share/match of 10% in this grant application.

Funding assistance is critical for Benton Harbor to create a reliable, lead free and safe drinking water supply without compromising the progress it has made toward stronger financial health. Water rates, already the highest in the area, do not have the capacity to raise the $16 million necessary to replace lead service lines (LSLs).

See supporting documentation in Project Narrative Attachments.

b. Known Lead Issue. Benton Harbor's water distribution system is about 100 years old with most of the original infrastructure still in use, including water mains and service lines. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents.

The City of Benton Harbor initiated the development of a GIS database during a 2014 Stormwater, Asset Management, and Wastewater (SAW) Grant process. As part of the SAW project work, 2,612 water meters were replaced. In 2017, the City completed a Water System Asset Management Plan which focused on the water distribution system. The water system was added to the GIS database, however, service line data was limited to recent projects where as-builts were available. Data such as installation date, diameter, material, and location description was largely unavailable.

In May 2018, the Michigan Department of Environmental Quality (DEQ, now Department of Environment, Great Lakes and Energy/EGLE) awarded the City of Benton Harbor a $284,000 Lead Abatement Pilot Program Grant to fund a Lead Water Service Verification

and Replacement Project. The results of the work were used to update the city Distribution System Material Inventory and Asset Management Program. Funding also allowed for the replacement of 17 lead water service lines which were identified during the project. Data collected included location, inspection date, inspection status, pipe material public, pipe size public, pipe material private, pipe size private, depth of pipe and notes.

During the investigation period of the Pilot grant, verifications and replacements were conducted simultaneously due to the known lead contamination issues from water sampling. These homes were scheduled for replacement while other homes had issues discovered during "pot holing" where a 3'x3' hole was dug around the curb stop so that pipe material could be identified on both the privately-owned side and the City-owned side. Several homes were found to have leaking or broken lead service lines. These home were then scheduled for replacement. Locating the service line was difficult at some addresses due to the age and condition of the existing site. Many of the services were nearing 100 years in age and were missing or had buried shut offs.

Almost half of the addresses in the GIS were able to be updated with historical material information. From this dataset, a review of the buildings footprint layer identified non-vacant lots from which residential homes were randomly selected for service pipe material verification. A total of 94 homes were verified by "pot holing." The majority of homes have lead on the City side and galvanized on the private side. The results of the field verification were recorded using GPS equipment and integrated into the GIS.

Results from the Pilot Grant have helped the City to identify the scope of lead service replacement lines that needs to occur to mitigate risk. Approximately 87%, or 2,383, of all homes in the City are likely to have lead services lines that need to be replaced.

ALE. The city triggered an action level exceedance (ALE) for lead when the regularly scheduled testing in 2018 discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the action level of 15 parts per billion (ppb) for lead in water. The higher levels of lead were confirmed in two subsequent sample rounds in 2019.

The September 2018 testing report for lead indicated the 90th percentile result at 22 ppb, with a range of 0-60 ppb. Nine sites were above the Action Level Limit of 15 ppb. The DEQ notified the City of an ALE in October 2018. Follow up (non-regulatory) sampling of an additional 336 samples indicated 54 location ranging from 16-62 ppb, 192 households from 1 -14 ppb and 89 households with no value for lead.

Between January 1, 2019 and June 30, 2019, City testing reported a 90th percentile value of lead at 27 ppb, again exceeding the 15 ppb Action Level limit. The range of results was between 0-59 ppb, with twelve sites above 15 ppb. July 1, 2019 to December 31, 2019 testing indicated a 90th percentile value of 32 parts per billion (ppb) for lead, continuing the ALE. The range of results was 0-72 ppb, with ten sites above 15 ppb.

A previous 2015 sample event indicated that while the 90th percentile was not over the action level in 2015, there were two samples that were above 15 ppb.

In response to the action level exceedance in 2018, the city worked to quickly install corrosion treatment and began feeding a phosphate-based corrosion inhibitor on March 25, 2019, with a modified chemical composition implemented in February 2020. Thus far, a reduction in lead levels has not been noted due to the treatment and a CCT optimization study has been requested by EGLE. This grant proposal includes funding for the optimization study.

See supporting documentation in Project Narrative Attachments – Section I. Supporting Documentation of Lead Issue.

c. Public Education. The City dedicates a page on its website to notices and resources on lead in the water supply https://bhcity.us/water/ with a link from its home page. It issued an advisory to drinking water customers in 2018. In August 2019 and February 2020, the City sent a mailer to residents regarding the ALE for lead in the drinking water. The mailers included information on steps to take to reduce exposure to lead in the drinking water, contact information for lead testing in children, and details on how to get free water filters and replacement filters from the Berrien County Health Department. In January 2020, the City issued a press release notifying drinking water customers of another ALE in the drinking water. Several publications picked up the press release. The City also publishes and delivers to customers an annual Consumers Confidence Report with water quality results. The reports are also available on the City website 24 hours a day.

Berrien County Health Department (BCHD) has been instrumental in being a resource for the City to help inform residents and mitigate health risks. It provides information about lead, its effects and precautionary actions to take on its website http://www.berriencounty.org/1568/Lead-Drinking-Water.

Courtney Davis at the BCHD developed and made publicly available an easy to understand timeline of the Action Level Exceedance. Public outreach groups that consist of various governmental partners and grassroots/non-governmental groups have also been assembled to inform and educate the public on the lead risk. While the city is required to conduct public advisory and public education each time an ALE occurs, these are not necessarily tailored to residents and may not reach most people. The goal of this coalition is to engage local residents at their level and on their terms, with consistent and accurate messaging. Some goals for the group are a plain language Q&A, develop a community engagement plan, collaborate on an environmental health web page in the local newspaper, and host a community forum to give residents a voice.

Remediation follow-up monitoring is planned to ensure corrosion control treatment and LSL replacements are working as anticipated. Water sampling will occur during the project period per EGLE requirements. Results will be used to verify that lead levels are reduced as anticipated.

Additionally, the City is working with EGLE on a Technical Managerial and Financial Capacity Study to ensure the city has adequate staffing and financial mechanisms to carry out operation and maintenance of the City's water system. In May 2020, City Commissioners

approved rate increases for water and sewer service to address a water and sewer budget shortfall. Starting July 1, water rates will increase approximately 10 percent annually for the next five years and annual sewer rates will increase by 7 percent for the next five years. This increase is anticipated to bring the sewer/water fund to a self-supporting level but does not provide additional funding for lead replacement.

See supporting documentation in Project Narrative Attachments – Section I. Supporting Documentation of Lead Issue.

d. **Maintaining Lead Level Reductions.** All residential lead service lines are being replaced with copper, with a new service valve and valve box. This should significantly reduce contamination sources within the system and improve reliability of water service. Testing will continue to occur per EGLE requirements to monitor lead levels in residences. Testing will entail collection of two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart from the entry point to the distribution system, Treatment Plant Tap and from ten locations in the distribution system. Samples will be tested twice a year, repeating every third year until both lead and copper Action Levels (ALs) are met during the entire three year period.

Additionally, to show the ALs can be met, lead and copper samples will need to be tested from 60 sites at least twice a year until both lead and copper ALs are met in two consecutive six month periods. Per EGLE, corrosion control treatment may be discontinued if the action levels are met during future rounds of monitoring. Results of the optimization study would also be discussed with various partners for consideration of implementing changes.

The City and Berrien County Health Department offer and will continue to offer lead blood testing for children and free water filters and replacement cartridges to residents. The City of Benton Harbor provides free water testing to residents as well. These services are planned to continue to maintain lead monitoring efforts.

Finally, targeted sampling of sentinel sites in the water system will be conducted as part of this project in coordination with state and county public health officials. The sampling protocol has been established during the 2018 ALE and consists of sequential bottles filled after a period of stagnation. These sentinel sites offer an opportunity to see trends in the system with a good degree of detail.

e. **ALE Status/Opportunity Zone.** The regularly scheduled testing for Benton Harbor in 2018 and 2019 discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the action level of 15 parts per billion (ppb) for lead in water.

The September 2018 testing report for lead indicated the 90th percentile result at 22 ppb, with a range of 0-60 ppb. Nine sites were above the Action Level Limit of 15 ppb. Follow up (non-regulatory) sampling of an additional 336 samples indicated 54 location ranging from 16-62 ppb, 192 households from 1 -14 ppb and 89 households with no value for lead.

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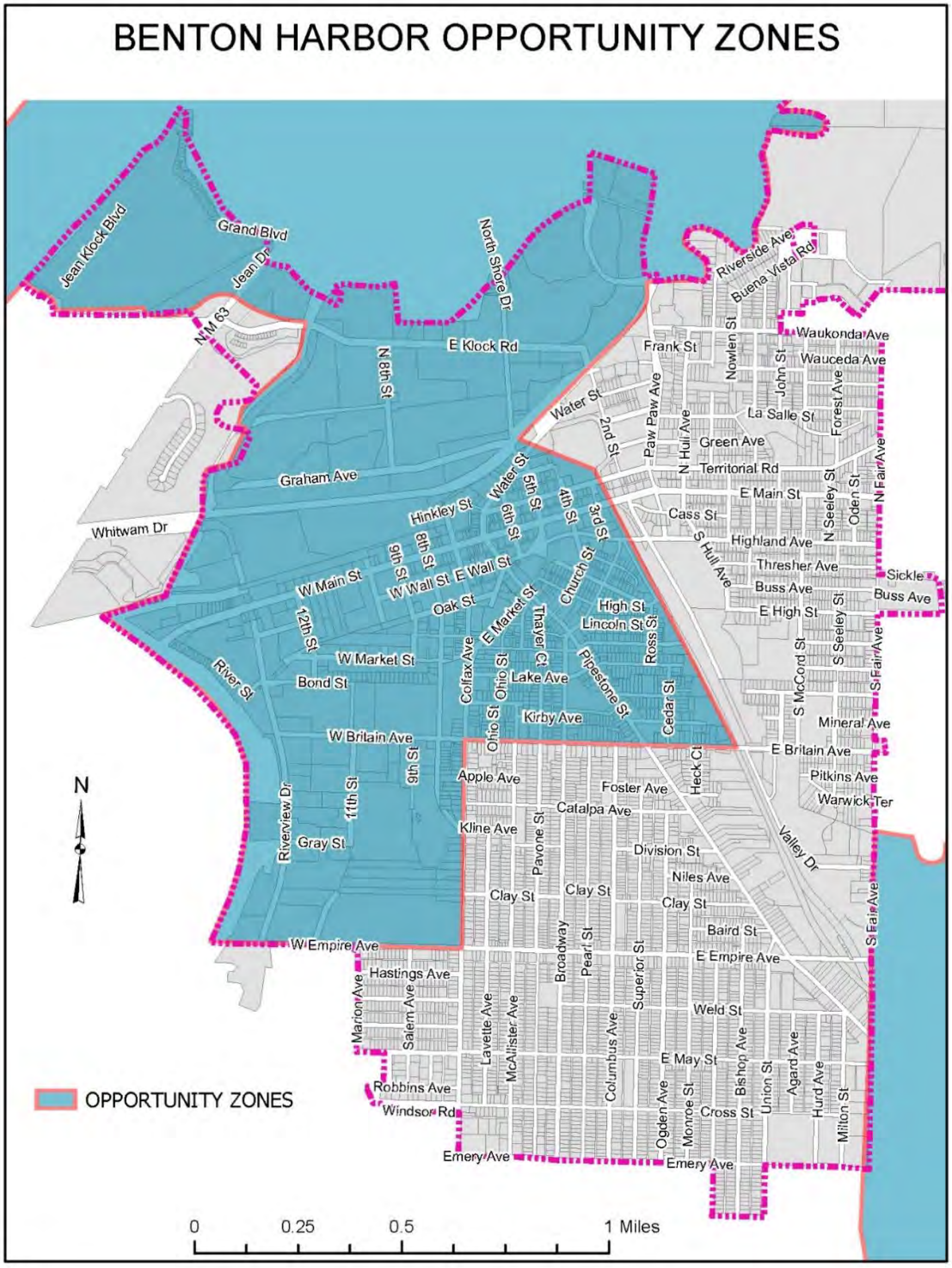
indicated a 90th percentile value of 32 parts per billion (ppb) for lead, continuing the ALE. The range of results was 0-72 ppb with ten sites above 15 ppb.

The water distribution system is also within an Opportunity Zone area. See map below.



f. Lead Service Line Replacement Project:

1. Demonstration that the applicant has considered corrosion control as an option for reducing the concentration of lead in its drinking water.

In response to the Action Level Exceedance in 2018, the City worked to quickly install corrosion treatment and began feeding a phosphate-based corrosion inhibitor on March 25 of 2019. Monitoring of the corrosion treatment by the city operators has consisted of phosphate readings at the water plant and in distribution system. After two rounds of lead and copper samples that did not show improvement, the City was asked to modify the chemical composition and increase the target residual by EGLE staff. The City changed chemicals and started increasing dosing levels in February of 2020. Monitoring of the phosphate levels continues on a daily and weekly basis. Furthermore, the City is now required to monitor for water quality parameters at the plant tap and in distribution.

The grant proposal includes funding for an optimization study of the corrosion treatment to best ensure public health protection moving forward. The study will occur during the first year of the project. The study will assess various types and levels of corrosion inhibitors to best match the treatment to the city's source water. Results of the study would be discussed with various partners for consideration of implementing changes.

See supporting documentation in Project Narrative Attachments – Section I. Supporting Documentation of Lead Issue.

2. Plan to ensure that both the publicly-owned and privately-owned portions of a lead service line will be replaced.

The full length of LSL's on public and private property will be replaced at the same time for each residence. A full LSL replacement means that the entire service line is replaced between the water main in the public right-of-way and the customer's meter, rather than being partially replaced only between the public water main and the private property boundary.

Partial replacements of lead service lines (only up to the private property boundary) are not feasible because partial replacement is prohibited under the Michigan Lead and Copper Rule.

When completed, the project will accomplish four major benefits: (1) improving protection of public health by helping ensure a reliable, safe drinking water supply to all customers; (2) reducing public health risks associated with water main breaks; (3) reducing wasteful and expensive water losses from leaking or broken pipes; and (4) eliminating lead and galvanized service lines.

3. Plan for notifying customers of the replacement of any publicly-owned portion of the lead service line.

Prior to project start, the City will advertise and host a public meeting to review the lead service lines replacement project, the phased approach, and timelines to expect for service replacement. Multiple agencies and authorities will be present at the meeting to

answer questions and provide educational materials. Information will also be available on the City website and Facebook page.

Residents will also be notified via door-hangers and letters when work is to begin along their street. Each resident will be provided a way to identify a date and time for the contractor to enter the property. Customers will be given the name and phone number of a contact person for any construction-related problems. Multiple contractors will be solicited and engaged to complete each project phase, with a goal of completing work in the same neighborhood in a systematic process, minimizing disturbance time throughout neighborhoods.

4. Plan for notifying each customer that a replacement of any publicly-owned portion of a lead service line that is funded by this grant program will not be carried out unless the customer agrees to the simultaneous replacement of the privately-owned portion of the lead service line.

Mailings and public information meetings will highlight the requirement for replacement of the privately owned portion of the line. Additionally, information will be clear that LSL replacements will be at no cost to the owner and will require contractors to enter the home to connect the new service line to the water meter located inside the building. Contractors doing the work will have to provide adequate insurance to protect the owner against any loss that may result from damage caused by negligent construction operations on the owner's property, and require the contractor to provide the City with proof of such coverage; and guarantee to the owner that any work done shall be free from defects in material and workmanship for a period of one year from its completion.

During the Pilot grant process, legal agreements were created to establish homeowner/tenant permissions and obligations for the lead service replacement work. These agreements will be utilized for this project. An agreement to decline service line replacement will also be available to residents.

See supporting documentation in Project Narrative Attachments – Section H – Readiness to Proceed.

5. Plan for ensuring customers are provided filters certified to remove lead, in accordance with applicable standards established by the American National Standards Institute, along with no less than three months of replacement cartridges, and notifying each customer of premise plumbing flushing instructions within 24 hours of the conclusion of each lead service line replacement.

Berrien County Health Department will continue to provide free water filters and replacements to anyone who requests them. This information has been provided to residents in all mailings, and placed on the City and Berrien County Health Department websites. Instructions for installing the filters and recommendations to flush water lines for 30 days after the service replacement is completed will also be given to residents as each home connection is completed.

2. Expeditious Project Readiness to Proceed

Previous lead service line replacements occurred during the MDEQ Pilot grant project in 2018, which has provided the City with a clear process to follow for future replacements. The City is poised to proceed immediately upon approval of grant funding. The City has additionally reached out to EGLE about the proposed project, and has received their enthusiastic support.

Upon award of grant funding, the city will initiate public outreach and educational meetings about the project. It will provide a proposed project schedule on its website, map of planned phases for neighborhoods, work to be done, and details on the importance of lead service line (LSL) replacement. It will issue press releases, set up a contact person for questions, and post details and updates on its website and Facebook pages. A public meeting will be scheduled to provide residents with an opportunity to ask questions and receive details about the project. The City will invite representatives of EGLE, the Berrien County Health Department and its Engineer of Record to assist with questions. Example homeowner/resident agreements granting permission to access private property will be available for review on the city website and at the public meeting. These agreements were previously utilized for the Pilot grant project.

The City expects to utilize a four year project period to replace all residential lead service lines. Additionally, the City will seek a qualified consultant to initiate the CCT Optimization Study in Year 1, to be completed within 12 months.

There is a high probability that many of the water service lines located within the project area are composed of lead or galvanized steel. Benton Harbor's municipal infrastructure was initially installed in the late 19th through mid-20th century and complete records were not kept describing water supply line materials, although it is known that lead was widely used before 1960. Analysis of data assembled during the Pilot grant indicate it is likely 2,383 replacement connections will need to be made. During the project/bid document development stage, the City will utilize all available resources to identify known lead service lines including seeking assistance from a water infrastructure analytics consulting company such as BlueConduit, who had a successful track record of locating probable lead service lines in Flint. With the previous data of how long contractors needed for each LSL replacement during the Pilot grant, completing all replacements is anticipated to take four years. This assumes a schedule of approximately 596 replacements per year. In order to hit this milestone, up to four contractors will be engaged each project year. The City will utilize a public bidding process to select each contractor. When service replacement work is put out to bid, the contractors will be required to submit a "per each" all included price per replacement, to establish a firm total project cost without variables. This will enable the city to evaluate proposed bids on an equal basis. EGLE does not require permits for this process, and contractors would need only to acquire city plumbing permits and county soil erosion and sedimentation control permits.

Previous work from the Pilot grant indicated that a contractor could complete 1 to 2 replacements per day. Each contractor will have to perform "pot hole" investigation at the curb stop to identify lead lines. Previously identified connections in the Pilot grant will be

incorporated into contractor assignments to aid their identification efforts and potentially reduce completion time for the entire project, resulting in more immediate health benefits to residents.

A map has already been created showing four (4) zones of the entire city limits (see map in attachments). The zones are broken into four (4) subzones to identify manageable contractor scopes of residential water services to investigate and potentially replace. A corresponding table shows the number of residential water service connections in each subzone and the sum for each zone recorded in the GIS database. Replacements that were done during the Pilot grant, and work that will be done as part of the fall 2020 DWRF project are excluded in the water service lines counts.

The replacement process involves verifying the service is lead at the curb stop and then proceeding to excavate the curb stop on the main. Once exposed, the existing lead service is turned off, disconnected and removed with new 3/4" to 1" copper piping being pulled at the same time. New copper water service is reconnected to the existing curb stop, a new curb stop and the meter inside the house. A new valve box will be set, all excavations will be backfilled and lawn areas will be restored. Residential water is out of service for approximately 4 hours during the process. Bituminous paving will be replaced at the completion of each LSL replacement.

Contractors will record their progress in the ArcGIS for Collector app to integrate records into the City's GIS infrastructure database. This will allow the city to see real time, up to date progress throughout neighborhoods. An Asset Program Manager will oversee the database throughout the project. Progress reports will be regularly submitted to the City.

Utilizing multiple contractors has many advantages. It allows the City to offer contracts to a wide range of contractors (local, small, women and minority owned), it keeps pricing competitive, it provides timelines that can absorb unexpected delays, it allows the contractor bonding obligation to be lower and not bidding prohibitive, and it allows for each year's contracts to incorporate previous successful strategies and eliminate unsuccessful ones.

As the City does not employ a staff engineer, the City's Engineer of Record, Abonmarche Consultants, will coordinate public notice flyers, bidding, contract award, contractor oversight, and provide progress reports to the city, following EPA solicitation clauses as required. As EPA funded work will be able to utilize Pilot grant processes, public notice flyers, and homeowner access permission forms, the city is ready to expeditiously proceed to the next phase of lead service line replacements.

Also occurring during the LSL replacement period will be upgrades to the city water distribution system and wastewater collection system financed through EGLE's DWRF loan program. This work is planned to occur between September 2020 and October 2021. These improvements will further strengthen protection of public health by ensuring a reliable, safe drinking water supply to all customers in the project area, and preventing failures of sanitary sewers where the probabilities and consequences of structural pipe failure are high. Sanitary sewer replacement will occur in the same street segments as the concurrent replacement of the antiquated water

mains since it would be fiscally irresponsible to replace water mains while leaving in place aged, structurally deficient sewers that are likely to fail in the next few years. This combined infrastructure improvement approach is consistent with the integrated asset management idea of "dig once" that saves both valuable time and resources. The DWRF project will also replace 150 LSLs and includes repairs to the city water tower.

In evaluating the proposed action alternatives for the DWRF funded projects addressing water distribution system, three options were considered. These action alternatives were also part of the evaluation criteria of the need to replace all the existing lead service lines proposed by this project.

a. No action - Taking no action would result in aged water mains remaining in service, with frequent breaks, broken or leaking valves, inadequate water pressures, and threats to public health from contamination. For the water tower, no action could result in ultimate failure of the vitally important asset. No action is unacceptable.

b. Optimum Performance of Existing Facilities - Problems inherent to a pipe itself cannot be solved through improved operational efficiency. Moreover, flushing a 100-year old water main will not remove tuberculation that has built up over decades. With the exception of the water tower, this alternative is infeasible. For the water tower, optimum performance can be achieved by making the necessary repairs, as described in the previous section, to allow maximum efficiency to be achieved.

c. Replacement - Full water main replacement, with full-length replacement of lead/galvanized service lines (LSLR) where encountered, is the only technically feasible solution that simultaneously accomplishes the following: (1) reverses the poor condition of the existing water pipe; (2) addresses technical and constructability considerations such as the comparative depths of the existing sanitary sewer and water main; and (3) resolves the pressure concern. Moreover, it is the only solution that guarantees no replacement of this antiquated water main will be required in a few years due specifically to its age and age-related condition. For the water tower, constructing a new tower is cost-prohibitive, approximately $5 million compared to roughly half million dollars to repair.

With replacement selected as the path forward on the DWRF project, the City is leveraging additional financial commitment to the health needs of its community.

The City will continue to monitor corrosion treatment that began in 2019 during the project period. While successful corrosion control protects users from lead levels, the sheer age and poor condition of city water infrastructure poses a high risk of failure and leaks to users. In addition, sources of lead also exist within customer plumbing systems such as high leaded brass or lead/tin solder copper piping. Replacement of all lines as soon as possible produces the highest and most comprehensive health benefit to the disadvantaged community, particularly when coupled with an optimized corrosion control treatment.

With EPA funding, the City of Benton Harbor will have addressed significant conditions that

are contributing to increased concentrations of lead in drinking water. The City will continue to sample drinking water twice a year, per EGLE requirements, until it has demonstrated Action Level Exceedance is no longer occurring.

See supporting documentation in Project Narrative Attachments – Section H – Readiness to Proceed.

3. Environmental Results and Measuring Progress

a. Stated Objective. This project will support will support EPA Strategic Plan Goal 1: "A Cleaner, Healthier Environment: Deliver a cleaner, safer, and healthier environment for all Americans and future generations by carrying out the Agency's core mission, Objective 1.2: Provide for Clean and Safe Water: Ensure waters are clean through improved water infrastructure and, in partnership with states and tribes, sustainably manage programs to support drinking water, aquatic ecosystems, and recreational, economic, and subsistence activities, of the EPA Strategic Plan."

Replacing known lead hazards in Benton Harbor drinking water will significantly improve the health and safety of residents and reduce the number of communities in the nation that are out of compliance with health-based standards.

It will modernize and update aging water infrastructure in the city, providing safe and reliable water delivery for all ages and future generations. The project will leverage and multiply the benefits of the DWRF funded projects to replace portions of the city water distribution system and wastewater collection system. Modern, reliable, safe drinking water serves to advance economic development within the community by attracting and retaining businesses and residents that can increase the city tax base and contribute to its sustainability.

b. Results/Outputs. Outputs of this project include:

- A reduction in lead in drinking water provided by the Benton Harbor drinking water system due to infrastructure improvements that will replace all residential lead service lines in the city.
- A decrease in the number of lead service lines, and galvanized pipes downstream of lead service lines, in the drinking water system, resulting in a decrease in exposure to lead via drinking water. The goal is to remove all existing residential lead service lines so none remain, dramatically reducing exposure potential.
- An optimized corrosion control treatment to protect public health during and after the lead service line removal activities.
- An increased number of customers will have information about lead in drinking water, achieved through outreach and public education throughout the project. All residents receiving lead service line replacement will receive information on the effects of lead, steps they can take to protect themselves, and city remediation efforts. Public outreach will occur to the entire community.

- The project will create a trackable, accurate GIS database of city infrastructure materials not previously recorded. During the project, an asset management plan coordinator will ensure the information is accurate and complete, ensure all elements have been addressed and confirm there is a process to identify any limitations on the use of the data.

c. Projected Environmental Improvements/Outcomes. Outcomes will include an overall reduction in lead exposure and associated harms through reduction of sources of lead in drinking water systems. Recent testing has shown that residents, especially children, are currently at risk from lead in drinking water. Removing lead at a young age prevents damage to developing bodies and nervous systems that affect learning, behavior, speech, hearing, and growth rates. Pediatric blood testing results can be used to track blood lead levels to understand if reduced childhood lead exposure goals are being met.

The local public school system has also been affected by declining enrollment and reduced budgets. Students are faced with fewer resources for learning each year. Removing the lead exposure in water lines can help eradicate the harm lead is doing to developing bodies and nervous systems and lead to higher testing and learning results, which can be tracked annually.

Benton Harbor can also experience an overall improvement in health outcomes in its community through this removal of source lead. Fewer residents will have their limited household budgets overwhelmed by health care costs, leading to more financially stable households. Outcomes can be measured by tracking the number of households seeking financial assistance through welfare, Medicaid, and the Children's Health Insurance Program.

Multiple years of public outreach during the projects will also lead to an overall increase in public understanding of the health effects of lead and efforts towards the reduction of sources of lead in the drinking water system. This can be measured by analyzing the number of requests for lead blood level testing, requested water kit tests, and requested water filters in the community per year.

4. Milestone Schedule

The Michigan Lead and Copper Rule promulgated in 2018 requires municipal water suppliers to begin removing all lead service lines at a rate averaging 5 percent per year, not to exceed 20 years for completion, starting in 2021. Completion of this project will ensure that Benton Harbor has met these requirements. Additionally, funding support from this EPA opportunity will allow the City to meet these requirements without imposing additional financial hardship on residents and will dramatically shorten the exposure of a known health risk to the public from 20 years to four.

Below is the proposed Milestone Schedule for the Lead Service Line Replacement project:

Year	Task	Timeline
1	Public Outreach Meetings/ Notification Mailings	January 2021

1	Develop bid plans/specs	February 2021
1	Contract with qualified consultant to perform Optimization Study for Corrosion Control Treatment (CCT)	March 2021
1	Bidding Phase 1 & Contractor Agreements	March 2021
1	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2021
1	Phase 1 Project start	April 2021
1	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2021
1	Phase 1 Project end	November 2021
1	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2021
1	Year One Milestone Completion – 596 Total LSL Replacements by end of Year 1. $4,160,554.25 in project costs expended. GIS database updated with field data Optimization Study for CCT initiated	December 2021
2	Homeowner/resident notification mailings Public Outreach	January 2022
2	Bidding Phase 2 & Contractor Agreements	February 2022
2	Completion of Optimization Study for Corrosion Control Treatment (CCT)	March 2022
2	Phase 2 Project start	March 2022
2	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2022
2	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2022
2	Phase 2 Project end	November 2022
2	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2022
2	Year Two Milestone Completion –	December 2022

	596 New LSL Replacements. 1,192 Total by end of Year 2. $8,271,108.50 in project costs expended by end of Year 2. GIS database updated with field data Completion of Optimization Study for CCT.	
3	Homeowner/resident notification mailings Public Outreach	January 2023
3	Bidding Phase 3 & Contractor Agreements	February 2023
3	Phase 3 Project start	March 2023
3	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2023
3	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2023
3	Phase 3 Project end	November 2023
3	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2023
3	Year Three Milestone Completion – 596 New LSL Replacements. 1,788 Total by end of Year 3. $12,381,662.75 in project costs expended by end of Year 3. GIS database updated with field data	December 2023
4	Homeowner/resident notification mailings Public Outreach	January 2024
4	Bidding Phase 4 & Contractor Agreements	February 2024
4	Phase 4 Project start	March 2024
4	Prepare and Submit Quarterly EPA Performance and Financial Reports	March, June, September, December 2024
4	Collect and report lead and copper sampling results to EGLE per monitoring requirements	June 2024
4	Phase 4 Project end	November 2024

4	Collect and report lead and copper sampling results to EGLE per monitoring requirements	December 2024
4	Year Four Milestone Completion – 595 New LSL Replacements. 2,383 Total by end of Year 4. $16,492,217.00 in project costs expended by end of Year 4. GIS database updated with field data	December 2024
4	Submit Final EPA Grant Reports	March 2025

5. Detailed Budget Narrative

The City GIS infrastructure database identifies 2,739 metered residential water service lines within city limits that have not been replaced. Previous service line replacements completed during the Pilot Grant project period in 2019 ranged from $4,800 - $7,200 per home depending on the distance from the main to the home, averaging $6,000 per home. This included all restoration, curb and pavement restoration. When service replacement work is put out to bid, the contractors will be required to submit a "per each" all included price per replacement, to establish a firm total project cost without variables. This will enable the city to evaluate proposed bids on an equal basis.

Additionally, during the Pilot Grant service line verification process, 87% of lines verified identified lead or galvanized piping on either the City-owned or privately-owned side of the service. To establish a project budget, the City is calculating its replacement costs per the following:

2,739 service lines x 87% = 2,382.93 lines to replace

2,382.93 lines x $6,000/line = $14,297,580.00 to replace LSLs

Engineering Administration fees at 15% of total project cost: $2,144,637.00

An optimization study for corrosion control treatment would also be initiated in Year 1 to be completed within 12 months. A qualified consultant would be hired to perform the study.

Optimization Study Corrosion Control Treatment - $50,000

Total Project Cost: $16,492,217.00

Of the total cost, the City is requesting $14,842,995.30 (90%) from this EPA funding opportunity and is committing to $1,649,221.70 (10%) for a cost share match. See reduced cost share/match letter requesting a 10% match due to the City's disadvantaged status in Project Narrative Attachments.

The City will complete the LSL replacement project over a four year period, or less, depending on contractor capacity. Each year will see the replacement of approximately 596 service lines, at a cost of $4,110,554.25. The Optimization Study's $50,000 cost will be incurred during the

first year of the project.

The City will utilize city income tax revenue each project year to provide its non-federal cost-share. The income tax generated $1,684,794 during the 2018-19 fiscal year. City income tax fund projections out to 2025 show that it can incur up to $500,000 per year ($2 million over four years) in additional expenses, providing for the City's $1,649,221.70 cost-share during this project. Please see funding projection spreadsheet in Project Narrative Attachments.

Contractual expenses will include contractor labor costs for excavation of the curb stop on the main, disconnection and removal of old line, pulling of new copper piping, reconnection of piping to the existing curb stop, and restoration of pavement and lawn areas as needed. Contractor materials cost include 3/4" to 1" copper piping, new curb stops, new meters inside the house and new valve boxes.

Engineering administration tasks will include preparation of bid documents, overseeing bid process, executing contractor agreements, providing public education and outreach about the project, notifying residents of project timeline, acquiring property access agreements from residents, overseeing contractor work, reviewing and approving contractor requests for payment, tracking and recording LSL replacement data in GIS database, final inspections and closeout of project.

Expenses for the Optimization Study for Corrosion Control Treatment will be consultant cost for professional evaluation of the various types and levels of corrosion inhibitors to best match the treatment to the city's source water, thus minimizing dissolution of lead and copper into drinking water without compromising other health-related water quality goals.

6. Programmatic Capability/Experience

a. Organizational Experience

The City of Benton Harbor is a local unit of government. The city charter became effective on April 14, 1945. Under that charter, the city is governed by a council-manager system that combines the political leadership of nine elected commissioners with the professional expertise of a city manager appointed by the commissioners.

The City Manager is the chief administrator of Benton Harbor and is responsible for the day-to-day administration of the city. The manager implements the council's policies and programs while coordinating the delivery of services throughout the city through the various departments in city government. The City Manager will oversee the LSL replacement project, providing regular updates to the City Commission. Current City Manager, Ellis Mitchell, has served as city manager for three other cities – Berkeley, Mo., East St. Louis, Ill., and East Point, Ga, bringing a wide understanding of city management to the project. The City Manager also oversees compliance with multiple federal, state and local funding sources involved in city projects and is well prepared to follow EPA compliance requirements.

The city water distribution system is managed by the Benton Harbor Water Department, under the direction of Mike O'Malley. Recently, City staff successfully oversaw and

completed the modernization and upgrades of the city water filtration plant over a two year period, ending in 2011. The Water Plant now has an anticipated life span in excess of 50 years and can properly treat up to 12 million gallons per day. Funding for the project was acquired through the State of Michigan's Drinking Water Revolving Loan Funds (DWRF), supplemented by American Recovery and Reinvestment Act (ARRA) funds.

The Community and Economic Development strives to foster a better quality of life for Benton Harbor residents by developing viable neighborhoods with safe, suitable housing and by eliminating slums and blight. It oversees the City Home Rehabilitation Loan Program, CDBG program, Vacant Lot Revitalization Purchase Program and other grant funded programs benefitting residents. This department will oversee EPA grant compliance throughout the duration of the project.

The City of Benton Harbor utilizes its engineer of record firm, Abonmarche Consultants, to provide civil engineering expertise and guidance on municipal infrastructure projects, as the city does not employ a staff engineer. Abonmarche has assisted the city for over 25 years and has a strong working relationship with staff and comprehensive understanding of city infrastructure needs. The firm has assisted with multiple projects funded through a variety of sources including federal and state grants and state loans. The City will utilize results from previous Abonmarche water studies and upgrades to identify and complete the citywide lead service line replacement project.

The City has also had initial discussions with Cornwell Engineering Group, a qualified engineering consultant, for the purposes of conducting an Optimization Study for Corrosion Control Treatment. Cornwell Engineering Group was founded in 1985 by Dr. David A. Cornwell, after his successful career as a Professor at Michigan State University. Cornwell Engineering Group utilizes the latest innovations and sound scientific fundamentals in the pursuit of optimizing and designing water facilities.

b. Staff Expertise/Qualifications

Key City staff on the project, representing three FTE workers, include:

Ellis Mitchell, City Manager – Mr. Mitchell has been City Manager since January 2020, after acting as Interim City Manager since July 2019. Mr. Mitchell had previously served as City Manager for Benton Harbor from 1983 to 1987. He brings more than 40 years of comprehensive achievements in public, private and educational sectors to the City of Benton Harbor. He has managed four cities (Benton Harbor, MI, Berkeley, MO, East St. Louis, IL, and East Point, GA) saving two from State Receivership. He has provided management consulting services for cities and private sector companies. He has led planning and implementation of balanced Operating Budgets and 5 Year Capital Improvement Programs in several cities, stabilizing and improving financial management. He has served as Project Manager over major bond issues, developments, and several capital funding projects from planning, negotiating and throughout the construction process. His comprehensive experience will provide strong support throughout the LSL replacement project.

Michael O'Malley, Water Department Superintendent – Mike has over 30 years of experience working in water treatment plants. He has been Benton Harbor Water Department Superintendent since July 2016, additionally holding the position between 2008-2012. He is an F-1 and S-1 licensed Operator in Charge. Mike oversees Water Plant operations and maintenance, water distribution, sewer collections and storm water management for the City of Benton Harbor.

Tracy-Ann Jennings, Community and Economic Development Director – Tracy has over 15 years of experience and understanding as it relates to: Grant Application and Reporting, Employee Management and Supervision, Human Behavior Analysis, Leadership Coaching, Volunteer Management, Youth Development, and Nonprofit Leadership. Her strengths lie in community outreach and engagement, creating and executing major events, developing and sustaining strategic relationships, working with local media, communications and community relations, forecasting and strategic planning. She will act as a key member of the public outreach team and track grant compliance.

Abonmarche Consultants, Inc - Abonmarche Consultants, Inc., is a professional consulting firm specializing in civil engineering, surveying, architecture, marina development, landscape and planning services. The company was established in 1979 and became the Engineer of Record for the City of Benton Harbor in 1994. The City does not employ its own engineering staff and instead utilizes the professional expertise provided by Abonmarche as their Engineer of Record. Abonmarche has assisted the city with multiple projects involving grant or loan funding and is well versed in compliance, procedures and reporting documents. Abonmarche led the FDCVT and Pilot grant projects and will be able to guide the lead service replacement project with a thorough understanding of the City's infrastructure, community and municipal needs.

The project will utilize the following key Abonmarche staff:

Jason Marquardt, PE - Jason is a licensed Professional Engineer with more than 16 years of experience. He is responsible for managing, designing, and providing construction engineering and administration on municipal, local agency and state projects. He currently serves as Group Director of the Construction Division at Abonmarche. He has worked on a variety of civil projects that include infrastructure design, sanitary sewer, storm sewer, and water distribution system construction. He was project manager for the City of Benton Harbor's 2017 and 2018 FDCVT grant projects and the Pilot Grant project. His knowledge of the City of Benton Harbor's water infrastructure will contribute important guidance to the project team.

Corey Kandow, PE - Corey has over 20 years of experience in design and construction administration of municipal and site development infrastructure, street reconstruction, drainage, engineering studies, permitting, waterfront development and recreational facility projects. His responsibilities also include plan preparation, project design, and cost estimating. Corey's projects have utilized multiple federal, state and local grant and loan funding sources including MDOT, MEDC CDBG, USDA Rural Development, SRF/DWRF

loan and DNR Recreation grants and Corey understands the wide range of compliance necessary for each funding source.

In each of his roles, Corey is committed to ensuring that quality projects are built to exceed the client's expectation and remain within budget. Corey has acted as project manager for multiple City of Benton Harbor projects.

Bret Witkowski - Asset Management Program Coordinator - Bret will lead efforts to further develop and complete the infrastructure asset management programs for the City of Benton Harbor. Prior to his position at Abonmarche, Bret served Berrien County as the County Treasurer for 20 years. In addition to his to his position of County Treasurer, Bret served on multiple financial review committees for villages and communities throughout Berrien County. He is Chairman of the Berrien County Land Bank, which received $10 million in grant funding to remove blight in distressed Berrien County communities during his tenure. His experience with funding and conducting public relations and awareness campaigns will greatly assist project efforts.

Joelle Regovich – Grant Administrator – Joelle has over 7 years of experience overseeing grant related efforts for a variety of Abonmarche clients. She seeks out relevant funding sources to support projects, writes grant applications, and performs grant administration on awarded funds. Her experience includes a wide range of federal, state and local grants and funding sources including USDA Rural Development grants and loans, Michigan Economic Development Corporation CDBG and Infrastructure Capacity Enhancement (ICE) grants, Michigan Department of Natural Resources Recreation Grants, Michigan Council for Arts and Cultural Affairs grants, and Michigan State Historic Preservation Office (SHPO) Lighthouse Assistance Program grants. She will work closely with City staff to ensure grant compliance is met throughout the project.

Please see resumes in Project Narrative Attachments – Section F. Biographical Sketches

7. Past Performance. Recent relevant grants received by the City of Benton Harbor in the past three years include two Financially Distressed Cities, Villages and Townships (FDCVT) grants and one Pilot Grant from the Michigan Department of Environmental Quality (DEQ). The City has a long history of completing a variety of grant projects.

2017 FDCVT Grant – Cities, villages and townships experiencing financial struggles were offered grant funds by the Michigan Department of Treasury to help fund special projects, services or strategies that move a city, village or township toward financial stability. In 2017, the City of Benton Harbor received $396,085 for water system enhancements that included water main replacements on Territorial and Sherman Streets and water valve replacements. The City had previously received FDCVT grants in 2015 and 2016, which assisted in the replacement of additional water mains and fire hydrant repairs. As a result of careful oversight and financial management practices, the City was able to request a reallocation of unused 2015 and 2016 funds toward its 2017 project, reducing its cost share of the water main work.

Throughout the grant period, the City complied with grant requirements such as approving resolutions, returning signed agreements, using funds only as authorized by grant scope,

following purchasing and bid requirements set forth by funding agency, providing adequate supporting documentation for expenses i.e. cancelled checks and invoices, following accounting practices to keep grant funds separate from other accounts, communicating with Treasury Department to update any status change or amendment request, and following all local, state, and federal laws. The grant requires completion of the project within five years of the award. The City completed all work in 18 months. Semi-annual progress and financial reports as required by the grant were completed each period on time. Progress reports indicated percentages complete toward stated goals for scope.

2018 FDCVT Grant – In 2018, the City received a grant award of $309,500 to replace 238 water meters that were outdated and obsolete. Project work began in September 2019 and will be completed by May 2021, after experiencing delays due to the COVID-19 pandemic.

During the grant period, the City has complied with grant requirements such as approving resolutions, returning signed agreements, using funds only as authorized by grant scope, following purchasing and bid requirements set forth by funding agency, providing adequate supporting documentation for expenses i.e. cancelled checks and invoices, following accounting practices to keep grant funds separate from other accounts, communicating with Treasury Department to update any status change or amendment request, and following all local, state, and federal laws. Semi-annual progress and financial reports as required by the grant have been completed each period. Progress reports track percentages complete toward stated goals for scope.

2018 MDEQ Pilot Grant – The Michigan Department of Environmental Quality (MDEQ) Drinking Water and Municipal Assistance Division provided a grant award of $284,000 to the City of Benton Harbor as part of a pilot program to improve water supply system infrastructure to help protect water quality and public health. The grant award was used to fund an inventory of the material of service lines, update the city asset management plan, and replace lead water service lines. Ninety-four (94) verifications and 17 replacements were completed between December 2018 and May 2019. Information was recorded in a GIS database.

Grant deliverables included an Asset Management Plan Certificate of Project Completeness which includes the AMP Executive Summary, and a Lead Service Line Replacement Certificate of Project Completeness which verifies that a Notice to Proceed was issued for the project. Both of these requirements were completed and delivered to the DEQ/EGLE within the project period.

8. Reduced Cost Share/Match Waiver Request Letter and QA/QC

a. Please see reduced cost share/match request letter in Project Narrative Attachments.

b. QA/QC – Not Applicable. Environmental Data will not be collected or used in this project.

E. Project Narrative Attachments

1. **Reduced Cost Share/Match Request Letter**
    a. **DWRF Supporting Data Regarding Disadvantaged Status**
    b. **DWRF 2020 Intended Use Plan**
    c. **Match – City Funding Projection Spreadsheet**
2. **Opportunity Zone Map**
3. **Section F – Biographical Sketches**
4. **Section G – Negotiated Indirect Cost Rate Agreement – NOT USED**
5. **Section H – Readiness to Proceed**
6. **Section I – Supporting Documentation of Lead Issue**

BENTON HARBOR
Port of Opportunities

May 29, 2020

Brianna Knoppow
U.S. Environmental Protection Agency (EPA), Office of
Water, Office of Ground Water and Drinking Water

RE: Funding Opportunity EPA-OW-OGWDW-19-01: Reduction in Lead Exposure Via Drinking Water - City of Benton Harbor Reduced Cost Share/Match Waiver Request

Dear Ms. Knoppow,

The City of Benton Harbor is submitting an application in response to the EPA funding opportunity "Reduction in Lead Exposure Via Drinking Water." Applicants are to provide a minimum non-federal 20% cost-share/match of the total project costs unless they request a waiver to reduce the cost-share/match requirement for reasons of affordability. The City of Benton Harbor is seeking funding to assist in National Priority Area One: Reduction of Lead Exposure in the Nation's Drinking Water Systems through Infrastructure and Treatment Improvements, and respectfully requests a waiver to reduce the non-federal cost-share/match to 10%.

In Michigan, Disadvantaged community status is determined by the Department of Environment, Great Lakes, and Energy (EGLE) as defined in Part 53 of Act 451. The City of Benton Harbor currently meets the state of Michigan's DWSRF disadvantaged community criteria as evaluated by EGLE. Please see attached supporting documentation. If you have any questions or need additional information, please do not hesitate to contact me at 269-927-8457 or via email at emitchell@cityofbentonharbormi.gov.

Sincerely,

Ellis E. Mitchell

Ellis Mitchell
City Manager
City of Benton Harbor

Enclosures:
EGLE May 18, 2020 Email Regarding Qualifying Disadvantaged Status
EGLE DWRF Disadvantaged Status Calculation
DWSRF Intended Use Plan Fiscal Year 2020

From: Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Sent: Monday, May 18, 2020 9:06 AM
To: Sarkipato, Ernest (EGLE); Green, Kelly (EGLE)
Subject: RE: BH grant
Attachments: benton harbor dwrf.xlsx; Application of the Afordability Criteria.docx

Ernie,

Attached is our disadvantaged worksheet for Benton Harbor. The Red Yes indicates they are disadvantaged. I have also attached our criteria. This is a document that explains our procedures and was something Detroit wanted for their EPA grant so this might be useful for Benton Harbor as well.

Bob

Bob Schneider
Financial Analyst
Michigan Department of Environment, Great Lakes, and Energy
517-388-6466 / schneiderr@michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, May 15, 2020 1:59 PM
To: Green, Kelly (EGLE) <GreenK1@michigan.gov>; Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Subject: RE: BH grant

Awesome! The wording below is "provide affordability criteria information for Benton Harbor as a Disadvantaged Community"

From: Green, Kelly (EGLE) <GreenK1@michigan.gov>
Sent: Friday, May 15, 2020 1:54 PM
To: Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Fwd: BH grant

Bob, can you send Ernie a copy of Benton Harbor's disadvantaged worksheet?

Ernie, I think all EPA might need is a memo from the state saying they qualify under the State's criteria. If that's the case Bob can draft a simple email to that effect.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, May 15, 2020 1:44 PM
To: Green, Kelly (EGLE)
Subject: BH grant

Happy Friday Kelly! We have a window of opportunity to support BH in making an application to EPA for grant funding related to lead service line removal. I need your help!
Do we have a document that outlines affordability criteria for Benton Harbor (#3 below)?

Ernie

Application of the Affordability Criteria for the State of Michigan

Household income is an economic measure that can be applied to one household, or aggregated across a large group such as a city or county. It is used by the State of Michigan to describe a household's economic status or to track economic trends.

A household's income can be calculated various ways but the US Census as of 2009 measured it in the following manner: the income of every resident over the age of 15, including wages and salaries, unemployment insurance, disability payments, child support payments received, regular rental receipts, as well as any personal business, investment, or other kinds of income received routinely.

Changes in median income reflect several trends: the aging of the population, changing patterns in work and schooling, and the evolving makeup of the American family, as well as long- and short-term trends in the economy itself. For instance, the retirement of the Baby Boom generation should push down overall median income, as more persons enter lower-income retirement.

Median inflation-adjusted ("real") household income generally increases and decreases with the business cycle. Household income in the United States varies substantially with the age of the person who heads the household. Overall, the median household income increased with the age of householder until retirement age when household income started to decline

The American FactFinder provides data gathered from the American Community Survey which the State of Michigan uses to determine affordability. Since 1996 the State of Michigan has used 4 criteria to determine affordability:

1) More than 50 percent of the geographic area to be served by a proposed project is identified as a poverty area by the U.S. Bureau of the Census. Current poverty areas within Michigan are identified in Appendix B on the Census website. (In order to perform a more systematic review, the state demographer has recommended that using the FactFinder poverty table and a family of 3 or 4, in the Poverty Status in the 12 Months for Families column with a percentage above poverty level of more than 20% +-0% will approximate the 50% of a geographic area)

2) The MAHI for the area to be served by a proposed project is less than the most recently published Federal Poverty Guidelines for a family of four in the 48 contiguous United States. These guidelines are published annually by the Department of Health and Human Services.

3) The MAHI for the area to be served by a proposed project is less than the most recently published statewide MAHI for Michigan, and annual user costs [as defined in 1994 PA 451, Section 5401(B)] for service will exceed 1.0 percent of the MAHI of the area to be served by the proposed project.

4) The MAHI for the area to be served by a proposed project is greater than the statewide MAHI for Michigan, (up to 120 percent) and annual user costs will exceed 3 percent of the MAHI of the area to be served by the proposed project.

For criteria 3 and 4 a detailed spreadsheet has been developed to determine affordability. The spreadsheet has 2 sections where a series of calculations are made and compared. The first set of calculations determine the annual threshold cost for water or wastewater services. The MAHI for a community is identified in the American Community Survey and the Detroit Consumers Price index applied to determine the updated MAHI. This updated MAHI is then multiplied by 1% to arrive at an annual threshold dollar amount. The second set of calculations factor in such variables as number of users, annual debt payments, and annual operating costs to determine the actual annual user costs. If the actual

annual user costs exceed the threshold then the affordability threshold has been exceeded and the community is eligible for subsidized assistance.

Step 1: Enter amount of total debt for project
Step 2: Enter term up to 20 years
Step 3: Enter present target rate of interest (call DEQ)

Step 4: Enter projected annual OM & R after completion
Step 5: Annual debt payment is computed
Step 6: Total annual cost of system is computed

Step 7: Enter total number of system users in service area
Step 8: Annual user cost is computed

Step 9: Updated State Wide MAHI is:
Step 9: Enter 1990 census median annual household income
Step 10: Updated MAHI is calculated on Detroit CPI-U to 1997
Step 11: The percentage of MAHI is computed

Step 12: If the annual user cost exceeds the percentage of MAHI, the community may qualify as a disadvantaged community

Amount of Debt	$5,076,698
Terms	20
Rate	2.00%
OM & R	$1,064,000
New annual debt	$310,474
existing debt	$ 282,000
Total Annual Cost	**$1,656,474**
# of Users	9063
Annual User Cost	$183
Updated MI MAHI	**$51,597**
MAHI - 2010 census	$20,157
Updated MAHI:	$22,475
MAHI Threshold $	$225
Disdavantaged??	**NO**

Benton Harbor	$20,157		
DWRF		51.80%	9.50%
	YES		

State of Michigan

Gretchen Whitmer, Governor

Department of Environment, Great Lakes, and Energy

Liesl Eichler Clark, Director

INTERNET: http://www.michigan.gov/drinkingwaterrevolvingfund

Drinking Water State Revolving Fund Intended Use Plan Fiscal Year 2020

Prepared by:
Water Infrastructure Financing Section
Finance Division

September 2019

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability or political beliefs, height, weight, genetic information or sexual orientation. Questions or concerns should be directed to the Quality of Life Human Resources, P.O. Box 30473, Lansing, Michigan 48909-7973.

Table of Contents

I. Introduction 3

II. Structure of the Drinking Water State Revolving Fund 4

III. Advantages of the Drinking Water State Revolving Fund 5

IV. Goals 5

V. Allocation of Funds 7

VI. Criteria and Method for Distribution of Funds - Set Asides 8

VII. Criteria and Method for Distribution of Funds - Project Loans. 14

VIII. Disadvantaged Business Enterprise 14

IX. Disadvantaged Community Status 15

X. EPA Automated Clearinghouse Activities 15

XI. Assurances 15

XII. Output/Outcome Measures 16

XIII. Public Review and Comment. 16

XIV. Origination of Documents 17

DWSRF Draft Project Priority List (PPL) for Fiscal Year (FY) 2020
DWSRF Draft PPL Scoring for FY 2020
Estimated Category Costs for FY 2020 Draft PPL
Draft Project Re-evaluation Request

I. INTRODUCTION

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) through the Finance Division administers the Drinking Water State Revolving Fund (DWSRF). The DWSRF program details are set forth in Part 54, Safe Drinking Water Assistance, MCL 324.5401-324.5421, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). In addition, the Michigan Finance Authority (Authority) is charged with administering DWSRF funds through the Shared Credit Rating Act, 1985 PA 227, as amended (Act 227).

The DWSRF provides reduced interest rate loan financing to qualified water suppliers to finance construction of public water systems. Projects may include new wells, new water treatment plants, storage facilities, upgrades or expansions to existing facilities, transmission lines, pumping facilities, and other related waterworks system improvements. Suppliers must meet federal and state program requirements, as well as demonstrate their ability to publicly finance their project and retire project debt. In addition to the loan provided by EGLE, suppliers also have the option to pay for part of their project with cash and other resources. Since 1998, Michigan has awarded over $1 billion in financial assistance to over 295 borrowers. In fiscal year (FY) 2020, the DWSRF Project Priority List (PPL) contains $258 million worth of projects.

This Intended Use Plan (IUP) describes how EGLE and the Authority will jointly administer all available DWSRF funds during FY 2020. An IUP is a required part of the process to request the federal 2019 capitalization grant, which will be matched with 20 percent in state match funds. The 2019 capitalization grant allotment for Michigan is $27,011,000. The Water Infrastructure Financing Section (WIFS) of the Finance Division is charged with carrying out the program administration responsibilities. The Community Water Supply Section (CWSS) of the Drinking Water and Environmental Health Division (DWEHD) will assess project priority, issue the necessary construction permits, and offer technical review and assistance throughout project planning, design, and construction. Financial administration of the program will be handled by the staff of the Authority.

The U.S. Environmental Protection Agency (EPA) Region 5 staff will offer guidance and conduct annual program oversight reviews of the DWSRF. The EPA serves as a helpful partner in creating and maintaining this program.

The relationship between EGLE, the Authority, and the EPA is established in an Operating Agreement signed by authorized signatories from each agency. The Operating Agreement is incorporated into this IUP by reference and is available from EGLE upon request.

The IUP includes details on specific project funding and identifies amounts to be set aside from federal capitalization grants for other uses authorized under the federal Safe Drinking Water Act (SDWA) and Part 54 of Act 451. A public hearing was held on August 21, 2019, at Constitution Hall, located at 525 West Allegan Street, Lansing, Michigan.

EGLE certifies that it is recognized by the EPA as the primary agency for management of the drinking water program. The priority system was developed by EGLE and will be used each fiscal year to determine which projects will have access to DWSRF assistance. The priority system is designed to provide low-interest financing to those projects that will have the greatest impact in facilitating safe drinking water supplies.

FY 2020 Project Funding

The 2019 federal capitalization grant allotment for Michigan is $27,011,000. Congress mandated that 20 percent of this amount be provided as additional subsidy to borrowers. EGLE plans to provide this 20 percent as principal forgiveness. An additional six percent to 35 percent must be provided to disadvantaged communities as principal forgiveness. All DWSRF projects funded in FY

2020 must pay their workers the federal Davis-Bacon wage rates for their job classification and comply with American Iron and Steel requirements.

II. STRUCTURE OF THE DWSRF

Due to a large increase in demand in FY 2020, EGLE will operate the DWSRF as a leveraged program, similar to the Clean Water State Revolving Fund (CWSRF). The state will sell State Revolving Fund revenue bonds that are secured by federal and state assets (i.e., federal capitalization grant, required state match, loan repayments, and interest earnings). State funds can include general fund or state revenue bonds. Bond issuance costs are covered by the bonds sold and, thus, are not identified as direct administrative expenses of the DWSRF. Historically, bond issuance costs are appropriately one percent of the total bond issue. Project costs of the local units of government are reimbursed from the bond issues.

For borrowers who are non-municipal entities, limitations on private activity from tax-exempt issues would require EGLE and the Authority to fund private water suppliers from funds other than tax-exempt revenue bonds. These loans would be made as direct loans with a letter of credit supplied by the private borrower or through a partnership with a private lending institution with the state providing an insurance annuity. There are no private, non-municipal water suppliers on the FY 2020 PPL.

There is a provision for subordinate investment of funds between the DWSRF and the CWSRF. This concept permits the administrators of the two funds to make temporary investments from one fund or the other in the event that monies are needed to service debt on the state's tax-exempt bond issues, cover deficiencies in a fund's reserve accounts, or satisfy other reserve account requirements. Only those funds periodically released from debt service reserve accounts, supplemental reserve accounts, revenue accounts, or any other account of the fund, wherein released monies may be generated, may be used for the purposes of subordinate investment.

At each point that monies are released, EGLE and the Authority will undertake a "snapshot" look at both the SRF and the DWSRF. For each fund, we will first examine whether we need to service debt or satisfy reserve account requirements within the fund from which the released monies originated. Next, we will examine the other fund for the same conditions. Then, if sufficient monies are available to satisfy requirements for each fund, the released money will pass completely through and become available for future commitments to new projects consistent with its source. This provision will not be exercised in FY 2020.

Set-asides in the DWSRF are derived from the capitalization grant awarded to the state by the EPA. Set-asides are designated for specified uses within the DWSRF to address areas of concern included in the reauthorization of the SDWA. Legal provisions included in Act 227 permit the Authority and EGLE to establish accounts and sub-accounts to track revenues and expenditures for the set-asides. The set-asides for program and other activities will be directly administered by the Environmental Health Section (EHS) of the DWEHD, with support from the CWSS. EHS and CWSS staff will also be responsible for the technical assistance activities, except for those funds made available to subsidize loans to disadvantaged communities. The disadvantaged community loans will be managed by WIFS.

The following is a list of potential set-asides identified in Section 1452 of the federal SDWA. The percentages noted affect the federal capitalization grant amount available to fund projects.

DWSRF Administration - 4 percent

Technical Assistance - 2 percent

Program Set-asides - 10 percent
•Public Water System Supervision

Other Activities - 15 percent, not to exceed 10 percent for any one activity
•Local Assistance for Capacity Development
•Wellhead Protection

III. ADVANTAGES OF THE DWSRF

The primary advantage for Michigan water suppliers is their ability to borrow funds at interest rates below market. The DWSRF interest rate is established prior to each new fiscal year. As identified in Part 54 of Act 451, determination of the interest rates is based on loan demand, market conditions, program costs, and future needs.

In setting the interest rates for FY 2020, EGLE examines a widely used market index for general obligation municipal bonds to identify current market conditions existing at the time the draft IUP is prepared. Then, to establish a rate of interest for municipal borrowers, EGLE considers present and future demand for DWSRF assistance and the costs to comply with program requirements.

Once the interest rate is determined for municipal borrowers, the resulting interest subsidy to municipalities will be used for private borrowers. If a private borrower chose to obtain a letter of credit and receives a direct DWSRF loan from the Authority, the interest rate would be determined by using the U.S. T-bill rate as the base and applying an identical percentage reduction of interest as municipalities receive. For those private borrowers who chose to obtain financing through a financial institution, the interest rate would be the lending institution's rate, reduced by an identical percentage as a municipality would receive.

The interest rate for municipal borrowers in FY 2020 is 2.0 percent for both 20-year and 30-year loans.

Apart from the low-interest rate, suppliers also benefit from the DWSRF in that they can finance all eligible waterworks system costs. The major benefit results from the fact that water supply financing in the past has always been left to the local units of government or private entities. Historically, there has been no significant state financial assistance available to local officials in meeting water supply needs. Recently, EGLE provided $9.5 million to 18 communities for the Pilot Drinking Water Community Water Supply Grant program. The grant program is funded by a state appropriation. The pilot will provide lessons learned for full lead service line replacement and asset management.

IV. GOALS

Michigan's DWSRF establishes a funding source designed to protect and preserve public health within the state's boundaries. Michigan's geographical identity as a "Great Lakes" state affords its residents with an abundant and high-quality water resource from which to draw its drinking water. Unlike many states, Michigan has plentiful supplies of fresh water with few periods of restricted use. The great challenge for water suppliers lies in protecting the high quality of the resource, as well as ensuring that adequate volume and pressure exist to deliver potable water to the customer.

To this end, Michigan's DWSRF has the following long-term goals:

Goal: *Provide low-cost financing for waterworks system improvements or upgrades while maintaining the perpetuity of the DWSRF.*
The Authority uses a financial advisor to guide decisions on funding levels, interest rates, and other financing terms. Michigan looks to balance the goals of meeting the capitalization grant requirements (i.e., additional subsidies, Davis-Bacon, signage, American Iron and Steel) while maintaining the DWSRF in perpetuity.

Goal: *Continue effective partnerships with other federal and state financing sources to promote efficiency in environmental review procedures and coordination of funding.*
Given the limitations on pooled capital, EGLE continues to work together with various federal and state agencies, such as the U.S. Department of Agriculture - Rural Development, Rural Community Assistance Program, the Michigan Department of Health and Human Services, Michigan Economic Development Corporation and the Michigan Department of Transportation, so that we may collectively fund qualifying projects and maximize use of our capital pool to achieve stated goals. Such partnerships ultimately benefit everyone. Industry, tourism, and day-to-day quality of life are strengthened when our most valuable natural asset is preserved and made available for use and enjoyment.

Goal: *Maintain statewide compliance with all applicable state and federal drinking water laws, rules, and standards while protecting the public health and environmental quality of our state.*
EGLE will use DWSRF set-aside funding to: maintain source water assessment, wellhead protection, and source water protection programs; assist economically disadvantaged communities in meeting drinking water standards; and apply a capacity assessment program for all new and existing community and nontransient, noncommunity water supplies.

Goal: *Continue use of the DWSRF program.*
EGLE will continue to use effective outreach methods such as: direct mail, electronic media, newsletter publication, and informational meetings and conferences to publicize and encourage the use of the DWSRF to meet the infrastructure needs of communities.

In order to accomplish the long-term goals, we must also focus on more immediate objectives. Therefore, our short-term goals in FY 2020 are:

Goal: *Secure Michigan's full share of federal funding and to expeditiously obligate these monies, along with the state contribution.*
EGLE has prepared and identified on the FY 2020 PPL all projects that are willing and able to progress to loan closing consistent with a project milestone schedule for the construction of eligible facilities. All projects receiving DWSRF funds in FY 2020 will issue a Notice to Proceed within 60 days of the loan closing.

Goal: *Ensure that the additional requirements of the 2019 capitalization grant is met, including those that are imposed on local borrowers.*
Congress mandated that 20 percent of the 2019 capitalization grant be provided as additional subsidy to borrowers and an additional six to 35 percent be provided as principal forgiveness for disadvantaged communities. As EGLE recognizes the challenges imposed by the new Michigan Lead and Copper Rule, the 20 percent mandated subsidy will be divided between disadvantaged communities and communities undertaking lead service line replacement.

EGLE will also provide 15 percent of the required disadvantaged community subsidy resulting in just over 30 percent of the capitalization grant awarded as principal forgiveness to disadvantaged communities. Congress requires all DWSRF projects funded in FY 2020 to pay their workers the federal Davis-Bacon wage rates for their job classification and comply with the American Iron and Steel and EPA signage requirements.

Goal: *Fund more projects, assist communities in completing full-length lead service line replacement projects.*
The WIFS provides financial assistance to communities addressing the private property portion of lead service line replacement projects. The signing of the Michigan Lead and Copper Rule will likely result in communities undertaking more lead service line replacement projects.

V. ALLOCATION OF FUNDS

The establishment of a fundable range for any given fiscal year entails a series of steps that culminate in a determination of how much fund resources could support. Using a series of assumptions (DWSRF loan rate, return on investment rates, and level of capitalization) the process for FY 2020 is outlined below:

1. EGLE reviewed the total amount of loans committed through September 30, 2019.

Total loan commitments through 9/30/2019	$1,074,135,000

2. EGLE assumes that the new federal capitalization grant and the appropriated state match will remain constant until 2020. However, it should be noted that EGLE has **no assurance** of state general fund monies to match federal funds beyond the 2019 capitalization grant. Five million dollars of general funds is available for use in FY 2020 to match the 2019 capitalization grants. Remaining state match needed will come from carry over funds from past years. Michigan was appropriated $27,011,000 in DWSRF federal capitalization grant funds for use in FY 2020.

2019 capitalization grant for loans (total grant is $27,011,000)	$18,637,590
General fund match	$5,000,000
Carry forward match	$402,200

3. EGLE then looked at how much the DWSRF could support using a five-year financial forecast at varying capitalization levels and interest rates.

   The PPL has 40 projects, totaling $530 million. Twenty-three projects, totaling $258 million, would like to proceed with construction in FY 2020. Sixteen projects, totaling $272 million, will be considered for funding future years.

   The provision of additional subsidy is a requirement of the capitalization grant and Safe Drinking Water Act. The FY 2019 capitalization grant requires 20 percent of the capitalization grant be provided as additional subsidization. An additional six to 35 percent of subsidization is required to be provided to disadvantaged communities per the Safe Drinking Water Act. The total additional subsidy will not exceed $9,710,000 in FY 2020 and will be awarded as principal forgiveness. The additional subsidy will be provided to projects with disadvantaged community status and to applicants undertaking lead service line replacement work. When principal forgiveness is provided from available loan proceeds to projects, it reduces the amount of the assets returning to the DWSRF as loan repayments, which could be used to make future loans. Total principal forgiveness awarded in FY2020 is approximately 50 percent greater than total principal forgiveness awarded in FY2019.

   Fifteen percent of the required 20 percent additional subsidy plus, approximately fifteen percent of required subsidy for disadvantaged communities, for a total of $8,321,400 in principal forgiveness, will be provided to disadvantaged communities. The amount

allocated to each disadvantaged community will be approximately nine percent of estimated project costs as follows:

Table 1

Disadvantaged Communities		
Community	Estimated Loan Amount	Principal Forgiveness
Detroit (DWSD)	$57,500,000*	$5,175,000
Highland Park	$18,460,000	$1,661,400
Benton Harbor	$4,465,000	$401,850
Muskegon	$6,095,000	$548,550
South Haven	$780,000	$70,200
Owosso	$5,160,000	$464,400
Total	**$92,460,000**	**$8,321,400**

***** Total of project numbers of 7460-01 and 7483-01

Approximately five percent of the required 20 percent subsidy, for a total of $1,387,952 will be provided to communities undertaking full length lead service line replacement as follows:

Table 2

Lead Service Line Replacement (LSLR)		
Community	Estimated LSLR Construction Cost	Principal Forgiveness
Kalamazoo	$12,652,350	$1,265,235
Lake Orion	$443,000	$44,300
Marquette	$389,173	$38,917
St. Joseph	$75,000	$7,500
White Pigeon	$185,000	$18,500
Rochester	$135,000	$13,500
Total	**$13,879,523**	**$1,387,952**

Each state may transfer 33 percent of available funds between the CWSRF and the DWSRF programs. Michigan does not propose to transfer funds between the CWSRF and DWSRF programs in FY 2020.

VI. CRITERIA AND METHOD FOR DISTRIBUTION OF FUNDS - SET-ASIDES

EGLE has established the set-asides and requests funding for each set-aside based on what is needed to effectively administer the public drinking water programs, to enhance public health protection, and the protection of surface and ground waters through additional non-regulatory programs, projects, and activities. In recent years, EGLE has become more dependent on the funding provided by the set-asides to fund the staff needed to effectively administer the programs because the federal Public Water Supply Supervision grant awards have not increased to cover the costs of additional work required to implement several new federal drinking water regulations nor for inflation.

In FY 2019, the DWEHD workload continued to increase. This is due to activities such as our response to the statewide Per- and Polyfluoroalkyl Substances (PFAS) sampling effort, and preparation and education to implement the new Michigan Lead and Copper Rule. The

DWEHD continues to need additional staff resources to adequately oversee water system compliance and be involved with the development of information technology projects, with the mission of protecting public health.

Each year Michigan is required to submit detailed work plans to the EPA for approval describing how each set-aside fund will be expended or the amount to be reserved. Work plans for the FY 2020 set-asides will be submitted to the EPA in late summer-early fall 2019.

Administration

Up to 4 percent of the federal capitalization grant can be used to administer the fund. Michigan intends to utilize the full 4 percent from the 2019 grant which is $1,080,440. Any funds not utilized in FY 2020 will be retained on account for administration costs in future years.

Small Systems Technical Assistance

EGLE is requesting two percent of the 2019 grant, or approximately $540,220 for small system technical assistance. These funds will support staff that provide technical assistance to small public water systems. This work includes, but is not limited to:

- Provide technical assistance to local health department (LHD) staff responsible for implementation of the Noncommunity Water Supply (NCWS) program in Michigan.
- Assist LHD staff in providing direct technical assistance to NCWS owners and operators, registered well drillers, and pump installers.
- Oversee the work conducted by the LHDs to implement the NCWS program throughout Michigan.
- Assist small nontransient, noncommunity public water supplies, formerly on an arsenic bottled water agreement, gain compliance with the arsenic maximum contaminant level by installing water treatment systems or using some other compliance option.
- Review engineering plans and issue permits for treatment systems at NCWSs. Provide direct assistance to small public water supplies that are exploring treatment options for PFAS.
- Provide direct assistance to small public water systems that employ treatment to comply with drinking water standards, primarily those that treat for arsenic and for nitrates.
- Provide direct assistance to facilities that are exploring or have installed secondary treatment for public health purposes therefore becoming a small public water supply.
- Conduct one-on-one or group technical training for LHD staff, NCWS owners and operators, and other stakeholders involved in the operation and maintenance of small systems. This technical training typically focuses on:

    - Sampling and monitoring practices;
    - Completing the preliminary Distribution System Materials Inventory (DSMI) under the Michigan Lead and Copper Rule.
    - Performing Revised Total Coliform Rule Level 1 assessments and Seasonal Start Up Procedures;
    - Compliance with NCWS regulations or Michigan's well construction code;
    - Investigatory techniques used to identify a problem with a NCWS or well and remedies to correct a given problem;
    - Cross connection control, including proper use and maintenance of control devices; and
    - Properly completing and submitting all required documentation or certifications, such as monthly operation reports.

- Assist LHD, NCWS, and consultants involved with the development and operation of small systems with understanding rule and code requirements to improve compliance rates.
- Draft technical guidance documents, fact sheets, brochures, or forms that can be used by the LHDs or distributed to NCWSs, well drillers, and pump installers to help improve or maintain compliance with applicable regulations.
- Administer Michigan's NCWS database, WaterTrack.
- Provide clerical, managerial, and administrative support to the scientific and engineering staff performing the activities listed above.

In addition, the funds in this set-aside will be used in FY 2020 for the following program activities:

- Training for the LHD staff responsible for implementation of the NCWS program in Michigan.
- Ongoing maintenance of the database system, WaterTrack, which houses all the NCWS program data.

Program Set-Asides

EGLE is requesting funds for one state program management set-aside in the 2019 grant, the Public Water System Supervision Program. The following is a breakdown of the projected amount:

Public Water System Supervision

EGLE requests $2,701,100, or 10 percent of the 2019 grant, to support staff and the existing scope of the CWSS Public Water System Supervision Program. This work includes, but is not limited to:

- Maintain an inventory of public water supplies in Michigan.
- Provide compliance assistance to public water supplies.
- Implement a centralized approach to the oversight of surface water treatment of public water supplies.
- Conduct sanitary surveys and surveillance visits at public water supplies.
- Issue permits for new construction or for modifications.
- Assess public water supply compliance with the federal SDWA, the National Primary Drinking Water Standards, Michigan's Safe Drinking Water Act, 1976 Public Act 399, as amended (Act 399), and the Administrative Rules.
- Initiate escalated enforcement actions, when indicated, to compel a public water supply to comply with applicable federal and state drinking water regulations.
- Maintain program data and submit reports to the EPA as required.
- Maintain a drinking water operator training and certification program.
- Draft Michigan's Annual Capacity Development Report and the Triennial Capacity Development Report to the Governor.
- Provide clerical, managerial, and administrative support to the scientific and engineering staff performing the activities listed above.

The funds in this set aside will be used to support local health departments with noncommunity water supply compliance assistance program work.

Wellhead Protection (Section 1452(k))

EGLE is requesting $1,350,550 for the Wellhead Protection set-aside from the 2019 grant, approximately 5 percent of the 2019 grant. The amount requested will be used to support staff responsible for the following work:

- Prioritize efforts relative to emerging issues such as PFAS in groundwater to ensure a more robust dataset for decision making and public health protection.
- Update and distribute technical guidance related to PFAS contamination in drinking water from groundwater supplies, including fact sheets, information for distribution to stakeholders and the public, including communication routes like the MI Environment Web site.
- Provide training and oversight to Michigan Geological Survey in their work (contracted using state funds) to enter well construction records into Wellogic. Begin developing a durable and ongoing process for quality control and quality assurance of information entered into Wellogic.
- Manage and maintain Wellogic, Michigan's on-line water well data system.
- Update the Source Water Assessments (SWA) for Community Water Supplies and Noncommunity Water Supplies. Provide education and outreach on wellhead protection, including providing delineations of wellhead protection areas to community water supplies and nontransient noncommunity water supplies. This will utilize management and other tools as they become available.
- Review and process SWAs submitted by the LHDs. DWEHD technical staff will track the updates and determine if the nontransient NCWSs qualify for substantial implementation of source water protection activities.
- Attend ongoing training, tools and trends in areas of groundwater protection and source evaluations, including new GIS technologies.
- Review and approve traditional wellhead delineations submitted by community water supplies.
- Administer the wellhead protection matching grant program to local communities.
- Register well drillers and pump installers to ensure they are qualified to construct wells or install well equipment, according to Michigan's well construction code requirements.
- Ensure wells are constructed to code, initiate enforcement for compliance, or revoke registrations from a well driller or pump installer when necessary.
- Administer the Abandoned Well Management Program.
- Collaborate on issues, training, and projects identified by members of the Director's WaterWell Advisory Committee formed in 2015.
- Provide technical training and assistance to public water supplies, LHD’s, well drillers, pump installers, and septage waste haulers.
- Provide clerical, managerial, and administrative support to the scientific and engineering staff performing the activities listed above.
- Administer the On-site Wastewater Program, including evaluating each LHD’s on-site wastewater program for consistency and assurance that minimum program requirements are met.
- Promote the need for a statewide sanitary code and assist with efforts to promulgate one.
- Review construction plans and issuance of permits for on-site wastewater installations or modifications at campgrounds to ensure site suitability, installation and operation.
- Evaluate and approve the use of new technologies for treatment of on-site wastewater.
- Administer the Septage Waste Program, including the licensing of septage waste haulers and permitting land application sites.

In addition, the funds in this set-aside will be used for the following program activities:

- Implementation of wellhead protection activities.
- Maintenance of the Wellogic database software.
- Subscription to EQuIS, an electronic data management system and decision support system. EQuIS is currently the solution for EGLE to gather, handle, and store PFAS drinking water data collected from public water supplies.
- Grants to local communities to increase source water protection efforts and initiatives. EGLE plans to utilize approximately $400,000 from the 2019 Wellhead Protection Set-Aside to provide the state funding for these 50/50 match grants.
- Water well construction technical training for LHD staff.
- Onsite wastewater technical training for LHD staff.
- DWEHD is partnering with American Water Works Association, Michigan State University Institute of Water Research, and Michigan Rural Water Association to host a Source Water Protection Conference on October 29-30, 2019. This conference will provide opportunities to learn about management options for source water protection and steps public water supplies can take to develop or enhance an existing program. Designed for communities and public water supplies, attendees will learn about a variety of important topics that include ground and surface water protection issues, wellhead protection, risk communication, funding initiatives, emerging contaminants and state program updates. Participants will have the opportunity to identify the challenges and opportunities that communities are facing as they work to update existing source water protection programs and implement new and innovative concepts, strategies and technologies. This conference is intended for community water supply personnel, local officials, community representatives, local, state and federal partners, consultants, service providers, and those with an interest in source water protection.

Local Assistance for Capacity Development (Section 1452(k))

EGLE is requesting approximately $2,701,100 or 10 percent of the 2019 grant, for the Local Assistance for Capacity Development Set-Aside for staff and other source water protection activities. The staff funded by this set-aside are responsible for providing direct technical assistance to public water supplies to enhance and maintain their technical, managerial and financial capabilities. Specific duties include:

- Assist public water supplies in acquiring and maintaining capacity as outlined in Michigan's Capacity Development Strategy for Existing Water Systems, dated August 1, 2000.
- Educate public water supplies about the Surface Water Intake Grant Program and provide assistance to surface water systems in the development and implementation of a Surface Water Intake Protection Program Plan.
- Continue and expand the implementation of source water select cyanotoxin screening and source water assessment methodology for surface water sources. Surface water sources utilized will be sampled at least once per month from July through October 2019. State of Michigan Renew Michigan Funding will be utilized for sample collection and analysis. Raw and finished water samples will be collected. The samples will be analyzed for microcystins and nodularins, cylindrospermopsin, and anatoxin-a. The set-aside funds will be utilized to provide technical assistance to supplies, including prompt assistance if any cyanotoxins are detected in the raw or finished tap. Water data will be reviewed as it becomes available with public health protection as the primary objective. In FY 2020, when the sampling effort concludes, the complete data set of this voluntary sampling effort will be reviewed for successes, improvements, and lessons learned in an effort to continue to receive support for this sampling.

- Provide technical guidance related to PFAS detections in surface water systems. The State of Michigan is funding sampling of all that utilize surface water for PFAS at least once per month from May through October 2019. Raw and finished water samples will be collected. Data will be reviewed as it becomes available with public health protection as the primary objective. In FY 2020, when the sampling effort concludes, the complete data set from this voluntary sampling effort will be reviewed for successes, improvements, and lessons learned to help public water systems determine next steps.
- Assist public water supplies vulnerable to PFAS, including providing information on treatment technologies, alternate sources, additional sampling, education, and communication.
- Coordinate with other departmental programs and state and federal agencies in the development and integration of drinking water protection strategies. In particular this includes EGLE Water Resources Division, EGLE Remediation and Redevelopment Division, and Department of Health and Human Services on lead, PFAS and HABs. This coordinated approach benefits both the public water supplies and the public.
- Provide extensive training for new and existing staff, including continuation of the successful "Rule School" series to provide an in-depth review of the Act 399 Rules; a rolling six-week series of new analyst training; and an extensive training series on engineering topics in both classroom and hands-on settings. These trainings, in addition to outside training for staff, are positively impacting the consistency and technical expertise available to the regulated community.
- Educate water supplies and operators on the new Michigan Lead and Copper Rule requirements, including inventory, sampling, corrosion control optimization and lead service line removal.
- Receive and review monitoring data and make associated compliance determinations in a consistent and coordinated manner. Educate water supplies about proper sampling methodologies and the timely and complete submittal of data to ensure that any exceedances are addressed.
- Provide guidance to assist supplies in preparing required reports to ensure that they meet regulations.
- Conduct sanitary surveys within the required timeframes.
- Conduct plan reviews for source changes and water supply improvements.
- Perform source water assessments at CWSs.
- Provide one-on-one technical assistance and consultation with water supply personnel to assist in the understanding of, and compliance with, state and federal requirements.
- Review asset management plans, general plans, reliability studies, and engineering studies to assure regulatory compliance and optimum performance.
- Provide cross connection control guidance and training and continue to assist CWS with the development of residential cross connection programs.
- Continue staff involvement in operator training classes to enhance the Operator Certification and Training Program.
- Explore innovative methods to reach water supply owners and operators to promote greater long-term compliance, including the use of one-minute videos on YouTube.
- Provide reminder letters for compliance activities.
- Provide emergency response training to internal staff, with subsequent follow-up to water supplies.

In addition, the funds in this set-aside will be used for the following program activities:

- Continue the surface water intake protection program.
- Determine if new community water supplies meet the financial adequacy requirements of the capacity development program.
- Reimburse LHDs for updating source water assessments at nontransient NCWSs.

- Reimburse LHDs for performing capacity assessments at new or existing nontransient NCWSs.
- Reimburse LHDs for performing annual site visits in situations where the noncommunity public water supply provides treatment for public health purposes.
- Purchase Field Analysis Equipment and Technical Assistance Reference Materials. These will be available to district staff for technical assistance and training to public water supplies.

VII. CRITERIA AND METHOD FOR DISTRIBUTION OF FUNDS - PROJECT LOANS

Michigan's DWSRF will commit loans for qualified projects based on project plans that were submitted to WIFS by May 1, 2019. Plans were reviewed by EGLE staff to ensure compliance with Section 5405 of Act 451, before being placed on the PPL for FY 2020. The DWSRF, to the maximum extent practicable, must give priority to projects that:

- address the most serious risks to human health;
- are necessary to ensure compliance with the requirements of the federal SDWA; and
- assist systems most in need according to the state's affordability requirements.

Michigan's priority system takes these factors into account in the assignment of priority points. Acute violations receive a larger number of points than any other category. In fact, standard compliance offers over 41 percent of a project's total possible points. All factors point to the need for the project to comply with federal drinking water requirements. Affordability is addressed by the award of additional points for disadvantaged community status and is the ultimate tiebreaker. Michigan's priority point system is detailed in Section 5406 of Act 451.

The FY 2020 draft DWSRF PPL is included as part of the IUP and was presented as part of the public hearing on August 21, 2019.

Section 1452(a)(2) of the federal SDWA requires the state to first make available 15 percent of all funds annually credited to the DWSRF for financial assistance to water suppliers serving fewer than 10,000 persons. For the 2019 capitalization grant, Michigan must reach or exceed $4,051,650 to satisfy this requirement.

All projects are reviewed and scored based upon the priority point system outlined in Part 54 of Act 451. Funds are made available for commitment based on the priority ranking and projects will only be funded out of order to satisfy requirements for small community assistance.

Employing the criteria found in Section 5415 of Act 451, the EGLE Director has set the interest rate at 2.0 percent for FY 2020. The term of the loans will run up to 20 years for most projects. Those suppliers meeting disadvantaged community criteria will, however, be able to extend their terms up to 30 years, if desired.

Part 54 of Act 451 also permits suppliers serving less than 10,000 persons to receive reimbursement of project planning costs upon delivery of an approvable project plan to EGLE. Legislation has been passed to provide a funding mechanism for this reimbursement. Interim planning loans first became an option for DWSRF applicants in FY 2001.

VIII. DISADVANTAGED BUSINESS ENTERPRISE

Beginning October 1, 2009, EGLE implemented the EPA's Disadvantaged Business Enterprise (DBE) Rule (40 CRF Part 33). The DBE rule applies specifically to ANY procurement made utilizing EPA financial assistance. The EPA financial assistance includes DWSRF funding. The DBE rule changed substantially from the prior Minority Business Enterprise (MBE) and Women's Business Enterprises (WBE) rule. The DBE rule requires that MBE and WBE firms be certified. Certification

applies to enterprises that are at least 51 percent owned and/or controlled by socially and economically disadvantaged individuals who are of good character, are citizens of the United States, and have an initial and continued personal net worth of less than $750,000.

DBE requirements apply to EGLE, DWSRF loan recipients, and the loan recipient's prime contractors. Additional information regarding the DBE requirements is available on EGLE's DWSRF website (http://www.michigan.gov/drinkingwaterrevolvingfund).

IX. DISADVANTAGED COMMUNITY STATUS

Disadvantaged community status is determined by EGLE based on information submitted with a water supplier's project plan. To qualify, an applicant must first meet the definition of "municipality" found in Part 54 of Act 451. Next, the updated median annual household income (MAHI) of the area to be served must be less than 120 percent of the state's updated MAHI. Finally, the costs of the project must be borne by the customers in the service area. If costs are spread over a larger area, then that area must demonstrate that it meets the poverty or affordability criteria.

Once these conditions are met, a community will be awarded the disadvantaged community status if one of the following is true:

- More than 50 percent of the area to be served by the proposed project is identified as a poverty area by the U.S. Census Bureau.
- The updated MAHI of the area to be served is less than the most recently published federal poverty guidelines for a family of four in the contiguous United States.
- The updated MAHI is less than the updated statewide MAHI and the annual user costs for water supply exceed 1 percent of the service area's MAHI.
- The updated MAHI is more than the updated statewide MAHI and the annual user costs for water supply exceed 3 percent of the service area's MAHI.

The major benefits for qualified communities include 50 additional priority points, extension of loan terms to 30 years principal forgiveness and assistance to help defray the costs of preparing project plans if the population is less than 10,000.

A complete discussion of the disadvantaged community status may be found in a guidance document prepared by EGLE to explain how a supplier can achieve the status and benefit from it. WIFS staff encourages all applicants to supply the pertinent data to allow EGLE to perform a disadvantaged community status analysis.

X. EPA AUTOMATED CLEARINGHOUSE ACTIVITIES

The EPA employs an Automated Standard Application for Payments (ASAP) system to make disbursements of federal funds. Michigan will comply with this system's requirements and deposit funds drawn from it into appropriate accounts set up for the DWSRF.

Beginning in the 1st quarter of FY 2020, Michigan anticipates drawing capitalization grant funds from the ASAP system. Michigan will draw 100 percent state funds first followed by the federal funds.

XI. ASSURANCES

The final guidelines from the EPA set forth provisions that the state must provide certain assurances in order to qualify for capitalization grant funding. Such assurances are incorporated into the Operating Agreement and are included here by reference. EGLE has a Quality Management Plan that guides our selection of qualified staff, and that the relevant staff is in place to work on DWSRF projects. DWSRF project information will continue to be provided to the EPA via the Drinking Water Project & Benefits Reporting (PBR) and the National Information Management

System (NIMS). All projects funded in FY 2020 will meet the equivalency requirements for crosscutter review and Federal Funding Accountability & Transparency Act (FFATA).

XII. OUTPUT/OUTCOME MEASURES

To comply with the EPA requirements on Environmental Benefits of the DWSRF, Michigan estimates that the following outputs could result from project loans in FY 2020 (including any projects noted as future on the PPL):

A. Output: Michigan could fund approximately 34 drinking water transmission/ distribution loans to construct/rehabilitate/upgrade drinking water transmission and distribution systems across the state. The dollar amounts of these applications total approximately $479 million.

   Outcome: The funding of these projects could result in more people receiving improved drinking water from existing treatment systems in Michigan.

B. Output: Michigan could fund approximately ten drinking water treatment projects to construct and/or rehabilitate drinking water treatment facilities across the state. The dollar amount of these application total approximately $22 million.

   Outcome: The funding of these projects could result in improved drinking water for thousands of people in Michigan and upon completion of the project, facilities that meet all applicable permits and SDWA requirements.

C. Output: Michigan could fund approximately two drinking water storage projects to construct and/or rehabilitate drinking water storage facilities across the state. The dollar amount of the application totals approximately $1.6 million.

   Outcome: The funding of this project could result in the improved drinking water and storage facilities that meet all applicable permits and SDWA requirements.

D. Output: Michigan could fund one drinking water source project to construct and/or rehabilitate drinking water source facilities across the state. The dollar amount of the application totals approximately $745,285.

   Outcome: The funding of this project could result in more people receiving improved drinking water from a new or rehabilitated water source that meets all applicable permits and SDWA requirements.

Please note that the number of applications will not agree with the number of loans on the PPL, as many of the project loans include work in more than one category (i.e., transmission/distribution, treatment, storage, and source).

XIII. PUBLIC REVIEW AND COMMENT

In order to satisfy public participation requirements, EGLE held a public hearing to discuss the DWSRF draft IUP on August 21, 2019. The hearing was publicly noticed in the *Detroit Legal News,* the *Lansing State Journal,* and the *Marquette Mining Journal;* posted on the EGLE calendar of events; mailed to all persons and engineering firms on our mailing list; and individually noticed to each water supplier on the FY 2020 draft PPL. These sources promote the hearing to ensure maximum public input from those interested in the DWSRF. The hearing affords stakeholders and other interested parties an opportunity to hear and comment on how EGLE plans to disburse the DWSRF loan funds.

Questions about the DWSRF IUP may be directed to:

Ms. Kelly Green, Administrator
Water Infrastructure Financing
Finance Division
Department of Environment, Great Lakes, and Energy
P.O. Box 30457
Lansing, Michigan 48909-7957
Voice: 517-284-5433
E-mail: GreenK1@Michigan.gov

Other contacts for the DWSRF are:

Ms. Dana DeBruyn, Section Manager
Environmental Health Section
Drinking Water and Environmental Health Division Department
of Environment, Great Lakes, and Energy
P.O. Box 30817
Lansing, Michigan 48909-8311
Voice: 517-930-6463
E-mail: DebruynD@Michigan.gov

Ms. Deborah M. Roberts, Executive Director Michigan
Finance Authority
Michigan Department of Treasury
P.O. Box 15128
Lansing, Michigan 48922
Voice: 517-241-2432
E-mail: TreasMFA@Michigan.gov

XIV. ORIGINATION OF DOCUMENTS

EGLE is responsible for issuing the DWSRF IUP and its accompanying information.

Department of Environment, Great Lakes and Energy

Current PPL

DWRF

Rank	Project #	Project Name, Location and Description			Population	Total Points	Binding Com Date	Binding Com Amount
PROJECTS WITH PRIOR YEAR SEGMENTS								
1	7473-99	City of Highland Park	Wayne County	Future wm repl phases, lslr	11,398	465	Future	$81,525,000
2	7461-02	GLWA	Oakland County	14 Mile Rd Trans Main Loop, Ph 2	3,600,000	400	Future	$46,000,000
3	7445-02	GLWA	Wayne County	Northeast Trans Main, Phase 2	3,600,000	375	08/07/2020	$92,030,000
3	7445-03	GLWA	Wayne County	Northeast Trans Main, Phase 3	3,600,000	375	Future	$50,320,000
PROJECTS WITHOUT PRIOR YEAR SEGMENTS								
4	7464-01	City of Benton Harbor	Berrien County	wm repl,lslr, elev strg imp	10,020	615	05/19/2020	$4,465,000
5	7482-01	City of Kalamazoo	Kalamazoo County	wm repl & ext, lead sl repl	144,500	525	02/28/2020	$22,700,000
6	7458-01	City of Owosso	Shiawassee County	wm replac, lslr	14,539	515	Future	$12,975,000
7	7457-01	City of Owosso	Shiawassee County	elev strg imp, WTP imp, wm repl	14,539	490	02/28/2020	$3,500,000
8	7473-01	City of Highland Park	Wayne County	wm replac, lslr phase 1	11,398	465	05/19/2020	$14,020,000
9	7418-01	City of Muskegon Heights	Muskegon County	Watermain & meter replacement	10,800	465	Future	$5,735,000
10	7436-01	City of St. Joseph	Berrien County	Wm replac, lslr	33,000	465	02/28/2020	$1,750,000
11	7470-01	City of Howell	Livingston County	W. Grand River watermain repl	9,203	430	Future	$2,675,000
12	7469-01	City of Howell	Livingston County	Clinton St. watermain repl	9,203	430	Future	$1,400,000
13	7462-01	City of Howell	Livingston County	WTP & well improv, wm repl	9,203	430	05/19/2020	$975,000
14	7480-01	Spring Arbor Township	Jackson County	New wellfield, wm ext	2,100	420	02/28/2020	$3,370,000
15	7426-01	City of Rochester	Oakland County	Watermain replacement & transm	13,660	415	02/28/2020	$5,950,000
16	7466-01	City of Muskegon	Muskegon County	WFP impr, PS impr, wm & lsl repl	38,500	415	08/07/2020	$6,095,000
17	7468-01	City of Muskegon	Muskegon County	WFP chem feed, wm & lsl repl	38,500	415	Future	$4,130,000
18	7467-01	City of Muskegon	Muskegon County	WFP impr, wm & lsl repl	38,500	415	Future	$3,035,000
19	7442-01	East Lansing	Ingham County	WTP filt add & controls	79,585	400	Future	$2,900,000
20	7441-01	East Lansing	Ingham County	HVAC upgrd	79,585	400	05/19/2020	$1,135,000
21	7461-01	GLWA	Oakland County	14 Mile Rd Trans Main Loop, Ph 1	3,600,000	400	05/19/2020	$8,400,000
22	7430-01	Village of Lake Orion	Oakland County	Watermain replacement Ph 3 & 4	3,032	395	05/19/2020	$4,390,000
23	7460-01	DWSD/GLWA	City of Detroit, Wayne County	Wm replac, lslr	650,000	375	05/19/2020	$32,635,000
24	7483-01	DWSD/GLWA	City of Detroit, Wayne County	wm replac, lslr	650,000	375	05/19/2020	$24,865,000
25	7463-01	City of South Haven	Van Buren County	Wm replac, lslr	11,650	340	11/15/2019	$1,210,000
26	7452-01	Livonia	Wayne County	WM repl (Project Area #1-3)	96,942	325	05/19/2020	$10,525,000

Project Type: DWRF Loan Fiscal Year: 2020 Include 4th Quarter From Previous FY: No

27	7434-01	City of Dearborn	Wayne County	Watermain replacement Area 1 20	100,000	325	Future	$8,000,000
28	7453-01	Livonia	Wayne County	WM repl (Project Area #4-6)	94,060	325	Future	$5,300,000
29	7454-01	Livonia	Wayne County	WM repl (Project Area #7-9)	94,060	325	Future	$4,815,000
30	7433-01	City of Dearborn	Wayne County	Watermain replacement area 1	100,000	325	Future	$4,500,000
31	7435-01	City of Dearborn	Wayne County	Watermain replacement area 2	100,000	325	Future	$3,500,000
32	7472-01	City of Ann Arbor	Washtenaw County	UV disinf	125,000	325	11/15/2019	$3,100,000
33	7437-01	City of St. Joseph	Berrien County	WTP improvement, watermain repla	33,000	315	Future	$35,565,000
34	7459-01	Charter Township of Port Huron	St. Clair County	wm replac	10,654	315	08/07/2020	$6,215,000
35	7425-01	City of Fraser	Macomb County	Watermain repl, PRVs	14,084	315	02/28/2020	$3,800,000
36	7479-01	Charter Township of White Lake	Oakland County	Iron filtration	6,000	305	08/07/2020	$3,615,000
37	7465-01	Village of White Pigeon	St Joseph County	Wm replac, lsl replac	1,530	295	05/19/2020	$1,665,000
38	7481-01	City of Marquette	Marquette County	wm replac	24,500	240	05/19/2020	$1,995,000
Total 39 Projects								**$530,780,000**

Department of Environment, Great Lakes and Energy

Drinking Water Revolving Loan Fund PPL Scoring

Category Description	Points	7418-01	7425-01	7426-01	7430-01	7433-01	7434-01	7435-01	7436-01	7437-01	7439-01	7441-01	7442-01	7445-02	7445-03	7452-01
Drinking Water System Compliance Total	**450 (max)**	150	150	150	150	150	150	150	150	150	0	150	150	150	150	150
Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**250**															
Non-Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**200**															
Facility Upgrade to Maintain Compliance	**150**	■	■	■	■	■	■	■	■	■		■	■	■	■	■
Aesthetic Upgrades to Maintain Compliance	**25**															
Infrastructure Improvements/Upgrades - Total	**350 (max)**	125	25	125	125	25	25	25	175	25	0	100	100	75	75	25
Source/Treatment with Connecting Mains	**125 (max)**	125	0	0	0	0	0	0	125	0	0	100	100	0	0	0
Meet Minimum Capacity	**100**	■							■							
Relliability	**75**	■							■			■	■			
Other Upgrades	**25**	■							■			■	■			
Enforcement Action	**25**															
Source Water Protection	**50**															
Transmission/Distribution Mains	**125 (max)**	0	25	125	125	25	25	25	25	25	0	0	0	75	75	25
Meet Minimum Capacity	**100**			■	■											
Relliability	**75**													■	■	
Other Upgrades	**25**		■	■	■	■	■	■	■	■						■
Enforcement Action	**25**															
Storage Facilities/Pumping Stations	**125 (max)**	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
Meet Minimum Capacity	**100**															
Relliability	**75**															
Other Upgrades	**25**								■							
Enforcement Action	**25**															
Population - Total	**50 (max)**	40	40	40	20	50	50	50	40	40	0	50	50	50	50	50
0 - 500	**10**										■					
501 - 3,300	**20**				■											
3,301 - 10,000	**30**															
10,001 - 50,000	**40**	■	■	■					■	■						
> 50,000	**50**					■	■	■				■	■	■	■	■
Disadvantaged Community - Total	**50 (max)**	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Granted	**50**	■														
Consolidation - Total	**100 (max)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achieve Compliance	**100**															
Correct Deficiencies	**60**															
Other	**40**															
Comp. Wellhead/Source Water Protect Plans - Total	**100 (max)**	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100
Granted	**100**	■	■	■	■	■	■	■	■	■		■	■	■	■	■
Total Priority Points Assigned	**1000 (max)**	465	315	415	395	325	325	325	465	315	0	400	400	375	375	325

Fiscal Year: 2020

Friday, September 20, 2019 4:04 PM

Department of Environment, Great Lakes and Energy

Drinking Water Revolving Loan Fund PPL Scoring

Category Description	Points	7453-01	7454-01	7457-01	7458-01	7459-01	7460-01	7461-01	7461-02	7462-01	7463-01	7464-01	7465-01	7466-01	7467-01	7468-01
Drinking Water System Compliance Total	**450 (max)**	150	150	150	150	150	150	150	150	150	150	350	150	150	150	150
Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**250**															
Non-Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**200**											■				
Facility Upgrade to Maintain Compliance	**150**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Aesthetic Upgrades to Maintain Compliance	**25**															
Infrastructure Improvements/Upgrades - Total	**350 (max)**	25	25	200	225	125	25	100	100	150	100	175	125	75	75	75
Source/Treatment with Connecting Mains	**125 (max)**	0	0	75	75	0	0	0	0	25	0	0	0	25	25	25
Meet Minimum Capacity	**100**															
Relliability	**75**			■												
Other Upgrades	**25**				■					■				■	■	■
Enforcement Action	**25**															
Source Water Protection	**50**				■											
Transmission/Distribution Mains	**125 (max)**	25	25	125	125	125	25	100	100	125	100	125	125	25	25	25
Meet Minimum Capacity	**100**			■	■	■				■		■	■			
Relliability	**75**			■	■			■	■		■					
Other Upgrades	**25**	■	■	■		■	■	■	■	■	■		■	■	■	■
Enforcement Action	**25**											■				
Storage Facilities/Pumping Stations	**125 (max)**	0	0	0	25	0	0	0	0	0	0	50	0	25	25	25
Meet Minimum Capacity	**100**															
Relliability	**75**															
Other Upgrades	**25**				■							■		■	■	■
Enforcement Action	**25**											■				
Population - Total	**50 (max)**	50	50	40	40	40	50	50	50	30	40	40	20	40	40	40
0 - 500	**10**															
501 - 3,300	**20**												■			
3,301 - 10,000	**30**									■						
10,001 - 50,000	**40**			■	■	■					■	■		■	■	■
> 50,000	**50**	■	■				■	■	■							
Disadvantaged Community - Total	**50 (max)**	0	0	0	0	0	50	0	0	0	50	50	0	50	50	50
Granted	**50**						■				■	■		■	■	■
Consolidation - Total	**100 (max)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achieve Compliance	**100**															
Correct Deficiencies	**60**															
Other	**40**															
Comp. Wellhead/Source Water Protect Plans - Total	**100 (max)**	100	100	100	100	0	100	100	100	100	0	0	0	100	100	100
Granted	**100**	■	■	■	■		■	■	■	■				■	■	■
Total Priority Points Assigned	**1000 (max)**	325	325	490	515	315	375	400	400	430	340	615	295	415	415	415

Department of Environment, Great Lakes and Energy

Drinking Water Revolving Loan Fund PPL Scoring

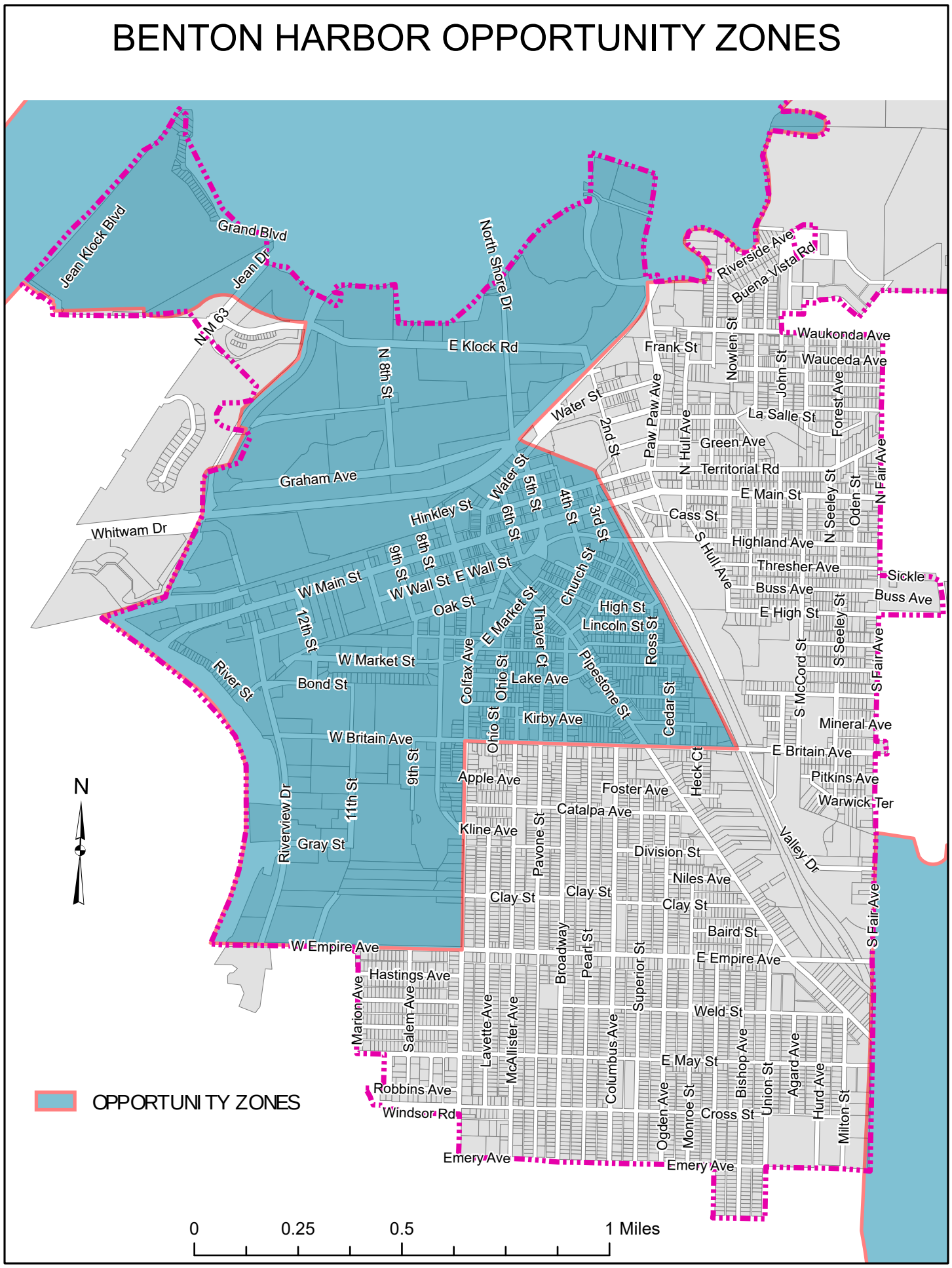
Category Description	Points	7469-01	7470-01	7472-01	7473-01	7473-99	7479-01	7480-01	7481-01	7482-01	7483-01
Drinking Water System Compliance Total	**450 (max)**	150	150	150	150	150	175	150	150	350	150
Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**250**										
Non-Acute Viol. of DW Standards, Health Advisory Levels, SWTT, Disease	**200**									■	
Facility Upgrade to Maintain Compliance	**150**	■	■	■	■	■	■	■	■	■	■
Aesthetic Upgrades to Maintain Compliance	**25**						■				
Infrastructure Improvements/Upgrades - Total	**350 (max)**	150	150	25	125	125	0	250	50	125	25
Source/Treatment with Connecting Mains	**125 (max)**	25	25	25	0	0	0	125	0	0	0
Meet Minimum Capacity	**100**							■			
Relliability	**75**										
Other Upgrades	**25**	■	■	■				■			
Enforcement Action	**25**										
Source Water Protection	**50**										
Transmission/Distribution Mains	**125 (max)**	125	125	0	125	125	0	125	25	125	25
Meet Minimum Capacity	**100**	■	■					■		■	
Relliability	**75**				■	■				■	
Other Upgrades	**25**	■	■		■	■		■	■		■
Enforcement Action	**25**				■	■					
Storage Facilities/Pumping Stations	**125 (max)**	0	0	0	0	0	0	0	25	0	0
Meet Minimum Capacity	**100**										
Relliability	**75**										
Other Upgrades	**25**								■		
Enforcement Action	**25**										
Population - Total	**50 (max)**	30	30	50	40	40	30	20	40	50	50
0 - 500	**10**										
501 - 3,300	**20**							■			
3,301 - 10,000	**30**	■	■				■				
10,001 - 50,000	**40**				■	■			■		
> 50,000	**50**			■						■	■
Disadvantaged Community - Total	**50 (max)**	0	0	0	50	50	0	0	0	0	50
Granted	**50**				■	■					■
Consolidation - Total	**100 (max)**	0	0	0	0	0	0	0	0	0	0
Achieve Compliance	**100**										
Correct Deficiencies	**60**										
Other	**40**										
Comp. Wellhead/Source Water Protect Plans - Total	**100 (max)**	100	100	100	100	100	100	0	0	0	100
Granted	**100**	■	■	■	■	■	■				■
Total Priority Points Assigned	**1000 (max)**	430	430	325	465	465	305	420	240	525	375

CITY OF BENTON HARBOR

Summary of Funding Needed for Sewer/Water Projects to be completed from 2020-2022

	2020	2021	2022	2023	2024	2025	Notes
FUNDING SUMMARY							
Utility Budget Shortfall	$ (900,000)	$ (932,613)	$ (937,934)	$ (250,472)	$ 35,558	$ 345,133	Gets Sewer/Water Fund self supportive
New Debt	$ -	$ (108,474)	$ (213,006)	$ (212,343)	$ (211,681)	$ (211,018)	
Transfer In from General Fund & Road Fund	$ 300,000	$ -	$ -	$ -	$ -	$ -	To-Date
Refund Transfer from General & Road Funds	$ (300,000)	$ -	$ -	$ -	$ -	$ -	
Transfer In from Income Tax	$ 900,000	$ 645,000	$ 740,000	$ 32,000	$ -	$ -	To Refund Transfers and Balance Budget/Expenses
Transfer In from PPI	$ -	$ 200,000	$ 200,000	$ 200,000	$ 25,000	$ -	For Water Tower
Rate Adjustments	$ -	$ 237,000	$ 259,000	$ 280,000	$ 308,000	$ 335,000	
NET FUNDS	**$ -**	**$ 40,913**	**$ 48,060**	**$ 49,185**	**$ 156,877**	**$ 469,115**	
PPI Fund							
PPI Fund Balance	$ 238,500	$ 188,500	$ 138,500	$ 88,500	$ 38,500	$ 163,500	
Receipts	$ -	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	No Increase (budgeted $168k in 2020)
Expenses Committed	$ (50,000)	$ -	$ -	$ -	$ -	$ -	DPW Work
Transfers Out to Utility Fund	**$ -**	**$ (200,000)**	**$ (200,000)**	**$ (200,000)**	**$ (25,000)**	**$ -**	For Water Tower Construction
New Balance	$ 188,500	$ 138,500	$ 88,500	$ 38,500	$ 163,500	$ 313,500	Good for other expenditures By 2024
Income Tax Fund							
Income Tax Fund Balance	$ 2,400,000	$ 1,100,000	$ 855,000	$ 965,000	$ 2,033,000	$ 3,133,000	
Less Reserves	$ (400,000)	$ (600,000)	$ (400,000)	$ (400,000)	$ (400,000)	$ (400,000)	Higher Reserves in 2021 due to COVID
Receipts	$ -	$ 1,000,000	$ 1,250,000	$ 1,500,000	$ 1,500,000	$ 1,500,000	Lower Receipts in 2021/22 due to COVID
Transfers Out to Utility Fund	**$ (900,000)**	**$ (645,000)**	**$ (740,000)**	**$ (32,000)**	**$ -**	**$ -**	
New Balance	$ 1,100,000	$ 855,000	$ 965,000	$ 2,033,000	$ 3,133,000	$ 4,233,000	Good for other road work by 2023
Rate Adjustments							
Water Rate Increase		9.95%	9.95%	9.95%	9.95%	9.95%	
Cost per Service/month		$ 5.00	$ 5.50	$ 6.00	$ 6.67	$ 7.33	
Funds Raised		$ 150,000	$ 165,000	$ 180,000	$ 200,000	$ 220,000	
Sewer Rate Increase		7%	7%	7%	7%	7%	
Cost per Service/month		$ 2.90	$ 3.13	$ 3.33	$ 3.60	$ 3.83	
Funds Raised		$ 87,000	$ 94,000	$ 100,000	$ 108,000	$ 115,000	
Street Fund							
Street Fund Balance	$ 1,493,000	$ 1,493,000	$ 491,000	$ 575,000	$ 515,000	$ 410,000	
Less Normal Expenditures for Maintenance	$ -	$ (875,000)	$ (875,000)	$ (875,000)	$ (875,000)	$ (875,000)	
Empire Avenue		$ (622,000)	$ 339,000	$ 45,000			Advance Construct - Reimbursement
Receipts	$ -	$ 875,000	$ 1,000,000	$ 1,150,000	$ 1,150,000	$ 1,150,000	Plan for a reduction the first couple years (50% in year 1)
Transfers Out for Debt on Loan Ineligible Costs - Storm/Roads	**$ -**	**$ (380,000)**	**$ (380,000)**	**$ (380,000)**	**$ (380,000)**	**$ (380,000)**	
New Balance	$ 1,493,000	$ 491,000	$ 575,000	$ 515,000	$ 410,000	$ 305,000	Will remain relatively healthy

E. 2. Opportunity Zone Map



F. Biographical Sketches

1. **City of Benton Harbor**
    a. **Ellis Mitchell – City Manager**
    b. **Mike O'Malley – Benton Harbor Water Superintendent**
    c. **Tracy-Ann Jennings – Community and Economic Development Department Director**
2. **Abonmarche Consultants, Inc**
    a. **Jason Marquardt, PE – Project Manager**
    b. **Corey Kandow, PE – Project Manager**
    c. **Bret Witkowski – Asset Management Program Director**
    d. **Joelle Regovich – Grant Administrator**

Ellis E. Mitchell

567 East Main Street, Unit #1, Benton Harbor, Michigan 49022
Phone: (314) 413-6776 ▪ E-mail: eammitch999@gmail.com

September 26, 2019

Honorable Mayor Muhammad and
Honorable Members of the City Commission
200 East Wall Street
Benton Harbor, MI 49022

RE: City Manager Recruitment – Benton Harbor, Michigan

Dear Mayor Muhammad and City Commission Members:

Pleasc accept this comprehensive employment package as my application for the position of City Manager for the City of Benton Harbor, Michigan. I have served as your Interim City Manager for the past two months, and the credentials presented in this package along with my body of work over this period serve as proof that I am the best candidate for the position of City Manager for the City of Benton Harbor.

Experience Matters!
As many of you already know, I have served as City Manager of Benton Harbors in years past, and some of you might know my history as the City Manager who saved this City from State receivership during that tour of duty.

Under my leadership, we were **ACTION-DRIVEN ...** creating opportunities and strengthening the status of our residents, businesses, staff team, and overall growth of the City.

I left the City of Benton Harbor, through my own will, to accept another challenging position closer to my family, whom I had been apart from during my four year tour here. I left the City with trained staff members, a balanced budget, and a stronger sense of unity in the community, where citizens, city businesses, partners, and the staff having a respect for this governing body.

I bring to the City of Benton Harbor a mature, seasoned, energetic, and visionary leader, with experienced executive management skills, including managing five cities; directing major departments in several others; as a business owner, providing management consulting services for several other organizations and businesses;

I know that was years ago, and some of you might have wondered, "What can he do for us now???" My body of work over the past two months should have answered that question, and hopefully we are ready to move forward. But know this; what you have seen is just the tip of the iceberg ... the beginning of the process of full recovery that began with stabilization. I submit that we are close enough to stable and planning for the future has already begun and almost ready for its unveiling.

I propose that the education, skills, background, and history I bring combined with the innovative and technologically sound, futuristic operational and financial management, leadership, strategic planning, team-building, and the execution and implementation of approved plans will keep Benton Harbor an alive

and fully functional and respected member in the Twin Cities business of Government operations community ... a fully functional and participatory city meeting the needs of its residents, fulfilling its leadership role in Southwest Michigan and within the State of Michigan.

In summary, I bring extensive experience in local, State, and Federal Government operations; relevant experience in non-profit, private, educational sectors; and military experience as a Vietnam War Veteran to the organization. This experience is supported by a Bachelor's Degree in Business Administration, a Master's Degree in Public Administration, a Certificate in Senior Executive Management, and many hours of formal continuing education, personal development, and training. Further, my education and experience, my management style, and personal traits are congruent with those required of your next City Manager.

My 40 year-plus employment history is highlighted by the following:

- Building and maintaining close working relationships with elected and appointed Councils/Commissions and Boards, staff and operating team leaderships, residential and business stakeholders, and with my fellow City/County Managers.
- Daily management, oversight, leadership, and accountability for all assigned areas within the organization, its financial, human, and physical resources.
- Strong, strategic planning and managing the annual operating and capital budget processes.
- Experienced team builder, leader, negotiator, mediator, communicator, and listener.
- Experienced in the core competencies of education, business, housing, economic and organizational development, public safety and services, and all other departmental functions and using technology as "the thread that binds".
- Strong advocate and practitioner of internal and external partnerships and intergovernmental relations.

These duties have required building intergovernmental and legislative relationships with County, State, and Federal legislative bodies and staff officials, neighboring jurisdictions, and all internal operations over the years. They have been performed while managing complex organizations in dynamic and fast-paced environments and jurisdictions:

- Ranging in size from 5,000 to over a 1,000,000 people;
- Budgets ranging from $10M to in excess of $1B;
- Number of employees ranging from 80 to over 12,000 ... in racially, ethnically, socially, and economically diverse communities, and in several sections of the Country.

My quality management and my highly developed interpersonal and communication skills have been honed by my many years of diversified experiences. These skills helped me:

- Save two cities from state receivership (Benton Harbor, Michigan and East St. Louis, IL).
- Improve planning, intra and intergovernmental relations, debt stabilization, income generation and service delivery in several others (Most recently, City of East Point Georgia).
- Serve as the first City Manager ever in one city and the first in four years in another.

The key to my success has been my dedication to working with and building strong internal teams with elected Councils, staffs, community residents, business owners, and religious and educational leaders.

I believe this extensive and diversified, professional background makes me an ideal candidate for this position. Therefore, I enthusiastically welcome the opportunity to personally discuss the attributes I bring to the organization, to you, the Mayor and Commission, to the Management Team and staff, and the contributions I can make to help further the organizations goals for its major stakeholders and the City as a whole.

Thank you in advance for this opportunity to present myself and my qualifications on paper for your considerations. My salary preferences are negotiable. If you have any questions or require further information, I can be reached at (314) 413-6776.

Sincerely,

[Please accept as signed]

Ellis E. Mitchell

Enclosures

Ellis E. Mitchell
567 East Main Street, Unit 1, Benton Harbor, MI 49022
Primary Phone: (314) 413-6776 ▪ E-mail: eammitch999@gmail.com

POSITION SOUGHT: CITY MANAGER - BENTON HARBOR, MICHIGAN

Performance-driven Senior Executive offering more than 40+ years of comprehensive achievements in public, private, and educational sectors; managed five cities, saving two from State Receivership; directed major departments in several others; provided management consulting services for cities and private sector companies; recognized for organizational and economic development skills that demand strong team building and focused and strategic planning, benefiting employees and community; MPA/BS in Management, Finance, Organizational Development, Marketing.

EXECUTIVE LEADERSHIP & OPERATION COMPETENCIES

• Executive Level Public Sector Management	• Building/embracing Intergovernmental Relations
• Budgeting, Finance, and Cost Controls	• Planning / Community/ Economic Development
• Long-Term Strategic Planning & Growth	• Staff Training / Development / Management
• Negotiation / Mediation, Labor / other Contracts	• Dynamic Team Building and Team Membership
• Building Partnerships with Supervisors / those Supervised • All facets of the Administrative / Management Process	• Capital Planning and Improvement • Thinking / Listening / Strategic Planning / Problem Solving • Required education and Experience
• Embracing Community Diversity • Facilities Planning and Management	• Excellent Oral / Written Presentations • Transportation Planning and Management

TRACK RECORD OF SUCCESS

Proven, consistent, and improved application of the above skills led to these accomplishments, to name a few:

- Managed five cities using planning techniques that saved two from state receivership; provided $9.1M funding for a major capital development for one; and provided contracted leadership and turnaround planning to stabilize and improve financial management, daily operations, team building, intergovernmental relations, and overall good government to the others.
- Led planning and implementation of balanced Operating Budgets and 5 Year Capital Improvement Programs in several cities stabilizing and improving financial management.
- Managed major departments, including Parks and Recreation, Public Works, Economic Development, Facilities & Grounds, and leading each back to prominence in the organization.
- Served as Project Manager over major bond issues, developments, and several capital funding projects from planning, negotiating, and throughout the construction process.
- Planned / implemented a utility improvement plan that increased collections from 51% to 92% and more than $1M.
- Led the Task Force that planned, created, and implemented legislation that brought law and order to a multi-million dollar Street Vending Program that went from paying no taxes to contributing its fair share to revenue collections.

EXPERIENCE – PUBLIC SECTOR

07/2019 – Present **Interim City Manager, City of Benton Harbor, MI**
Hired by the City Commission to oversee and manage the daily affairs of the City.

11/2017 – 07/2019 **Mobility Manager, Twins City Area Transportation Authority (TCATA), Benton Harbor, MI.**
Hired by Executive Director to oversee and manage the Mobility Management approach to optimizing all public transportation in Southwest Michigan toward improving specialized transportation for older adults, people with disabilities, people with lower incomes, and, thereby, those with limited to no personal means of mobility … where public transportation is the only option.

11/2013 - 12/2014 **Interim City Manager, City of East Point, GA**
The Robert Bobb Group was awarded the Management Contract to provide turn-around management services for the City; Mitchell was selected and appointed by the Mayor and City Council to direct the administrative and operational services of around 549 employees, leading all City Departments in developing a $127M Budget, population of 35,000, managing the daily affairs, strategic planning, team building, economic and community development, and building strong intergovernmental relations within the county, state and federal governments. Performance highlights including:

- Developing an Operating Budget within the first 15 days on the job
- Assuring the development of the Comprehensive Annual Financial Report (CAFR)
- Bringing stability to the management and administrative staff teams
- Improving Intergovernmental relations by making sure the City was back at the table at cross- jurisdictional meetings
- Building more effective and efficient Council/Manager relationships

10/2009 - 09/2010 **City Manager, Berkeley, MO**
Appointed by Mayor and City Council to direct the administrative and operational services of around 160 employees, all City Departments in developing a $21M budget, population of 11,000, management of daily affairs, strategic planning, team building, economic and community development, and building strong intergovernmental relations within the county, state and federal governments. Performance highlight including:

- Planning and implementing a 5-Year Plan that streamline operations, improving internal and Intergovernmental relations, service delivery, budget planning and development, strategic team building, staff training, and overall better government.
- Responsible for City Bond rating increasing to A and overall City rating increasing to A+ as prerequisite to receiving $9.1M Bond award to build new Municipal Complex ... catalyst for Downtown improvement / development / and redevelopment.

01/1992 – 10/1993 **City Manager, East St. Louis, IL**
Brought in to direct the administrative and operational services of 300 employees,, Departments in developing a $25M budget, population of 44,000, strategic planning, management of daily affairs, and working with the State appointed financial oversight Board. Performance highlights including:

- Planning and implementing a 5-Year Plan that streamlined operations, preparing the first balanced Operating budget, improving internal and intergovernmental relations, service delivery, revenue to debt ratios,

strategic team building, staff training, overall better government.
- Orchestrating turnaround that actually saved the City from State receivership.

01/1983 – 02/1987 **City Manager, Benton Harbor, MI**

Recruited to direct the administrative and operational services of 200 employees, all City Departments in developing a $12M budget, population of 16,000 strategic planning, working with the State appointed financial agent, serving on various boards and commissions including Airport, Wastewater Treatment, Solid Waste, and Economic Development boards, and the Planning Commission; worked closely with the Library Board, Transit Commission, Housing Commission, the Chamber of Commerce. Performance highlights including:

- Planning, implementing, and managing a 5-Year Comprehensive Plan that streamlined operations, preparing the first balanced operating budget, improving internal and intergovernmental relations, service delivery, and revenue to debt ratios, strategic team building, staff training and overall better government.
- Updating much needed water meter reading program, staff services, and revenue collection program that led to increased collections for 51% to 92% and more than $1M.
- Orchestrating improvements that led City from receivership.

01/1977 – 10/1977 **Assistant City Manager, Emeryville, CA**

Brought in as first Assistant City Manager to assist the first City Manager in performing administrative and managerial oversight of the City's daily affairs in this full service city of over in 4,500 night population and 15,000 day population; $7M total operating budget; 163 employees; worked closely in budget development and administration, personnel administration, economic and community development, finance and projects management and operations. Performance highlights including:

- Building viable working departmental teams under a new government structure.
- Recruiting and hiring first Senior Center Program Director who built a model program.

10/1998 – 02/2002 **Special Assistant to City Manager & Manager & Municipal Buildings Services Division, Public Works Agency - Oakland, CA.**

Brought in to oversee and coordinate City Manager's special and most challenging projects and managing City's most difficult operating Division of 120 employees, $18M budget, over 350 buildings/facilities, population of 400,000. Performance highlights including:

- Planning and coordinating development of 3 major Initiatives: Banishing Bureaucracy, Community Oriented Government, and Public Safety Strategy and rolling-out legislative initiatives for City Council approval to implement.
- Planning and implementing major city projects including: 1) Fleet Week which lead to the city's participation in a major, Bay Area-wide week of military simulated warfare activities, a major tourism attraction; 2) Golf course development which included negotiations for the proper closing of a landfill and the selection, approvals, and coordination of the building of a first class golf course; the planning and construction of a police substation in the toughest part of town.
- Developing, implementing, and overseeing the first comprehensive planning, design, construction, maintenance, repair, and custodial services programs for the City's over 350 buildings / facilities (more than 3,000,000 square feet) and their related equipment; initiating

aggressive team building concepts, leading to and sustaining effective and productive staff improvements.

- Coordinating team efforts toward selection of vendor to provide an integrated public safety computer system within the police department and between police and fire departments.
- Heading City's Golf Course Development Team from planning, to contract negotiation, to construction and project management.

12/1995 – 03/1997 **Director, Parks, Recreation, & Neighborhood Services Department, San Jose, CA**

Hired to manage the daily affairs of this Department; $65M Department Operating and Capital Budgets, 850 employees, population of almost 1M A Neighborhood Parks System of over 135 developed parks, 3000 acres of undeveloped land, and 50 civic grounds and regional areas, and one municipal golf course; A Recreation and Community Services Program of over 20 community, senior, and therapeutic centers; an aquatics program, and youth and adult sports leagues; A Youth Services Program that included youth employment services, child care, after school and homework activities, teen centers, and gang prevention and intervention programs; A Human Services Program funded by the HUD CDBG Program to address community development needs; and A Neighborhood Services Program which teamed with community-based organizations, neighborhood associations, and individual residents to improve neighborhoods. Performance highlights including:

- Initiating aggressive team building concepts that improved staff morale goals each year.
- Clearly establishing department as the reliable social services Center within the City and as a major player in the local government decision-making process.
- Leading and participating in inter-departmental teams to meet department and City goals.

04/1981 - 01/1983 **Assistant Director, Office of Business and Economic Development District of Columbia, Washington, DC**

Recruited to serve as principal liaison between the Office and the DC business community and to assist in planning, development, implementation, maintenance, performance and impact monitoring of the District's massive multi-million dollar economic development plan including responsibility for business planning, retention, attraction, development, and expansion and job creation. Performance highlights including:

- Playing integral role in the planning, economic recovery, revitalization, of our Nation's Capital.
- Leading the Street Vending Task Force that planned, created, and implemented legislation that brought law and order to a very viable Vending business that went from paying no taxes to contributing its fair share to revenue collections.

08/1978 - 08/1980 **Special Assistant, Intergovernmental Affair, U.S. Department of Commerce, Office of Science and Technology, Washington, DC**

Recruited from CA to DC to serve as a non-political liaison to assure the application of science, technology and innovation to the needs of state and local governments, while simultaneously working to promote a public / private partnership in these technical areas. Performance highlights including:

- Planning and implementing partnership projects in 10 targeted cities, one in each region.

- Serving as member on a Presidential panel on Science and Technology

09/1970 - 01/1977

10/1977 - 07/1978 **Assistant to City Manager/Administrative Assistant/Administrative Trainee**
Model Cities Program, Richmond, CA

Hired and promoted to provide administrative and managerial services aiding professional staff, Board, and Council assistance; assist the Assistant City Manager for Housing and Community Development and City Manager in performing administrative and managerial oversight of the City's daily affairs of its 80,000population; 900 employees; and $123M operating budget. Performance highlights including:

- Completing City's Overall Economic Development Plan 4 years in a row that become the standard in years since.
- Hiring and training the Student Intern who later went on to become and retire as City Manager.
- Hiring the City's first and only Washington, DC Representative in 1973, who still represents the City in DC.
- Being part of two-man team that planned, prepared, competed, and won award of one of, only, six major housing development grants awarded nationally.

EXPERIENCE – EDUCATION SECTOR

10/2010 - 09/2012 **Director of Facilities, Riverview Gardens School District - St. Louis, MO.**

Appointed by Superintendent of Schools to oversee the daily operations of over 80 employees; $21M department budget, in a "lapsed" district of over 6,000 students, building an effective and involved staff team to plan and implement improvements, maintenance, preventative maintenance, and custodial services for a compliment of 29 buildings and grounds. Performance highlights including:

- Managing all approved projects under a $15M Bond Issue.
- Leading team planning and participation in the development of a 5 Year Capital Improvement Plan.
- Addressing daily physical plan emergencies caused by years of neglect.
- Improving the culture of and actual service delivery throughout the School District.
- Creating and implementing continuous staff improvement plans.
- Working as member of the Executive Cabinet in planning and implementing district-wide Accountability Plan as the roadmap to re-accreditation.
- Oversaw bus planning, operations, and services for the school district

EXPERIENCE – PRIVATE/NON-PROFIT SECTORS

02/1987 - 01/192 **Business Owner/Independent Contractor/Consultant, Washington, DC / San Jose, CA / Winston Salem, NC / Richmond, VA**

02/2002 - Present Contracted to perform independent consulting services, to recruit, train, and supervise teams of inside operations managers and outside sales executives. Performance highlights including:

- Providing Notary Public and loan signing services, life insurance, real estate, and mortgage loan services, as CA Licensed Notary Public, Life Agent, and Real Estate Agent, respectively.

- Providing business start-up, management, marketing, loans, financial, procurement, organizational development, community/economic development, and community organizing consulting services
  training, and supervising team representatives to execute customer service models in the insurance, commercial & residential mortgage loans, real estate areas, and transportation services.

EDUCATION

07/1984 **Harvard University** **Boston, MA** Graduate – Kennedy School of Government, Senior Executives in State and Local; Government Management

12/1975 **California State University Hayward, CA** Graduate - Master of Public Administration, Urban Management, Organizational Development

08/1973 **University of California** **Berkeley, CA** Graduate - Bachelor of Science - Business Administration, Finance, and Marketing

PROFESSIONAL ORGANIZATIONS

Missouri School Plant Managers Association
International City Management Association (ICMA)
- Served as Co-Chair, Strategic Planning Committee;
- Member, Diversity Committee

American Management Association (AMA)
The National Honor Society for Public Affairs and Administration (Pi Alpha Alpha)
National Forum for Black Public Administrators (NFBPA)
Real Estate Associations: National Association of Realtors (NAR); California Association of Realtors (CAR)
Recreation and Parks Associations: National and California Recreation and Parks Association (NRPA) and (CARPA)

HONORS AND RECOGNITIONS

Honorary Member National Honor Society
Key to the City, Benton Harbor, Michigan
Certificate of Appreciation for Service, District of Columbia Government
Certificate of Appreciation for Service, City of Emeryville, CA
Certificate of Appreciation for Service, City of Richmond, CA
Air Force Accommodation Medal, While Serving in Vietnam
Salutatorian of High School Graduating Class

REFERENCES

Cooke, Wilce	Former Mayor	Benton Harbor, MI	269-519- 2890-m
Gardiner, Fredrick	City Manager	East Point, GA	678-739-8357-m fgardiner@eastpointcity.org
Moore, Charlotte	City Treasurer/- Retired	East St. Louis, IL	618-406-2260-m Charlotte.moore@cesl.us

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Watson, Kyra.	Former Mayor	Berkeley, MO	314-524-4311 314-922-5972-m Mayorwatson@hotmail.com
Woolridge, Charlette	County Manager	Brunswick County, VA	804-646-5456-o

Cwoolridge@brunswickco.com

CONSULTING CLIENT LIST

Ellis Mitchell, President/CEO Mitchell Diversified Business Solutions (MDBS)

First Merchants Financial Services, Winston Salem, NC; Served double duty as St. Louis Area Manager and Director of Operations for First Merchants, providing loans and other financial assistance and consultation to small businesses throughout the U.S.

HC Investments, San Jose, CA; **H&J Properties, Inc.** Huntsville, AL; **Greater Richmond Interfaith Program,** Richmond, CA; **Rivkin Group, Inc., AtHome Consulting Group, Inc., Primerica Financial Services, Inc.,** respectively, San Jose, CA – **Mortgage Loan and Real Estate Agent** and **Financial Services Representative** and **Property Management Services**– Providing management consulting, outreach, and assisting customers in planning their financial futures and providing financial resources and products to help reach these goals.

Economic & Social Opportunities, Inc. (ESO), San Jose, CA – **Vice President for Program Operations** - Responsible for planning, budgets, daily operations, staff, and future development for this Non-Profit, Community Action Agency's programs including Family Health, Education & Training, Housing & Energy departments and a satellite South County Operation.

Community Services Association of California and Nevada, San Jose, CA - **Interim Director** - planned and oversaw daily affairs of this Non-profit Association of Community Action Agencies designed to provide improved service delivery to poor and low income of both California and Nevada housed at Economic & Social Opportunities, Inc.; was a major player in Welfare Reform planning.

Commonwealth of Virginia Government, Department of Housing & Community Development, State-wide Lead-Based Paint Abatement Program – Interim Director - Planned, implemented, and managed $5.4 M. State-wide program.

Commonwealth of Virginia Government, Department of Labor & Industry - Interim Planning and Policy Director – Planned/restructured Department's State-wide service delivery process for businesses and employees.

City of Richmond, Virginia Government, City Manager's Office – Project Consultant - Planned, trained staff and Board, lead community organizing and coordination, and implemented Model Neighborhood Revitalization Strategy, **"The East District Initiative."**

Lawrence Township, NJ Neighborhood Service Center - Interim Executive Director- managed Center's daily affairs, oversaw recruitment process to hire Executive Director, and completed a Management Study to improve operations and neighborhood program service delivery.

Lawrence Township, Public Works Department – Interim Public Works Director - managed department's daily affairs, oversaw recruitment process to hire permanent Director.

Lawrence Township, City Manager's Office – Project Consultant -Developed a Management Study improving internal operations and service delivery.

Private Sector Company, Washington, DC- Assisted a local minority-owned firm through business merger, completed initial organizational development, and managed the company's affairs as **Interim General Manager**.

Houston, TX City Government – Project Consultant - Subcontracted with another firm to develop City's 5 Year Financial Management Plan.

Private Sector Company, Benton Harbor, MI – Project Manager - Represented company, and consulted on staffing, facility, and operations planning and new product development.

Michael O'Malley 5/26/2020
Resume

Education:
High School: Lake Michigan Catholic HS, St. Joseph, MI. Graduate 1975
College: Ferris State College, Big Rapids, MI. Graduate May 1980
A.A.S Ornamental Horticulture
A.A.A. General Education, Major in Business
Lake Michigan community college & Southwest Michigan Community College: Several years of course work toward an Engineering Degree; I did not receive a diploma.

Employment:

City of Bento Harbor Water Superintendent's position July 1, 2016 to present. Became the Benton Harbor Water Department's F-1 and S-1 licensed Operator in Charge. The tasks included: Water Plant Operations and Maintenance; Water Distribution leader, of Maintenance, planning, trouble shooting and customer service; Sewer Collections leader for maintenance, care, problem solutions, and planning; & Storm Water Management maintenance and care, planning and reporting. All tasks also involved a massive re-construction of equipment documentation and record keeping.

Severn Trent North America Water Contract Operations
December 2012 to June 2016.
Assigned to the Technical Solutions Group, in South Bend IN.
Initially, Drinking Water Treatment Surface Water Specialist, trouble shoot and assist Water Plants across a wide range of Treatment Plants. Near the end, assigned to a 3 man team for New Severn Trent project development and bidding, and officially as Projects start up team and problem solver.

City of Benton Harbor, MI
December 15, 2008 to June 25, 2012: - Water Superintendent.
Supervision over the activities of the Water Plant, Water Distribution System, Sanitary Sewer Collection and Lift Station pumping, and the Storm Water collection system.

City of St. Joseph, MI.
March 9, 1981 to December 15, 1984 – Parks Department Laborer
December 15, 1984 to May 1, 1993 – Water Treatment Plant Operator
May 1, 1993 to December 5, 2008 – Water Plant Superintendent

City of Benton Harbor, MI.
December 1, 1993 to June 1, 1995 – Acting Water Plant Superintendent, Part-time, to assist the Water Plant in meeting the MDEQ F-1 certification requirement.
June 9, 2008 to December 5, 2008 Operator in Charge Water Plant/Utility Services.
Again to assist the City's Utility Services department meets its MDEQ F-1 requirement.

Owner and Operator: Irish Green Landscaping, Self Employed; Part-time

Michael O'Malley, Employment Cover Letter and Resume

December 1980 to September 1993

Licenses Held:
Michigan F-1 received June 1990; the F-1 license is a MI. complete water treatment plant Certification at the top level.
Michigan S-1 received December 2008; the S-1 license is the MI Water Distribution Certification at the top level.
Michigan Industrial Storm Water Treatment Operator, received July, 2010

Organizations:
Michigan Section AWWA member since 1985
Member of Education Committee and the Source Water Protection Committee
Chairman, Treasurer and Trustee West Michigan Water Works Association
Elected Employee Representative to the Board of Directors: St. Joseph Employees Retirement System 1994 to 2007

Additional Skills: Somewhat computer proficient; very capable on Microsoft Excel and Word; very capable on most any Windows based programs and programs that run under Windows, particularly Windows explorer. I enjoy digital photography.

References:
Mr. Gary Wozniak, District Engineer Water Div. MDEQ, Kalamazoo (269) 567-3613
Mrs. Lianne Shekter Smith, Chief Resource Management Division, MDEQ, Lansing, MI. (517) 373-9523
Mr. Timothy Lynch, Director of the BH-SJ Joint Wastewater Treatment Plant (269) 983-7719
Mr. William Sinclair, Retired St. Joseph City Manager, (269) 983-2817
Mr. Ray Mak, BH-SJ Joint Wastewater Treatment Plant Board Chairman, (269) 429-7730

Personal:
Born: September 26, 1957, Chicago IL. Age: 54 I have lived in St. Joseph area 51 years.
Married: Lisa Schadler in 1976.
Children: I have 1 daughter, married and living in St. Joseph, Cortney (Ian) Septoski and 1 grandson, Quinn Septoski.
Outside Interests: Coached Jr. HS. Football for Lake Michigan Catholic and several summer youth baseball teams in St. Joseph.
Active in the Lake Michigan Catholic Blue Tide Athletic Support program, I am the announcer at home football games.
I also like to help friends with landscaping projects, things like patios, retaining walls, planting around the home and such.
Member of the St. John & Bernard Catholic Church in Benton Harbor, MI.

Tracy-Ann N. Jennings

tracyann.cleveland@gmail.com • (269)849-9116

PROFILE

A results driven, goal oriented, passionate and analytical professional that is well organized and innovative with over 15 years experience and understanding as it relates to: Grant Application and Reporting, Employee Management and Supervision, Human Behavior Analysis, Leadership Coaching, Volunteer Management, Youth Development, and Nonprofit Leadership. My strengths lie in community outreach and engagement, creating and executing major events, developing and sustaining strategic relationships, working with local media, communications and community relations, forecasting and strategic planning.

Relevant knowledge, skills and abilities include:

Strategic Alignment
Program Prioritization
Strategic Project Execution
Communication & Change Management
Stakeholder Management
Budget Forecasting and Building
Team Development
Group Facilitation
Special Event Organizing & Executing
Staff Training, Evaluation & Development
Grant Writing, Evaluating & Reporting
Strategic Relationship Development & Sustaining
Community Relationship Building
Public Speaking & Presentation

SELECTED ACCOMPLISHMENTS

Non-Profit Leadership/Management

- Recruited, Hired, Supervised and Evaluated Leadership and Case Management Staff
- Partnered with Service Corps of Retired Executives (SCORE) to assess and implement Board of Directors Development
- Partnered with Listen to Your Mother Southwest MI, to bring Monologue-based Performance to Benton Harbor/St. Joseph, MI, which increased Agency visibility in Southwest Michigan and produced a $800 charitable donation to Emergency Shelter Services

Project Based Work – Project/Program Development and Management

- Reinstated Planned Parenthood Peer Educator Program in Benton Harbor after a four-year hiatus. Interviewed, Hired, and Trained 20 Peer Educators during 2011/2012 and 2012/2013 School Year.
- Exceeded Projected Department Goals for Youth Programming by 20% FY 2012 & FY 2013
- Berrien Community Foundation Grantee FY 2013
- Secured Cooperative Agreement to Benefit Homeless Individuals (CABHI Grant) through MI Department of Health & Human Services, a 3-year capacity grant adding $435,000 in operating funds to Emergency Shelter Services
- Conducted Key Informant Interviews and Compiled Community Resource Inventory for Pregnant and Parenting Teens Program
- Exceeded Projected Program Goals for MI-APPP Program Enrollees FY 2014 & FY 2015
- U.S. Department of Health & Human Services Office of Adolescent Health June 2015 Feature
- Michigan Department of Community Health MI-APPP Learning Collaborative Group Facilitator (2014)
- Increased HUD CDBG Timeliness from 3.75 to 1.5 during FY 20118/2019

Leadership/Community Engagement

- Berrien Community Foundation Golden Acorn Grantee Award for Lifelong Learning Recipient (2013)
- Michigan Department of Community Health PREP Institute PREP Talk Presenter (2013)
- Cornerstone Chamber of Commerce Young Business Leader Award Nominee 2017
- Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Program Participant 2017
- Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Program Coach 2018
- Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Program Coach 2019
- Redevelopment Ready Community Certified 2019

WORK EXPERIENCE

May 2016	-	*Current*	**5D Leadership Coach, Human Behavior Analyst, and Consultant**	
Nov 2017	-	*Current*	**Strategy and Capacity Building Consultant**	D3 Cerebral Palsy Foundation
Nov 2018	-	*Current*	**Director, Community and Economic Development**	City of Benton Harbor, MI
Sept 2016	-	*May 2017*	**Master of Social Work Intern**	City of Benton Harbor, MI
			My Brothers Keeper	
Oct 2015	-	*Aug 2017*	**Executive Director**	Emergency Shelter Services, Inc
Feb 2014	-	*Oct 2015*	**MI-APPP Program Coordinator**	Berrien County Health Department
Jan 2013	-	*June 2013*	**Development and Marketing Contractor**	Brookview Montessori School
Jan 2011	-	*Feb 2014*	**Community Outreach Educator**	Planned Parenthood Mid and South Michigan

EDUCATION

2020 *Western Michigan University*, Master of Social Work
2009 *University of Michigan Ann Arbor*, Bachelors of Arts

PROFESSIONAL DEVELOPMENT:

Grant Writing for Non-Profit Professionals | Volunteer Management and Recruitment | Technology of Participation (TOP) Facilitation Methods | Great Lakes Institute for Community Health Educators (GLICHE) | Authentic Institute 5D Coaching
Michigan's Great Southwest Strategic Leadership Council Leadership Accelerator Class of 2017 | Redevelopment Ready Communities Certification 2019

ABONMARCHE

JASON W. MARQUARDT, PE, LEED AP

SENIOR PROJECT ENGINEER

Jason is a licensed Professional Engineer with more than 16 years of experience. He has worked on a variety of civil projects that include infrastructure design, sanitary sewer, storm sewer, and water distribution system construction. He is also responsible for the design and administration of street and roadway construction projects.

Jason's specialties include infrastructure design on MDOT local agency projects and municipal projects that include water mains, storm sewer, sanitary sewer, and roadway design. He is also experienced in environmental permitting and is an Accredited Professional in Leadership in Energy and Environmental Design (LEED AP).

EDUCATION
Michigan State University
Bachelor of Science,
Civil Engineering

REGISTRATION
Professional Engineer
Licensed:
Michigan

LEED Accredited Professional

PROFESSIONAL AFFILIATIONS
American Society of Civil Engineers (ASCE)

CERTIFICATIONS
Certified Storm Water Operator (MDEQ)

Part 91, SESC Certification

AREAS OF EXPERTISE:

MUNICIPAL ENGINEERING

Jason's experience in municipal engineering includes design and construction administration in roadways, water main, sanitary and storm sewer construction projects. He has worked on numerous combined sewer overflow (CSO) construction projects to eliminate combined sewers across the state. Jason successfully administered the construction process and mediated between contractor, municipality, residents and business owners during construction on many of the projects listed below.

- Botham Avenue Reconstruction, St. Joseph, MI
- Williams Street Reconstruction, South Haven, MI
- 2016 Local Streets Resurfacing, Portage, MI

PROJECT MANAGEMENT

As project manager, Jason's priority is understanding the client's goals and managing the project's schedule, budget, and Abonmarche staff in such a way that the client's goals are achieved efficiently, on time, and on budget. Communication between the client and members of the team is key as is understanding what it takes to accomplish a successful project.

- Silver Beach, St. Joseph, MI
- Elkenburg Park, South Haven, MI
- Rizzo Drain, Berrien County Drain Commission, Berrien County, MI

SITE DEVELOPMENT

Jason has planned, designed, and permitted for various types of residential site developments and commercial projects throughout his career. These projects include water distribution system design, storm sewer design, sanitary sewer design, site grading, and roadway design. Jason has designed rain gardens and other sustainable features for incorporation into site design.

- The Fairways at Harbor Shores, Residential Development, St. Joseph, MI
- Trailside at Harbor Shores, Residential Development, Benton Harbor, MI
- Whirlpool, Inc., Whirlpool Downtown Campus, Benton Harbor, MI

CONSTRUCTION ENGINEERING

Jason has performed administrative inspection and testing services on a number of projects with the Michigan Department of Technology. He has served as engineer-in-charge on construction phase services for many bridge and roadway projects, and he manages Abonmarche's construction and inspection staff.

- MDOT Coloma TSC as-needed
- Park Street Rehabilitation, St. Joseph, MI
- I-94 Bridge Rehabilitation Project, Van Buren and Berrien Counties, MI

ABONMARCHE

COREY A. KANDOW, PE

SENIOR PROJECT ENGINEER

Corey has over 20 years of experience in design and construction administration of municipal and site development infrastructure, street reconstruction, drainage, engineering studies, permitting, waterfront development and recreational facility projects.

Corey is responsible for designing and administering construction of municipal and private development projects including roadway reconstruction, widening and rehabilitation, drainage, sanitary sewer, water system, and traffic signal projects. His responsibilities also include plan preparation, project design, and cost estimating. He served as Office Director at Abonmarche's Manistee Division as well as the Engineer of Record for the City of Manistee from 2013 to 2014. In each of his roles, Corey is committed to ensuring that quality projects are built to exceed the client's expectation and remain within budget.

AREAS OF EXPERTISE:

MUNICIPAL

Corey's municipal design experience includes roadways, water main, sanitary and storm sewer, alignment and pavement design, and grading, as well as water system modeling. He successfully mediates between the demands of an efficient schedule and the needs of residents and business owners. MDOT Local Agency Funds were used for several of these projects.

- City of Benton Harbor, MI
  - E. Klock Road Construction
  - Ravine Interceptor Replacement
  - Arts District Reconstruction
  - Pipestone Street Resurfacing
- City of St. Joseph, MI
  - Lake Street Reconstruction
  - Napier Avenue Resurfacing
  - 2012/2013 CSO Projects
  - SRF/SWQIF Project Plan Update
  - Sanitary Sewer Evaluation Study (SSES)
  - South State Area CSO Separation
  - Michigan Area CSO Separation
  - Napier Avenue/Lakeland Hospital Entrance Safety Project
  - SRF Project Plan
  - Ship and State Street Reconstruction
  - Morton and Highland Avenue Reconstruction
  - Lake Boulevard Reconstruction
  - Midway Avenue Reconstruction
  - Old Lakeshore Road Reconstruction
  - Cleveland and Lakeshore Drive Intersection Realignment
  - Broad and Main Street Intersection Improvements
  - Lions Park Drive CSO Separation
  - Pearl Street CSO Separation
  - Niles Avenue CSO Separation
  - Ravine Interceptor Replacement
  - Michigan and Harrison CSO Replacement
  - Lakeview Avenue Reconstruction
  - Ship Street Resurfacing
  - Wayne Street CSO Separation

EDUCATION

Michigan Technological University
Bachelor of Science,
Civil Engineering (Transportation Engineering)

REGISTRATION

Professional Engineer
Licensed:
Michigan, Indiana

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers (NSPE)

Michigan Society of Professional Engineers (MSPE)

President, Blossomland Chapter of MSPE (2006-2012)

American Society of Civil Engineers (ASCE)

Transportation and Development Institute (T&DI)
Order Of the Engineer (OOE)

CERTIFICATIONS

Certified Storm Water Operator (MDEQ)

    - Church Street CSO Separation
    - Court Street CSO Separation
- Other Selected Municipal Projects
    - Woodmere Avenue Reconstruction, Traverse City, MI
    - Valves Replacement, Buchanan, MI
    - SEBCLA Watermain, Buchanan Township, MI
    - Oakland Drive Reconstruction, Portage, MI
    - Front Street Improvements, Buchanan, MI
    - Water Reliability Study, Village of Paw Paw, MI
    - Downtown Fennville Streetscape Improvements, Fennville, MI
    - East Milham Boulevard Reconstruction, Portage, MI

SITE DEVELOPMENT

Corey has designed infrastructure improvements for several significant commercial and residential site development projects, including those listed below, totaling just over 50,000 feet of sewer, storm, water piping and other services. He has experience with sedimentation pools, bank protection, supporting walkout basements, minimizing environmental impact to critical dunes, and system pressure calibration.

- Northshore Drain Enclosure Project, Harbor Shores Community Redevelopment
- Edgewater Dunes Phase IV, Edgewater Development Company
- Palisades Park Water System Improvements, Palisades Park Country Club
- Caretel Village, Lakeline Associates/Caretel Inns of America
- Berrien Hills Estates, St. Joseph Township, MI
- Harbortown Development, Benton Harbor, MI
- Boulder Creek, Phase 3 and 4, East China Township, MI
- Island Pointe Marina Development, St. Joseph, MI

MARINA/WATERFRONT

Corey's designs for floating docks and fixed docks for new waterfront developments and marina renovation projects have serviced boats ranging in size from 25 feet to 240 feet in length. Design elements have featured ADA accessibility, utility design, composite decking, and layouts to maximize overall slip mix and count.

- N. Stevens Street Kayak Launch, Benton Harbor, MI
- Gateway Harbor, Chicago, IL
- 31st Street Harbor, Chicago, IL
- The River Club at Harbor Shores Marina, St. Joseph, MI
- West Basin Marina, St. Joseph, MI
- Island Pointe Marina, St. Joseph, MI
- Michigan City Port Authority, Municipal Boat Launch
- South Haven Maintenance Dredging, South Haven, MI
- Berrien Hills Estate Maintenance Dredging, St. Joseph, MI
- Belle Maer Harbor Maintenance Dredging, Harrison Township, MI

RECREATIONAL

Corey has played a key role in the design and development of several recreational trail projects around the state. Being an avid outdoorsman, he takes great care to help ensure facilities are available to encourage the public to get out and enjoy the great outdoors.

- N. Stevens Street Kayak Launch, Benton Harbor, MI
- Historic Trailside Park, Metz Township, MI
- Kiwanis Park Improvements, St. Joseph, MI
- Howard Family Trail, St. Joseph, MI
- TART Trail Connection, Traverse City, MI
- Portage Creek Restoration, Portage, MI

ABONMARCHE

BRET WITKOWSKI

ASSET PROGRAM MANAGER

Bret leads efforts to develop and complete asset management programs for Abonmarche clients. Bret understands the importance of data collection, planning and implementation procedures as a path to strong financial health and sustainability for any organization.

Prior to his position at Abonmarche, Bret served Berrien County as the County Treasurer for 20 years. He applies this vast knowledge of funding, public relations and awareness campaigns to clients and projects.

Bret also served as Manager for the community of Stevensville and is able to apply his governing experience, working with business owners and the public to the big picture needs of a project.

EDUCATION

Ball State University
Bachelor of Business, Finance and Insurance

PROFESSIONAL AFFILIATIONS

Michigan Association of County Treasurers

Michigan Association of Counties

St. Joseph Lions Club

AREAS OF EXPERTISE:

BERRIEN COUNTY TREASURER—COUNTY COMMISSIONER CHAIRPERSON

Bret served as Berrien County as Elected County Treasurer and Elected County Commissioner for 20 years, including as Chairman of the Board. Highlights of his experience include:

- Elected to Treasurer position from Chairman of the Board in January 2005 to manage $55 million in investments, lead entire Treasurers Department comprised of 8+ employees, collaborate with The State of Michigan on City of Benton Harbor delinquent property tax program, partner with County Commissioners on $110 million annual budget, and conduct public relations campaigns utilizing various media outlets to enhance public awareness.
- Responsible for foreclosure process, developed automated monthly payment program that has saved over 1,000 properties from foreclosure process the last few years
- Developed homestead audit program that has generated extra $35,000,000 for public education in Berrien County
- Responsible for all public relations for the Treasurer's office.
- Worked with Parks Department to assist them with selling of annual passes, thus increasing cash flow during slow months.
- Chairman of the Berrien County Land Bank. As Chairman of the Board, served as commission lead in effort to assist with county responsibilities related to economic development, personnel, facilities, juvenile justice, and jail overcrowding. Spearhead local and state states of emergencies when necessary. Assist with setting policies and procedures. Key county representative responsible for public relations and negotiations.

STEVENSVILLE VILLAGE MANAGER

As Village Manager for Stevensville, Bret increased grant development efforts, Village promotion endeavors, and contract negotiation activities related to fire, police, and real estate construction and renovation. He collaborated with local, state, and federal officials regarding grant availability and revenue-sharing programs. His partnership with other government agencies and contacts led to the improvement of Stevensville's overall economy.

ABONMARCHE

EDUCATION
University of Notre Dame
Bachelor of Arts, English

COMMUNITY INVOLVEMENT
Southshore Concert Band,
Board Vice President

Southwest Michigan Symphony Orchestra—Education Programs Coordinator

JOELLE REGOVICH

GRANT ADMINISTRATOR

Joelle performs work related to grant seeking, grant writing, and grant administration. She helps to identify the grant funding needs of our clients and then actively researches and identifies funding opportunities. Joelle coordinates with the client to gather the required information to write a compelling grant. Once the grant has been received, Joelle assists with the administration of the grant. Joelle understands the impact that grants can have on a project and works diligently and tirelessly to find funding opportunities for our clients.

AREAS OF EXPERTISE:

USDA RURAL BUSINESS DEVELOPMENT GRANT

Joelle has worked with various communities to prepare, submit, and help administer rural business development grants.

- Fennville, MI
- Allegan, MI
- South Haven, MI
- Three Oaks, MI

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Joelle has assisted various municipalities in seeking funds from MDNR. Many of her grant applications have been subsequently funded. Additionally, she has provided grant administrative support once the grant has been received.

- Waterways Grant Programs
- Land and Water Conservation Fund
- Michigan Natural Resources Trust Fund
- Recreation Passport

MICHIGAN COUNCIL FOR ARTS AND CULTURAL AFFAIRS

Joelle has prepared a variety of awarded grants for different MCACA programs. She also served as a grant reviewer for the Capital Improvement Program.

- Calhoun County - Project Support Program
- City of Allegan - Capital Improvement Program
- Liberty Hyde Bailey Museum - Capital Improvement Program

MICHIGAN ECONOMIC DEVELOPMENT CORPORATION

Joelle has worked with various MEDC grant funding programs for several communities.

- City of Allegan - Core Community Fund
- City of Allegan - PlacePlan Implementation Mini-grant
- City of South Haven - Community Development Block Grant (CDBG)
- City of Grand Haven - Infrastructure Capacity Enhancement (ICE) Grant

MICHIGAN STATE HISTORICE PRESERVATION OFFICE

Joelle has prepared and received grant funding to restore lighthouses through the Michigan Lighthouse Assistance Program.

- South Haven Lighthouse—Exterior paint project
- Grand Haven Lighthouse—Window replacement project

G. Negotiated Indirect Cost Rate Agreement

NOT USED

H. Supporting Documentation – Readiness to Proceed

1. **Example Owner/Tenant Agreements to Access Private Property**
2. **Example Door Notice to Residents – Previously Used for Pilot Grant**
3. **Map of Zone Areas for Water Service Line Replacement**

BENTON HARBOR
Port of Opportunities

WATER SERVICE LINE REPLACEMENT AGREEMENT

PURPOSE. The purpose of this Agreement is to set forth the terms and conditions pursuant to which the City of Benton Harbor (the "City") will provide a new water service line to the undersigned owner's property located at _____, tax parcel number _____. The existing lead private water service line will be disconnected and replaced with a new water service line to accomplish a non-lead service line replacement from the water meter to the water main.

This Agreement anticipates that a contract will be awarded by the City for the work to be performed under this Agreement.

CONSIDERATION. Each party agrees that the promises made by the other party and the benefits to be derived from their execution are full and sufficient consideration for entering into this Agreement.

THE CITY'S OBLIGATIONS.

1. Do a pre-inspection of the water service line as it enters inside the building and connects to the meter to determine if the meter setting is correct, if the meter should be replaced, and if the service line needs to be replaced. If necessary, either or both of these items will be corrected/replaced at no cost to the undersigned owner of the property (the "Owner");

2. Have a new non-lead private water service line constructed at City expense, from the curb box in the public right-of-way to the water meter on the Owner's property including the meter setting and any necessary connections to reset the water meter. The existing service line will be disconnected and capped off;

3. Restore the Owner's property disturbed by construction, including seeding of grass areas on the property and restore the interior portions of the building on the property disturbed by such work;

4. Require the contractor doing the work to provide adequate insurance to protect the Owner against any loss that may result from damage caused by negligent construction operations on the Owner's property, and require the contractor to provide the City with proof of such coverage; and

5. Guarantee to the Owner that any work done shall be free from defects in material and workmanship for a period of one year from its completion.

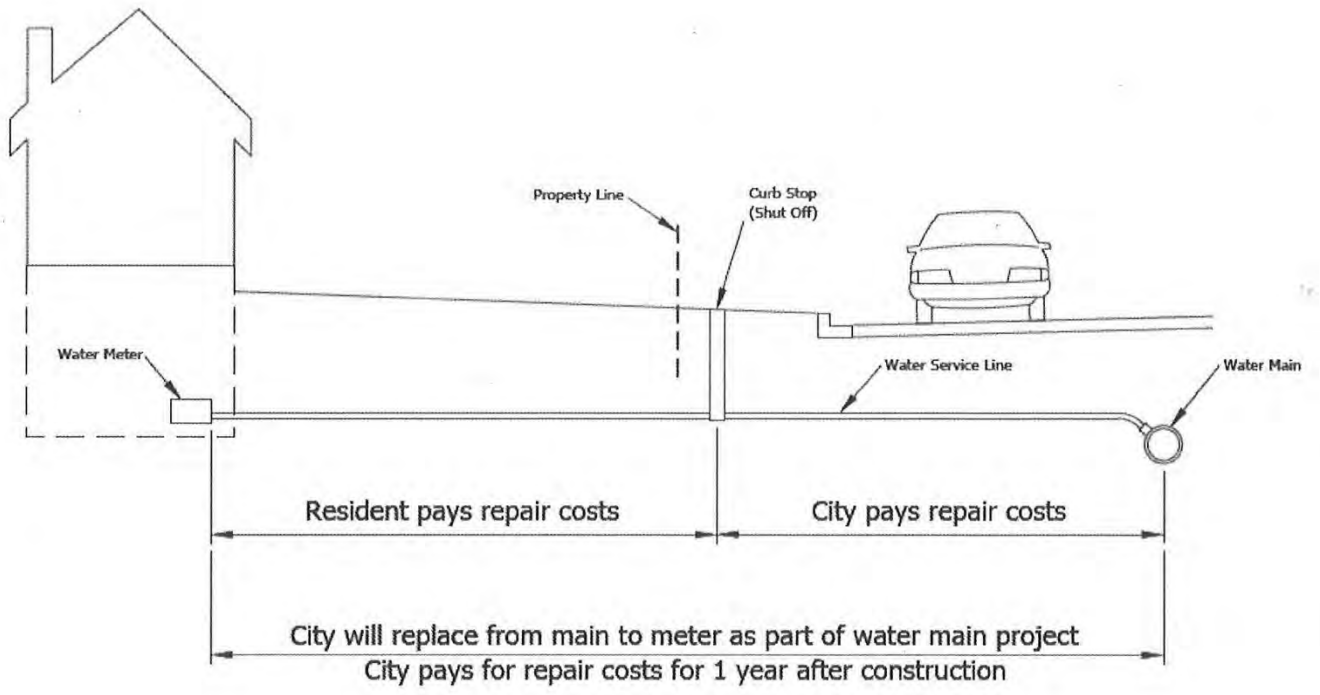
THE PROPERTY OWNER'S/OWNERS' OBLIGATIONS.

1. Confirm that the Owner(s) is/are the only owner/owners of the above referenced property and provide adequate proof thereof;

2. Permit temporary access and right of entry to and upon the above-referenced property to the City and the City's designated contractor(s) to perform a pre-inspection as described above, to enable construction and testing of the new private water service line and to enable any needed adjustments, maintenance, or repairs during the guarantee period;

3. Assume full responsibility for the maintenance, repair, and replacement of the private part of the water service line, located on the above-referenced property, after expiration of the guarantee period. After the end of the guarantee period of one year, the responsibility of each party (City and the Owner) shall be as shown on the diagram below; and

4. Hold the City harmless and free from any claim or liability from any lawsuits, claims, injuries or damage done in performance of the water service line replacement work.



MISCELLANEOUS TERMS.

1. The responsibility of the maintenance, repair and the replacement of the water service located in the public right-of-way will be pursuant to City of Benton Harbor Water System Rules and Regulations.

2. This Agreement is a legally binding document and your signature will commit you to its terms. You acknowledge that you have been advised to discuss all aspects of this Agreement with an attorney, that you have carefully read and fully understand all of the provisions of this Agreement, and that you are voluntarily entering into this Agreement.

☐ Adequate proof of ownership provided and on file.

Signed by Owner(s) the _____day of _____, 20_____.

_____ _____
Owner – Signature Owner - Signature

_____ _____
Owner – Print Name Owner – Print Name

_____
Land Contract Holder(s)

Signed by City this _____day of _____, 20_____.

_____
City Manager or Designee - Signature

_____
Print Name / Title

TENANT WATER SERVICE LINE REPLACEMENT ACKNOWLEDGEMENT

In consideration of the City of Benton Harbor Water Sewerage Department's ("BHWSD") efforts to remove lead water services, the owner has given permission per the attached signed agreement to BHWSD and/or its officials, employees, or contractors to excavate, investigate, and replace non-copper water services on the property described below:

> This property is described as Tax Parcel No. _____,
> and the street address is _____
> _____.

The Tenant will permit temporary access and right of entry to and upon the above-referenced property to BHWSD and BHWSD's designated contractor(s) to perform a pre-inspection, to enable construction and testing of the new private water service line and to enable any needed adjustments, maintenance, or repairs during the guarantee period.

This Agreement is subject to the following provisions:

1. Where investigation indicates that lead water service materials are present, they will be replaced with non-lead water service materials.

2. All property disturbed by construction will be restored, including seeding of grass areas on the property and interior portions of the building on the property disturbed by such work.

3. Piping inside buildings beyond the water meter will not be replaced.

4. BHWSD guarantees that any work done shall be free from defects in material and workmanship for a period of one year from its completion.

5. The cost of replacing lead water service materials will be the City's responsibility.

6. The Tenant agrees to hold BHWSD and its contractors harmless for any damage in performance of the water service line replacement work described in the attached Water Service Line Replacement Agreement.

_____ _____

Printed Name of Tenant 1 Signature of Tenant 1

Date: _____ Phone: _____

_____ _____

Printed Name of Tenant 2 (if joint) Signature of Tenant 2

Date: _____ Phone: _____

_____

Land Contract Holder(s)

_____ _____

Owner Address (if different from property) Owner phone number

Signed by City this _____day of _____, 20_____.

_____

City Manager or Designee - Signature

_____

Print Name / Title

DECLINATION OF PARTICIPATION IN THE WATER AND SEWERAGE DEPARTMENT'S PHASE I LEAD WATER SERVICE LINE REPLACEMENT PROGRAM

The City of Benton Harbor's Water and Sewerage Department (the "BHWSD) is in the process of making repairs to the water service in my area and has recommended that I participate in its Phase I Lead Water Service Line Replacement Program that allows for the potential replacement of my lead water service line. I understand that the BHWSD will replace my lead service line from the water main to my property line and the BHWSD is offering to replace my lead service line on private property at no charge.

I acknowledge that I am aware of the following facts:

- Partial lead service line is associated with elevated drinking water lead levels for some period of time after replacement. Elevated lead-in water can continue for months following a partial lead service line replacement.
- If present, elevated levels of lead can cause serious health and development problems, especially for pregnant women and young children. In adults, long-term lead exposure can result in increased blood pressure and hypertension and coronary heart disease.
- That the state of Michigan is in the process of revising its Lead and Copper Rule and it is possible that the final version of the Lead and Copper Rule will require all lead service lines in the City of Benton Harbor to be replaced within the next 20 years. Therefore, if I

decline to participate at this time, it may be up to 20 years before the BHWSD will be able to replace my lead water service line and cost assistance may not be available at that time.

- That at some future date I may be required to replace my lead water service at my own cost.

Despite these facts, I am choosing to decline participation in the Phase I program for the following reasons: _____

_____

I have read and fully understand the information on this declination form.

Signature: _____ Date: _____

Name (print): _____

Signature: _____ Date: _____

Name (print): _____

Property Address: _____

Property Tax I.D. Number: _____

ABONMARCHE
Confidence By Design

CONSTRUCTION NOTICE

Lead Water Service Replacement - City of Benton Harbor

Contractors will be verifying/reviewing your existing water service materials.

The City has been awarded a Pilot Grant by the State of Michigan to update their water service inventory and to replace existing lead services. Your address has been selected to recieve a new water service from the existing water main to your water meter.

Contractors will be looking at your water service to provide pricing for replacement. Please contact John Nelson at the contact number below to set up a time to review the replacement work and agreements needed.

The project is expected to commence in December 2018 and be completed by May 2019.

If you have an issue or any questions, please call the Project Engineer at:
Abonmarche
John Nelson
(269) 487-9652

ABONMARCHE
Confidence By Design

CONSTRUCTION NOTICE

Lead Water Service Replacement - City of Benton Harbor

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The project is expected to commence in December 2018 and be completed by May 2019.

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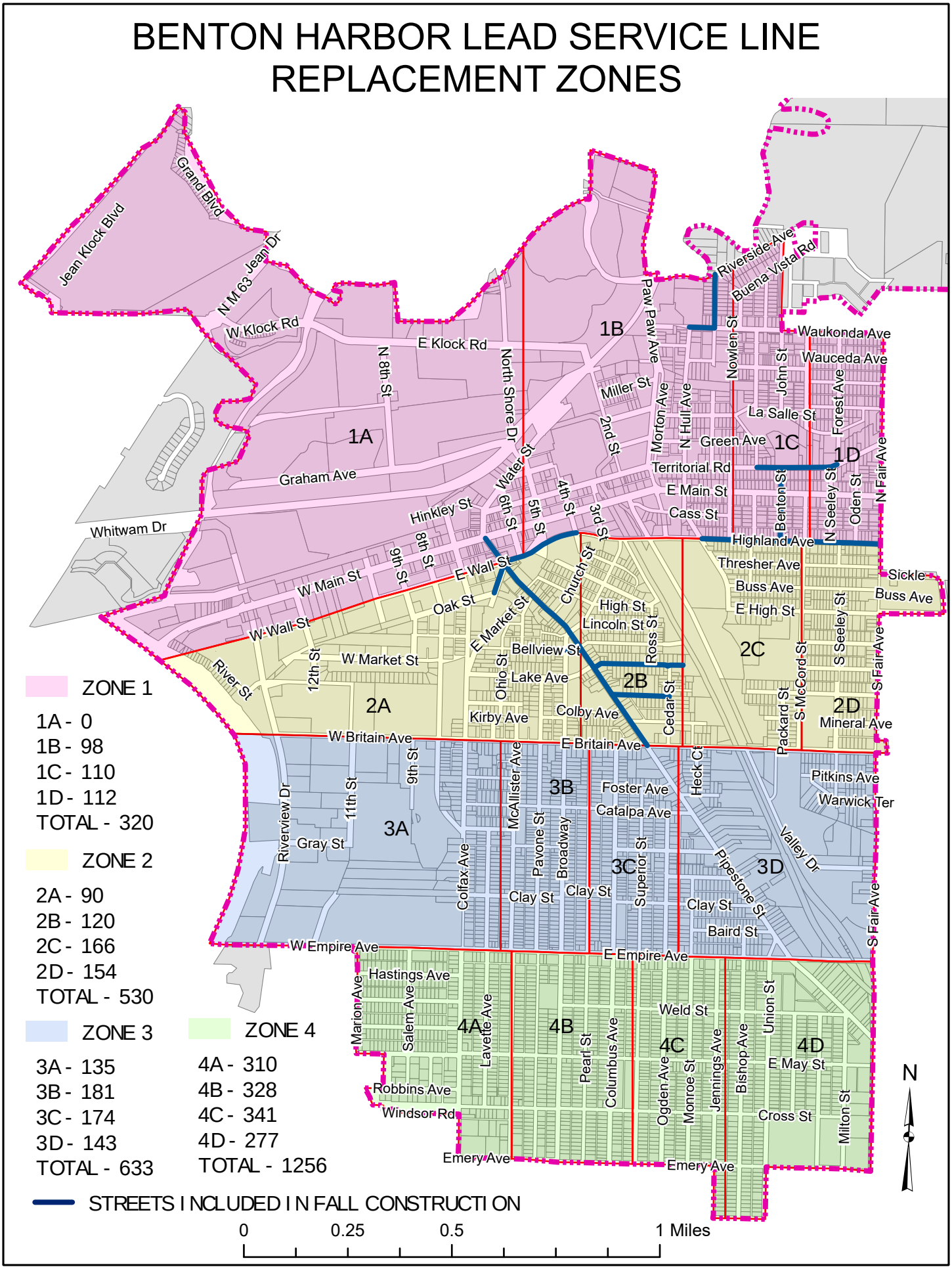
Abonmarche
John Nelson
(269) 487-9652

H. 3. Map of Zone Area

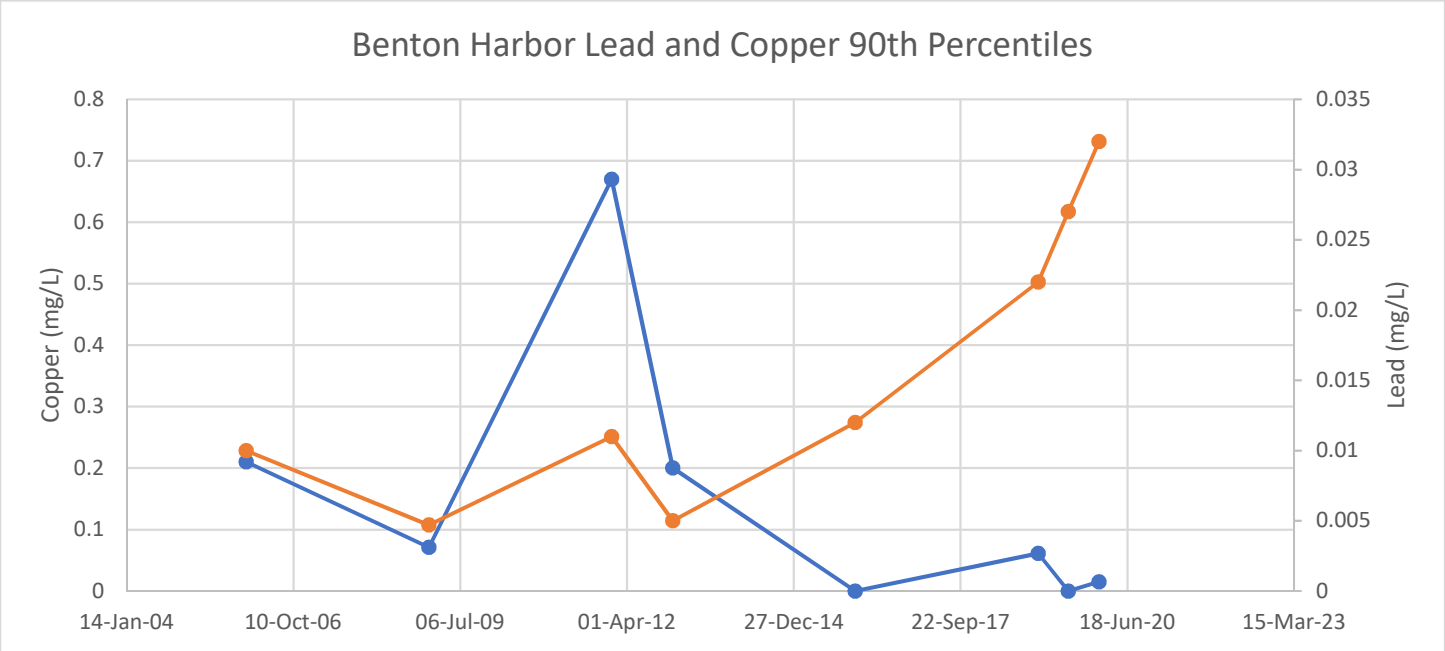


I. Supporting Documentation of Lead Issue

1. **Benton Harbor Lead/Copper Data Report**
2. **Lead Results 2015 - January 26, 2016 DEQ Lead Monitoring Notice Letter**
3. **Lead Results 2018**
    a. **October 22, 2018 DEQ Action Level Exceedance Letter**
4. **Lead Results 2019**
    a. **July 24, 2019 EGLE Action Level Exceedance Letter**
    b. **January 16, 2020 EGLE Action Level Exceedance Letter**
5. **Notifications to Public of Lead Issue**
    a. **City of Benton Harbor Website Page**
    b. **Benton Harbor August 2019 Public Notice Mailer**
    c. **Benton Harbor February 2020 Public Notice Mailer**
    d. **Michigan Radio Notice**
    e. **Berrien County Health Department Timeline Flyer**
    f. **Berrien County Health Department Lead ALE Notice**
    g. **October 24, 2018 Herald Palladium Newspaper Article**
6. **February 13, 2020 EGLE Water Corrosion Treatment Letter**

I. 1. Benton Harbor Lead/Copper Data Report

WSSN	Begin	End	Analyte	Collected	90th Percentile (mg/L)
00600	01-Jan-03	31-Dec-05	CU90	40	0.21
00600	01-Jan-06	31-Dec-08	CU90	33	0.071
00600	01-Jan-09	31-Dec-11	CU90	23	0.67
00600	01-Jan-12	31-Dec-12	CU90	30	0.2
00600	01-Jan-13	31-Dec-15	CU90	30	0
00600	01-Jan-16	31-Dec-18	CU90	30	0.061
00600	01-Jan-19	30-Jun-19	CU90	46	0
00600	01-Jul-19	31-Dec-19	CU90	39	0.015
00600	01-Jan-03	31-Dec-05	PB90	40	0.01
00600	01-Jan-06	31-Dec-08	PB90	33	0.0047
00600	01-Jan-09	31-Dec-11	PB90	23	0.011
00600	01-Jan-12	31-Dec-12	PB90	30	0.005
00600	01-Jan-13	31-Dec-15	PB90	30	0.012
00600	01-Jan-16	31-Dec-18	PB90	30	0.022
00600	01-Jan-19	30-Jun-19	PB90	46	0.027
00600	01-Jul-19	31-Dec-19	PB90	39	0.032



STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
KALAMAZOO DISTRICT OFFICE

RICK SNYDER
GOVERNOR

KEITH CREAGH
DIRECTOR

January 26, 2016

Mr. Darwin Watson
City of Benton Harbor
200 Wall St.
Benton Harbor, MI 49022

WSSN: 0600
City of Benton Harbor

Dear Mr. Watson:

Subject: City of Benton Harbor WSSN 0600, Lead and Copper Monitoring of Drinking Water Taps

We received your report for the monitoring period June 1, 2015, through September 30, 2015. This letter has been revised from the one sent December 17, 2015, as we discovered a typographical error that referenced a different water supply. We apologize for any confusion this may cause.

Action Levels	Results this monitoring period		Next monitoring period	
	90th Percentile	# of Samples Above Action Level	# of Samples Required	Take Samples Within These Dates
Lead 15 parts per billion (ppb)	12 ppb	2	30	06/01/2018, and 09/30/2018 Submit results to this office by October 10, 2018
Copper 1300 parts per billion (ppb)	0 ppb	0		

Ninety percent of the sites you tested are within action levels under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. These results must be reported on your 2015 Consumer Confidence Report (CCR), which is due to our office, your customers, and the local health department by July 1, 2016. Also, include the following statement in the CCR, regardless of the lead and copper levels:

> *If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at http://water.epa.gov/drink/info/lead.*

The Lead and Copper Rule requires you to provide individual lead tap results, within 30 days of learning of results, to people who receive water from sites that were sampled, even if lead was not detected. You must also send us a certification that you met all the delivery requirements, along with a sample copy of your customer notice. We are in receipt of the required sample results and accompanying forms regarding 2015 sampling requirements.

Samples due during the next period will be a continuation of your triennial monitoring. Please make every attempt to select the same sites used in the previous monitoring period, giving Tier 1 sites first priority. If original sites are unavailable, select replacement sites based on the Tier 1, 2, and 3 criteria. This office strongly encourages you to sample early in the monitoring period.

Bottles will NOT be mailed automatically. If you use the DEQ laboratory, order your bottles by calling 517-335-8184, or download the form EQP 2301 *Requisition for Water Sample Units* from http://michigan.gov/deq. Click on Key Topics, Laboratory Services, Drinking Water, Obtaining the Necessary Sampling Units, and test list.

If you have any questions, please contact me at the telephone number below, or by e-mail at bishoph@michigan.gov.

Sincerely,

Heather Bishop
Environmental Quality Analyst
Kalamazoo District Office
269-330-9153

HB:NE

cc: James Ouzts, F&V Operations

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 24, 2019

VIA E-MAIL AND U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from January 1, 2019, through June 30, 2019, Benton Harbor community water supply's ninetieth percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	27 ppb	12	0 ppb – 59 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements, along with a sample copy of your consumer notice, 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format, visit Michigan.gov/LCR. Select the appropriate report form based on whether you are or are not collecting samples from sites with lead services lines.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and information about the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material, along with a PE distribution certification form, must be submitted to EGLE no later than ten days after the PE is due.

Conduct WQP Monitoring
As part of installing corrosion control treatment, you have been requested to collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your second AL exceedance. You recently installed corrosion control treatment using a phosphate product to reduce corrosion. As part of this installation, a coupon study was to be performed. Results from this study should be used to help identify the dosage necessary to sufficiently reduce corrosion rates in the distribution system. EGLE looks forward to receiving the study results and the recommendations based off those results.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between July 1 and December 31, 2019, and again between January 1 and June 30, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1, or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first liter and fifth liter sample from each sampling location.

Within 30 days of learning of results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks (Starting July 1st)	Collect WQP samples. (Entry Point)	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
August 29, 2019	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2019	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
September 28, 2019	For the January through June 2019 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2020	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
March 31, 2020	For the July through December 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
September 29, 2020	For the January through June 2020 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc: Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Ernie Sarkipato, Surface Water Specialist, EGLE
Mr. Jeremy Klein, District Analyst, EGLE
cc/enc: Mr. Mike O'Malley, City of Benton Harbor

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

January 16, 2020

VIA E-MAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from July 1, 2019, through December 31, 2019, Benton Harbor community water supply's 90th percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	32 ppb	10	0 ppb – 72 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. As previously mentioned, it is your intent to develop and distribute the PE materials within three business days to fulfill both the PA and PE requirements simultaneously.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement timely. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your third AL exceedance. A letter regarding changes to your current corrosion control treatment will be sent under separate cover from Mr. Ernie Sarkipato, Surface Water Engineer, Engineering Unit, Environmental Health Section, Drinking Water and Environmental Health

Division (DWEHD); and Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, DWEHD.

Lead and Copper Monitoring
You have already increased your lead and copper monitoring. Please continue to collect samples from 60 sites between January 1 and June 30, 2020, and again between July 1 and December 31, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of the results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Every two weeks	Collect WQP samples. (Entry Point)	Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap). Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
February 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 10, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between January 1 and June 30, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 29, 2020	For the January through June 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2021	For the July through December 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

1. 5 a. Benton Harbor Website Page

BENTON HARBOR PUBLIC WORKS

Benton Harbor Public Works, Water Plant and Distribution, Sanitary Sewer, and Storm Water

Mike O'Malley, Director
(269) 927-8471, then press 2.
If no answer and for immediate assistance, dial (269) 927-8400, press 2.
Hours: 6:30 a.m. to 3 p.m.

City of Benton Harbor Water Department and Public Works Important Notices:

February 26, 2020 – Benton Harbor Public Education for Web and Mailer

Make Convenient Payments

(https://www.accessmygov.com/OnlinePayment/OnlinePaymentSearch?PaymentApplicationType=10&uid=971)

Save gas and stamps by using our convenient online services to pay your taxes or utility bills (water and trash

(https://bhcity.us/wp-content/uploads/2020/03/Benton-Harbor-Public-Education-for-Web-and-Mailer.pdf) Download (https://bhcity.us/wp-content/uploads/2020/03/Benton-Harbor-Public-Education-for-Web-and-Mailer.pdf)

- January 29, 2020 – Preliminary Distribution System Materials Inventory Notification Memo (https://bhcity.us/wp-content/uploads/2018/03/BH-Water-System-potential-Lead-Tap-Inventory-for-Web-site.pdf)
- January 21, 2020 – Public Advisory for Drinking Water Customers (https://bhcity.us/wp-content/uploads/2018/03/Press-Release-Public-Advisory-ALE-07-26-2019-MO-dist.pdf)
- *Important Information to the (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf)*

Landlord Packet (https://bhcity.us/wp-content/uploads/2019/12/Landlord-Packet.pdf) Download (https://bhcity.us/wp-content/uploads/2019/12/Landlord-Packet.pdf)

City of Benton Harbor Leak Policy (https://bhcity.us/wp-content/uploads/2019/10/City-of-Benton-Harbor-Leak-Policy-10.11.19.pdf) Download (https://bhcity.us/wp-content/uploads/2019/10/City-of-Benton-Harbor-Leak-Policy-10.11.19.pdf)

Benton Harbor Lead Public Education – August 2019 (https://bhcity.us/wp-content/uploads/2019/08/Benton-Harbor-Lead-Public-Education-August-2019.pdf) Download (https://bhcity.us/wp-content/uploads/2019/08/Benton-Harbor-Lead-Public-Education-August-2019.pdf)

Public Education Document for Lead and Copper (https://bhcity.us/wp-content/uploads/2018/03/Public-Education-Document-for-Lead-and-Copper-for-web.pdf) Download (https://bhcity.us/wp-content/uploads/2018/03/Public-Education-Document-for-Lead-and-Copper-for-web.pdf)

services). (https://www.accessmygov.com/OnlinePayment/OnlinePaymentSearch?PaymentApplicationType=10&uid=971) If you have questions about your trash services, or to arrange for the pickup of large items, call We-Cycle Industrial Sanitation direct at (269) 926-6360.

Helpful Tips to Protect Our Systems

Hundreds of us perform tasks in our daily routines that may negatively impact the water and sewer systems that we rely on. Just by following a few simple strategies, we can greatly reduce harmful effects. Take a few minutes to read about how you can contribute to safe water in Benton Harbor.

If you fertilize, please follow directions and use sparingly.

Benton Harbor Lead Results June 2019 (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Results-Sorted-for-web.pdf) Download (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Results-Sorted-for-web.pdf)

Consumers Confidence Report Announcement (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf) Download (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf)

Consumers Confidence Report for 2018 (CCR 2018) (/forms/water-ccr-2018.pdf)

For more information please view these documents:
Lead Poisoning Prevention BCHD (https://bhcity.us/wp-content/uploads/2018/03/Lead-Poisoning-Prevention-BCHD-updated.pdf)
Lead In Drinking Water (EPA) (https://bhcity.us/wp-content/uploads/2018/03/Lead-In-Drinking-Water-EPA.pdf)
Cleaning Your Aerators (https://bhcity.us/wp-content/uploads/2018/03/Cleaning-Your-Aerators.pdf)

- *Drinking Water Customers of the City of Benton Harbor* (https://bhcity.us/wp-content/uploads/2019/07/PDF-version-for-BH-Water-CCR-Announcement.pdf)
- COBH Public Advisory 2018 (https://bhcity.us/wp-content/uploads/2018/03/COBH-Public-Advisory-102318-Final.pdf)

- BH Lead results for 2018 (https://bhcity.us/wp-content/uploads/2019/01/BH-Lead-and-Copper-Results-for-2018.pdf)
- Consumers Confidence Report for 2018 (CCR 2018) (https://bhcity.us/forms/water-ccr-2018.pdf)

(https://bhcity.us/wp-content/uploads/2018/03/Lawn-Care-1.pdf)

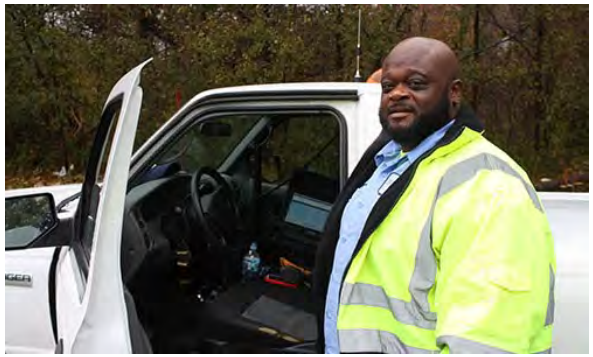
Do you know what your fertilizer may be doing to our water? Read more about the effects of lawn care (https://bhcity.us/wp-content/uploads/2018/03/Lawn-Care-1.pdf) and visit the Southwest Michigan Water Coalition (http://www.swmpc.org/water.asp) website for even more information.

Grease, fat and oil can clog sewer lines, causing sewage back-ups and flooding.

- REVISED: Consumers Confidence Report for 2017 (CCR 2017) (https://bhcity.us/wp-content/uploads/2018/03/Revised-Benton-Harbor-Water-CCR2017-Ready-for-Web-Site.pdf)
- Consumers Confidence Report for 2017 (CCR 2017) (https://bhcity.us/wp-content/uploads/pdf-large/consumers-confidence-report-2017.pdf)
- City of Benton Harbor Water Filtration Plant Annual Report for 2017 (https://bhcity.us/wp-content/uploads/2018/06/scan-of-2017-MOR-Report-for-2017-CCR.pdf)

Mike O'Malley, Director of the Water Plant, is often called "The Benton Harbor Water Guy." He and his team are responsible for the water distribution system, the sanitary sewer collection system, and storm water collection and discharge.

Benton Harbor Public Works and Water Sewer Supervisors



Benton Harbor Meter Reader

(https://bhcity.us/wp-content/uploads/2018/03/Sewer-Grease-pdf.pdf)

Did you know that grease from cooking is one of the major causes of residential sewer main clogs resulting in sewer backups? Too often, grease is washed into the plumbing system, usually through the kitchen sink. Grease sticks to the inside of sewer pipes (both on your property and in the streets). Over time, the grease can build and block the entire pipe. Read more here: Sewer Grease (https://bhcity.us/wp-content/uploads/2018/03/Sewer-Grease-pdf.pdf)

Do not pour anything down the drain – it may flow directly to inland lakes, streams or Lake

Benton Harbor Water Dist and Sanitary Sewer Crew

Benton Harbor Water Plant Operators

Your Renovated Water Plant

Benton Harbor Water Plant

The Benton Harbor Water Plant is located in the southwest corner of Benton Harbor's beautiful Jean Klock Park. The Water Plant was constructed in the 1950's as a complete treatment plant that includes chemical addition for disinfection and particulate removal; mixing and settling chambers; filters; a storage reservoir;

Michigan!

(https://bhcity.us/wp-content/uploads/2018/03/Storm-Drains.pdf)

Polluted stormwater runoff can harm plants, fish, animals, people, and it can even pollute our drinking water sources. Be sure to do your part to protect water quality. Read more about Storm Drains (https://bhcity.us/wp-content/uploads/2018/03/Storm-Drains.pdf) and visit the Southwest Michigan Water Coalition (http://www.swmpc.org/water.asp) website for even more information.

and high lift pumps to distribute the water to the City of Benton Harbor.

The water plant was aging and had experienced some failures, so a renovation project at a cost of slightly over $12 million was developed. Funding was acquired through the State of Michigan's Drinking Water Revolving Loan Funds, which feature low interest loans to Michigan Water projects. Additional funding was obtained from the federal government through the American Resources and Recovery Act, which will reduce the loan amount by 40%.

The project took two years to complete. The principal contractor, Davis Construction, along with several sub-contractors remodeled the existing plant and equipment and built the new treatment addition shown in the photograph. The Water Plant now has an anticipated life span in excess of 50 years and can properly treat up to 12 million gallons per day.

Consumer Confidence Reports

The Environmental Protection Agency (EPA) requires community water systems to deliver a Consumer Confidence Report (CCR), also known as an annual drinking water quality report, to their customers each year by July 1.

- Consumers Confidence Report for 2018 (CCR 2018) (https://bhcity.us/forms/water-ccr-2018.pdf)
- REVISED: City of Benton Harbor Utility Services Department's 2017 (https://bhcity.us/wp-content/uploads/2018/03/Revised-Benton-Harbor-Water-CCR2017-Ready-for-Web-Site.pdf)

- Consumers Confidence Report (https://bhcity.us/wp-content/uploads/2018/03/Revised-Benton-Harbor-Water-CCR2017-Ready-for-Web-Site.pdf)
- Benton Harbor 2017 CCR (https://bhcity.us/wp-content/uploads/pdf-

large/consumers-confidence-report-2017.pdf)

- Benton Harbor 2016 CCR (https://bhcity.us/wp-content/uploads/2018/03/Benton-Harbor-2016-CCR.pdf)
- Benton Harbor 2015 CCR (https://bhcity.us/wp-content/uploads/2018/03/Consumer-Confidence-Report-water-2015.pdf)
- Benton Harbor 2014 CCR (https://bhcity.us/wp-content/uploads/2018/03/Benton-Harbor-2014-CCR.pdf)

This report provides customers with information about their water quality, including the water source, a risk contamination summary, the regulated contaminates found and any potential health effects, an accounting of efforts to restore safe water, and other educational information. For more information about your CCR, read the Centers for Disease Control and Prevention's Guide to Understanding Your CCR (https://www.cdc.gov/healthywater/drinking/public/understanding_ccr.html).

I. 5. b. August 2019 Public Notice

Benton Harbor Water Plant
200 E. Wall Street
Benton Harbor, MI. 49022

PRSRT STD
ECRWSS
U.S.POSTAGE PAID
EDDM Retail

PLEASE READ
Important Lead
Information inside

**********ECRWSS**********

Local
Postal Customer
Benton Harbor, MI. 49022

This picture of a water connection to homes in Benton Harbor is where all the lead comes in the City System. Public Education Flyer for City Residents "**Protect yourselves from this**!"

This is what we have all over the City. This is a dig up of a Water Service Line going into a Residential Home. These are all over in Benton Harbor.
Most of All of our records (like this one) tell us where the tap and service is located. Some times it will say something about the materials; but usually not.
That is why we do not know until we dig a hole about 4-feet deep.
This line was installed to this home in September 1948.
This kind of water service is the majior reason for lead in you tap water, there could be other sources of Lead, but this leads to the BIG #'s

This is the City Side and it is made of lead piping.

This is the water shut off valve. It is made of brass mostly.

This is the Home Owner's side. The pipe is usually Galvanized. Like this one.

I. 5. c. February 2020 Public Notice

Benton Harbor Water Plant
200 E. Wall Street
Benton Harbor, MI. 49022

PRSRT STD
ECRWSS
U.S.POSTAGE PAID
EDDM Retail

**********ECRWSS**********

Important Information from the Benton Harbor Water Department
Please open and read, consider sharing it with your Neighbors & Friends

Local
Postal Customer
Benton Harbor, MI. 49022

IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER

THE BENTON HARBOR WATER DEPARTMENT HAS EXCEEDED THE ACTION LEVEL FOR LEAD. Lead can cause serious health and development problems, especially for pregnant women and young children. Please read this information closely to see what you can do to reduce lead in your drinking water.

This notice is brought to you by the Benton Harbor Water Department.
Water Supply Serial Number: 00600 Distribution Date: [February 26, 2020]

Health Effects of Lead
Lead can cause serious health and development problems. It can cause damage to the brain and kidneys, and can interfere with the production of red blood cells that carry oxygen to all parts of your body. The greatest risk of lead exposure is to infants, young children, and pregnant women. Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults. Lead is stored in the bones, and it can be released later in life. During pregnancy, the child receives lead from the mother's bones, which may affect brain development. Although other sources of lead exposure exist, such as lead paint, and lead contaminated dust, the Benton Harbor Water Department is contacting you to reduce your risk of exposure to lead in drinking water. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

The Water System in Benton Harbor has many water service lines that contain some portion of Lead piping. The City just completed a Preliminary Distribution System Materials Inventory that contain up to 750 homes that may have lead. When we complete the final Distribution Systems Materials Inventory, we believe that number will rise to about 2,000.

BENTON HARBOR
PORT OF OPPORTUNITIES

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Sources of Lead

Lead is a common metal found in the environment. Drinking water is one possible source of lead exposure due to the widespread use of lead in plumbing materials. EPA estimates that drinking water can make up 20 percent or more of a person's potential exposure to lead. Infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water.

The action level is 15 parts per billion (ppb) for lead and 1.3 parts per million (ppm) for copper. The action level is a measure of corrosion control effectiveness. It is not a health-based standard. To meet the requirements of the Lead and Copper Rule, 90 percent of the samples collected must be below the action level. The following table summarizes the lead and copper data collected during the most recent monitoring period:

Most Recent Sampling Information. We only managed 39 locations of the 60 mandated by the State. If your house was sampled in the October to December sampling and want to continue participation that is Great! Let us know. If you have not been involved in our Lead & Copper Sampling program and you want to participate, that would be good, and we are asking you to contact us.

Most Recent Sampling Information: October to December 2019:

Action Levels	90th Percentile Value	Range of results (minimum-maximum)	# of samples used for 90th Percentile The 1st and 5th each house.
Lead 15 parts per billion (ppb)	**32 ppb**	0 ppb – 72 ppb	78
Copper 1.3 parts per million (ppm)	**0 ppm**	0 ppm – 0.1 ppm	78

Lead can enter drinking water when pipes, solder, home/building interior plumbing, fittings and fixtures that contain lead corrode. Corrosion is the dissolving, or wearing away, of metal caused by a chemical reaction between water and your plumbing. Several factors affect the amount of lead that enters the water, including the water quality characteristics (acidity and alkalinity), the amount of lead in the pipes, plumbing and/or fixtures, and the frequency of water use in the home.

Some plumbing products such as service lines, pipes and fixtures may contain lead. The infographic below demonstrates where sources of lead in drinking water could be in your home. Older homes may have more lead unless the service line and/or plumbing has been replaced. Homes built…

- **Before the 1960s** are more likely to have lead service lines, lead pipes, fixtures, and/or solder that contain lead.
- **Before 1988** are likely to have fixtures and/or solder that contains lead.
- **Between 1996 and 2014** are likely to have fixtures that contain up to eight percent lead but were labelled "lead-free."
- **In 2014 or later** still have potential lead exposure. "Lead free" was redefined to reduce lead content to a maximum of 0.25 percent lead in fixtures and fittings. Fixtures that are certified to meet NSF Standard 61 meet this more restrictive definition of "lead free."

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Leaded solder and leaded fittings and fixtures are still available in stores to use for non-drinking water applications. Be careful to select the appropriate products for repairing or replacing drinking water plumbing in your home.

Galvanized plumbing can be a potential source of lead. Galvanized plumbing can absorb lead from upstream sources like a lead service line. Even after the lead service line has been removed, galvanized plumbing can continue to release lead into drinking water over time. Homes that are served by a lead service line should consider replacing galvanized plumbing inside the home.

Drinking water is only one source of lead exposure. Other common sources of lead exposure are lead-based paint, and lead-contaminated dust or soil. Because lead can be carried on hands, clothing, and/or shoes, sources of exposure to lead can include the workplace and certain hobbies. Wash your children's hands and toys often as they can come in contact with dirt and dust containing lead. In addition, lead can be found in certain types of pottery, pewter, food, and cosmetics. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

Particulate Lead
Lead results can vary between tests. A single test result is not a reliable indicator of drinking water safety. Two different types of lead can be present in drinking water, soluble lead and particulate lead. Soluble lead is lead that dissolves because of a chemical reaction between water and plumbing that contains lead. Particulate lead is dislodged scale and sediment released into the water from the sides of the plumbing and can vary greatly between samples. Disturbances, such as replacing a water meter, construction and excavation activities, or home plumbing repairs can cause particulates to shake free from inside pipes and plumbing. Particulate lead is a concern because the lead content can be very high. Lead particulate could be present in a single glass of water, but not present in water sampled just before or after. During construction, monthly aerator cleaning and using a filter certified to reduce lead are recommended to reduce particulate lead exposure.

Check whether your home has a lead service line.
Homes with lead service lines have an increased risk of having high lead levels in drinking water. Please contact the Benton Harbor Water Department for more information about your home's service line.

Steps You Can Take to Reduce Your Exposure to Lead in Your Water

1. ***Run your water to flush out lead.*** The more time water has been sitting in your home's pipes, the more lead it may contain. Therefore, if your water has not been used for several hours, run the water before using it for drinking or cooking. This flushes lead-containing water from the pipes.

- If you **do not** have a lead service line, run the water for 30 seconds to two minutes, or until it becomes cold or reaches a steady temperature.
- If you **do** have a lead service line, run the water for at least five minutes to flush water from both the interior building plumbing and the lead service line.

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200 East Wall Street
Benton Harbor, Michigan 49022

Additional flushing may be required for homes that have been vacant or have a longer service line. Your water utility can help you determine if longer flushing times are needed.

2. ***Use cold water for drinking and cooking.*** Do not cook with or drink water from the hot water tap; lead dissolves more easily into hot water.

3. ***Use cold water for preparing baby formula.*** Do not use water from the hot water tap to make baby formula. If you have a lead service line, consider using bottled water or a filter certified to reduce lead to prepare baby formula.

4. ***Do not boil water to remove lead.*** Boiling water will not reduce lead levels.

5. **Consider *using a filter to reduce lead in drinking water.*** Public health recommends that any household with a child or pregnant woman use a certified lead filter to remove lead from their drinking water. Look for filters that are tested and certified to NSF/ANSI Standard 53 for lead reduction.

Some filter options include a pour-through pitcher or faucet-mount systems. If the label does not specifically mention lead reduction, check the Performance Data Sheet included with the device. Be sure to maintain and replace the filter device in accordance with the manufacturer's instructions to protect water quality.

If you are not able to afford the cost of a lead filter, please contact the Berrien County Health Department at 800-815-5485.

6. Consider purchasing bottled water. The Food and Drug Administration (FDA) regulates bottled water. The bottled water standard for lead is 5 ppb.

7. ***Get your child tested.*** Contact your local health department, the Berrien County Health Department at 800-815-5485, or healthcare provider to find out how you can get your child tested for lead if you are concerned about exposure.

8. ***Identify older plumbing fixtures that likely contain lead.*** Older faucets, fittings, and valves sold before 2014 may contain higher levels of lead, even if marked "lead-free." Faucets, fittings, and valves sold after January 2014 are required to meet a more restrictive "lead-free" definition but may still contain up to 0.25 percent lead. When purchasing new plumbing materials, it is important to look for materials that are certified to meet NSF standard 61. The EPA prepared a brochure that explains the various markings that can indicate that materials meet the new "lead free" definition: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.txt.

9. ***Clean your aerator.*** The aerator on the end of your faucet is a screen that will catch debris. This debris could include particulate lead. The aerator should be removed at least every six months to rinse out any debris.

10. ***Test your water for lead.***

BENTON · HARBOR
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City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Since we have not been successful collecting the State Mandated required number, we encourage you to join in our Lead and Copper testing program that is required between the months of January to July and again during the months of July to December 2020.

11. **What Happened? What is Being Done?**The Benton Harbor Water Department had elevated lead levels in their 2018 and 2019 lead and copper sampling. We have sent educational materials to residents and offered free testing in 2018,

The Berrien County Health Department has provided free filters and replacement filters to anyone who wanted to participate.

Between July and December 2019, we made every effort to collected samples from 60 homes. We are still looking for more homes with lead service lines to volunteer to have their water tested. During this round of sampling, there were 10 homes out of 39 that had lead results higher than the 15ppb Action Level (AL). When the sample results were reported to the MDEQ, the action level was exceeded for Lead at 32 ppb.

The Benton Harbor Water Department does not have lead in its water mains. However, lead can enter drinking water when it is in contact with service lines, pipes, solder, home/building interior plumbing, fittings and fixtures that contain lead. Based on recent excavation and verification of service line materials, approximately 30% of the lines in the City are made of lead.
The graphics on the last page are a good way to understand where the Lead comes from:

In March 2018, the Benton Harbor Water Department has installed corrosion control treatment to reduce lead leaching. However, it can take up to 12 to 18 months to develop the protective coating on the pipes to reduce the amount of lead leaching into the drinking water.

If you are a Benton Harbor Water Department customer and would like your service line inspected or would like to have your drinking water tested for lead, contact the Benton Harbor Water Department phone number, 269 927-8471, press 2, or contact Mr. Mike O'Malley, momalley@cityofbentonharbor.gov. City resources are limited to complete these tasks, but efforts are still in place, please understand and be patient. See Item 10 above.

For More Information

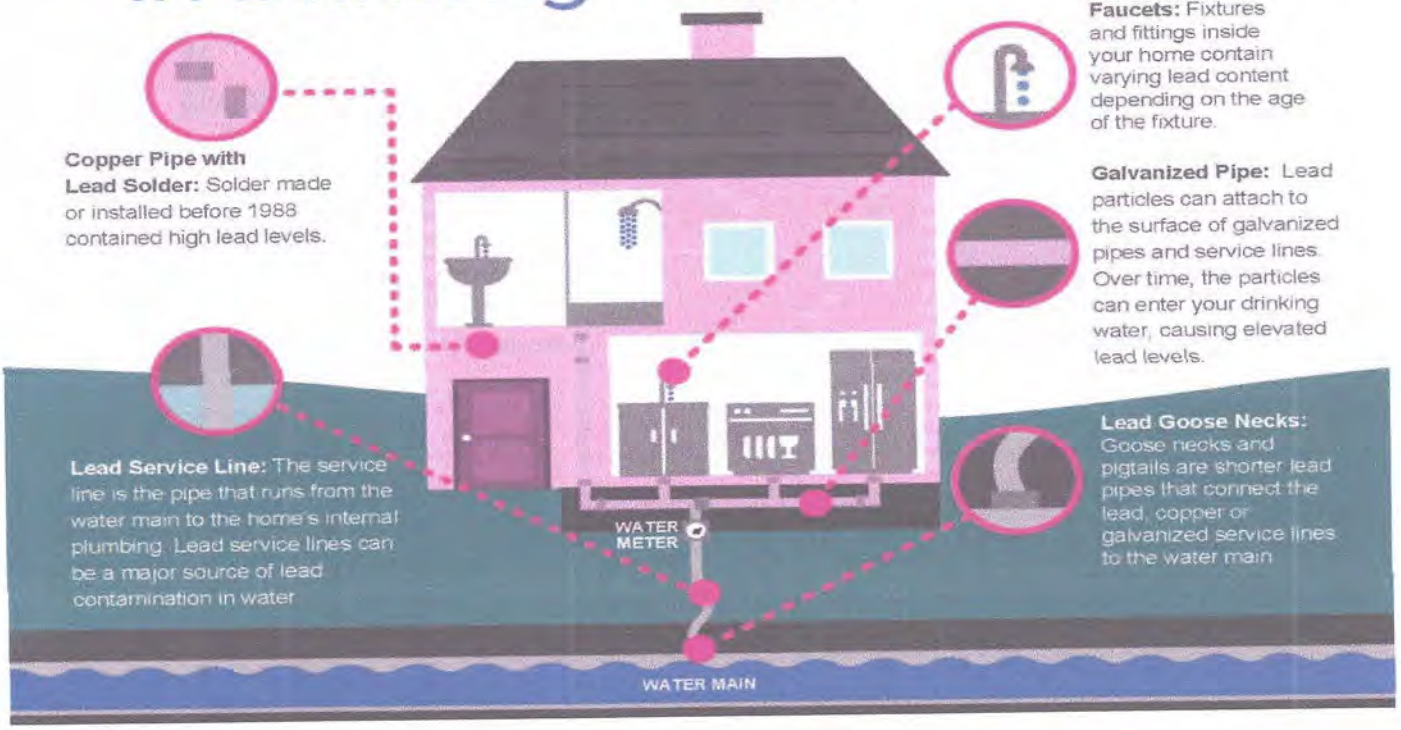
Contact the Berrien County Health Department at 800-815-5485, *the Benton Harbor Water Department at, 269-927-8471, press 2, or visit our website at* ***www.bhcity.us*** *or* www.michigan.gov/deqleadpublicadvisory. *For more information on reducing lead exposure around your home/building and the health effects of lead, visit EPA's Web site at* ***www.epa.gov/lead****, call the National Lead Information Center at 800-424-LEAD, or contact your healthcare provider.*

BENTON·HARBOR
PORT·OF·OPPORTUNITIES

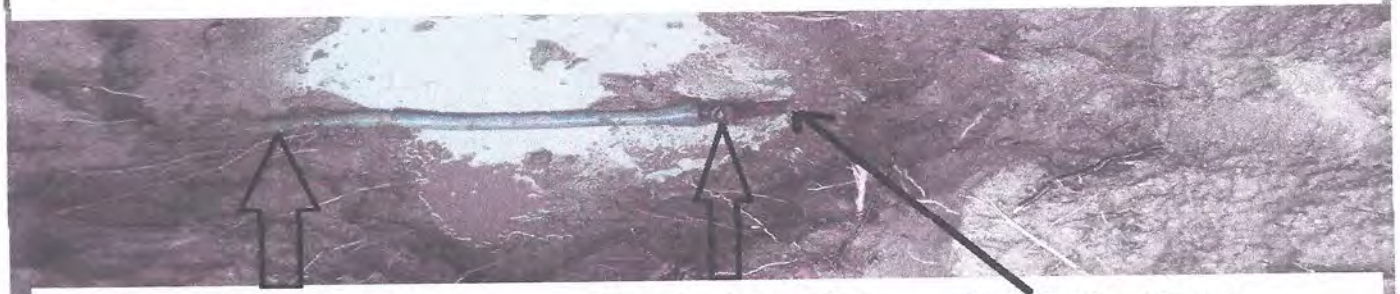
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

CONCERNED ABOUT LEAD IN YOUR DRINKING WATER?

Sources of **LEAD** in Drinking Water



This is what we have all over the City. This is a dig up of a Water Service Line going into a Residential Home. These are all over in Benton Harbor.
Most of All of our records (like this one) tell us where the tap and service is located. Some times it will say something about the materials; but usually not.
That is why we do not know until we dig a hole about 4-feet deep.
This line was installed to this home in September 1948.
This kind of water service is the majior reason for lead in you tap water, there could be other sources of Lead, but this leads to the BIG #'s



This is the City Side and it is made of lead piping.

This is the water shut off valve. It is made of brass mostly.

This is the Home Owner's side. The pipe is usually Galvanized. Like this one.

IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER

THE BENTON HARBOR WATER DEPARTMENT HAS EXCEEDED THE ACTION LEVEL FOR LEAD. Lead can cause serious health and development problems, especially for pregnant women and young children. Please read this information closely to see what you can do to reduce lead in your drinking water.

This notice is brought to you by the Benton Harbor Water Department.
Water Supply Serial Number: 00600
Distribution Date: Friday, August 23, 2019

Health Effects of Lead

Lead can cause serious health and development problems. It can cause damage to the brain and kidneys, and can interfere with the production of red blood cells that carry oxygen to all parts of your body. The greatest risk of lead exposure is to infants, young children, and pregnant women. Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults. Lead is stored in the bones, and it can be released later in life. During pregnancy, the child receives lead from the mother's bones, which may affect brain development. Although other sources of lead exposure exist, such as lead paint, and lead contaminated dust, the Benton Harbor Water Department is contacting you to reduce your risk of exposure to lead in drinking water. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

Sources of Lead

Lead is a common metal found in the environment. Drinking water is one possible source of lead exposure due to the widespread use of lead in plumbing materials. EPA estimates that drinking water can make up 20 percent or more of a person's potential exposure to lead. Infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water.

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Most Recent Sampling Information

Action Levels	90th Percentile Value	Range of results (minimum-maximum)	# of samples used for 90th Percentile
Lead 15 parts per billion (ppb)	**27 ppb**	0 ppb – 59 ppb	92
Copper 1.3 parts per million (ppm)	**0 ppm**	0 ppm – 0.1 ppm	92

Lead can enter drinking water when pipes, solder, home/building interior plumbing, fittings and fixtures that contain lead corrode. Corrosion is the dissolving, or wearing away, of metal caused by a chemical reaction between water and your plumbing. Several factors affect the amount of lead that enters the water, including the water quality characteristics (acidity and alkalinity), the amount of lead in the pipes, plumbing and/or fixtures, and the frequency of water use in the home.

Some plumbing products such as service lines, pipes and fixtures may contain lead. The infographic below demonstrates where sources of lead in drinking water could be in your home. Older homes may have more lead unless the service line and/or plumbing has been replaced.

Homes built…

* **Before the 1960s** are more likely to have lead service lines, lead pipes, fixtures, and/or solder that contain lead.
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Drinking water is only one source of lead exposure. Other common sources of lead exposure are lead-based paint, and lead-contaminated dust or soil. Because lead can be carried on hands, clothing, and/or shoes, sources of exposure to lead can include the workplace and certain hobbies. Wash your children's hands and toys often as they can come in contact with dirt and dust containing lead. In addition, lead can be found in certain types of pottery, pewter, food, and cosmetics. If you have questions about other sources of lead exposure, please contact the Berrien County Health Department at 800-815-5485.

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Check whether your home has a lead service line.

Homes with lead service lines have an increased risk of having high lead levels in drinking water. Please contact the Benton Harbor Water Department for more information about your home's service line.

For More Information

Contact the Berrien County Health Department at 800-815-5485, *the Benton Harbor Water Department at, 269-927-8471, press 2, or visit our website at* ***www.bhcity.us*** *or* *www.michigan.gov/deqleadpublicadvisory*. *For more information on reducing lead exposure around your home/building and the health effects of lead, visit EPA's Web site at* ***www.epa.gov/lead*****,** *call the National Lead Information Center at 800-424-LEAD, or contact your healthcare provider.*

Berrien County Printing

BENTON HARBOR
Port of Opportunities

Benton Harbor extends advisory for lead in the water supply

By DUSTIN DWYER (/PEOPLE/DUSTIN-DWYER) • JUL 30, 2019

Share (http://facebook.com/sharer.php?u=http%3A%2F%2Ftinyurl.com%2Fy5jvjhn7&t=Benton%20Harbor%20extends%20advisory%20for%20lead%20in%20the%20water%20supp

(//www.michiganradio.org/sites/michigan/files/styles/x_large/public/201209/benton_harbor_city_hall.jpg)

LINDSEY SMITH / MICHIGAN RADIO

The city of Benton Harbor says lead continues to be problem in the city water supply.

The city says 12 of 47 homes tested since January of this year were above the federal action level for lead in the water.

Benton Harbor first announced the higher lead levels in the water in October of last year. Since then, the city says it has started using corrosion controls in the water supply, and it's begun replacing lead service lines. Still, in tests from January through June of 2019, lead continued to show up in the water.

"The City is committed to continuing to take all corrective actions necessary to educate residents, improve the community water supply, and replace lead service lines with the goal of eliminating lead exposure in drinking water for residents," the city said in an advisory posted online (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Public-Advisory-Notification.pdf).

[For more information on how to reduce lead exposure, or how to pick up a free filter in Berrien County, go here (http://www.bchdmi.org/1568/Lead-Drinking-Water).]

The Berrien County Health Department says it has handed out nearly 2,000 free water filters to residents.

Overall, there's been no uptick in the number of children who show elevated levels of lead in their blood. The county says blood tests actually show a decline in the number of kids with elevated blood lead levels.

Out of the homes that tested high for lead in the water, there have been two children who tested for elevated levels of lead in their blood, according to Gillian Conrad, a spokesperson for the Berrien County Health Department.

But, Conrad says, it's not clear that the two children were exposed to lead through the water supply.

"Lead-based paint continues to be the primary source for lead exposure for children all over Berrien County, including Benton Harbor," Conrad says.

And Benton Harbor is not alone among Michigan cities and towns that have had high levels of lead in the water.

Last year, Benton Harbor was one of four municipalities in Michigan that tested above the federal action level for lead in the water. Earlier this month, the city of Highland Park said it tested above the federal level.

The federal action level for lead in the water supply is set at 15 parts per billion. According to the federal lead and copper rule, cities can have some test results come in at above that level without triggering a system-wide advisory. The advisory kicks in after a complicated calculation to find the 90th percentile of test results. If the 90th percentile result is above 15 parts per billion, the water supplier is required to issue an advisory and take steps to fix the problem.

Following the Flint Water Crisis, Michigan Radio calculated (https://www.michiganradio.org/post/video-how-dropping-two-flints-lead-test-numbers-changed-things-state) the 90th percentile for Flint's tests should have been at 18.8 ppb.

Four of the five municipalities in Michigan that have had lead advisories in the past year were above that level. Hamtramck was at 28 ppb. The village of Lawrence was at 24 ppb. Highland Park was 57 ppb (https://www.michiganradio.org/post/elevated-lead-levels-found-highland-park-tap-water) and Benton Harbor's latest results came in at 27 ppb (https://bhcity.us/wp-content/uploads/2019/07/Benton-Harbor-Lead-Public-Advisory-Notification.pdf).

And Gillian Conrad with the Berrien County Health Department says expects even more cities to find high lead results in the coming years.

“So it is definitely going to be a lot of communities that will be going through this process of understanding where lead might be present in their communities,” she says. “And I think it’s something that’s important for all of us to understand for public health.”

Conrad says the county will continue to provide free filters for anyone concerned about lead in their water. Information on where to get the filters, and how to reduce exposure to lead, is available on the health department’s website (http://www.bchdmi.org/1568/Lead-Drinking-Water).

TAGS: ELEVATED LEAD LEVELS (/TERM/ELEVATED-LEAD-LEVELS) BENTON HARBOR (/TERM/BENTON-HARBOR)

Share (http://facebook.com/sharer.php?u=http%3A%2F%2Ftinyurl.com%2Fy5jvjhn7&t=Benton%20Harbor%20extends%20advisory%20for%20lead%20in%20the%20water%20supp

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FEB 12, 2019

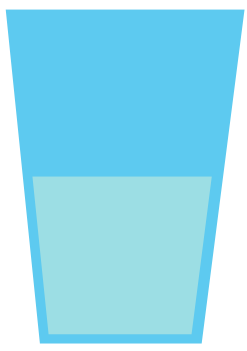
(/post/benton-harbor-residents-asked-flush-taps-more-homes-test-positive-lead-water)

Benton Harbor residents asked to flush taps, as more homes test positive for lead in the water (/post/benton-harbor-residents-asked-flush-taps-more-homes-test-positive-lead-water)

JAN 25, 2019

CITY OF BENTON HARBOR

DRINKING WATER & LEAD



OCT. 2018

During **routine** lead testing, required of every municipal water provider, City of Benton Harbor had 8 of 30 homes with lead levels greater than 15 part per billion.

This elevated result from testing triggered an **Action Level Exceedance (ALE).**

Notification & information was distributed to residents, including recommendations for flushing times.

NOV. 2018 - JAN. 2019

Additional investigation into the **source of lead in the drinking** water was completed.

335 homes participated in voluntary water testing (46 were elevated). MDHHS conducted sequential water sampling to further ensure good recommendations were being made for residents

JAN. - FEB, 2019

Following investigation period, it was determined that **lead service lines and aging infrastructure** were of concern.

Residents were recommended to use 5 minute flushing times or use a water filter that is NSF 53 certified for lead.

FEB. - MARCH, 2019

Berrien County Health Department, with support from the Michigan Department of Health & Human Services (MDHHS) **began to distribute water filters to all City residents**.

Michigan Department of Environment, Great Lakes, & Energy (EGLE) continues to work with City Water Plant; **corrosion prevention treatment** implemented by City of Benton Harbor - Water Treatment Plant on March 25th.

MAR. 2019 - PRESENT

Berrien County Health Department continues to provide water filters to residents & monitor blood lead levels in children throughout the City (and county). No increase in the trend of elevated blood lead levels has been seen.

City of Benton Harbor continues to replace lead service lines.

EGLE & MDHHS continue to support work and resident communication.

Updated April, 2020

I. 5. f BCHD Lead ALE Notice

LEAD ACTION LEVEL EXCEEDANCE IN THE CITY OF BENTON HARBOR

WATER FILTER DISTRIBUTION FOR CITY OF BENTON HARBOR:

How To Get A Water Filter or Replacement Cartridge During COVID-19 Pandemic:

Water filters and replacement cartridges are still available for Benton Harbor City Residents.

If you are in need of a water filter or your cartridge needs to be replaced, please call the Berrien County Health Department at 1-800-815-5485 (option 2) and a filter will be mailed to you.

If we miss your call, please leave a message with your phone number. We will call you back and arrange filter delivery. Stay home, stay safe!

At this time, all public distribution/pick-up dates have been cancelled.

BACKGROUND INFORMATION:

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) and the US Environmental Protection Agency (EPA) require public water supplies to test regularly for lead and copper in drinking water. The regularly scheduled testing discovered lead was in the water and that at least 10% of the samples tested had lead levels that exceeded the "action level" of 15 parts per billion (ppb) for lead in water. More information about water testing in the City of Benton Harbor can be found on the City of Benton Harbor Website.

When at least 10% of the samples tested exceed the action level for lead in drinking water (15ppb), public health officials recommend precautionary actions to protect residents - especially those most at risk of harm to their health, including children and fetuses. Lead exposure can pose a serious health risk for children because their bodies and

nervous systems are still developing. The use of water filters is recommended in any residence served by the City of Benton Harbor water system that is home to a child or a pregnant woman. However, free filters are being provided to any City of Benton Harbor resident who would like one.

In homes with children or pregnant women, the Berrien County Health Department also recommends using only cold filtered (or bottled) water for drinking, rinsing food, cooking, mixing powdered infant formula, and brushing teeth. When buying a water filter, make sure it is certified to NSF/ANSI Standard 53 for lead reduction and NSF/ANSI Standard 42 for particulate reduction. It is important to follow the manufacturer's instructions for installing and maintaining the filter.

FOR QUESTIONS ABOUT THE WATER OR WATER TESTING:

City of Benton Harbor
City of Benton Harbor Website
Email: bhwater@cityofbentonharbormi.gov
Phone: 269-927-8400 ext.1143

https://www.heraldpalladium.com/news/local/too-much-lead-in-benton-harbor-water/article_b5a94742-8edc-5574-8859-4e62159fa907.html

I. 5. g. October 23, 2018 Herald Palladium Newspaper Article

TOP STORY

Too much lead in Benton Harbor water

Officials hold press conference today to inform residents

By LOUISE WREGE - HP Staff Writer
Oct 24, 2018

Don Campbell / HP staff

BENTON HARBOR — Benton Harbor's water system is under a state advisory for lead after summer sampling revealed higher-than-acceptable levels, city officials confirmed Tuesday night.

City officials will hold a press conference at 11 a.m. today at City Hall to let residents know what it means now that the state has found there is too much lead in the city's tap water, City Manager Darwin Watson said.

According to an advisory from the Michigan Department of Environmental Quality, out of the water samples collected from 30 homes this summer, eight were above the action level of 15 parts per billion (ppb) for lead. And the 90th percentile of the samples was 22 ppb for lead.

“Exceeding the Action Level triggers additional actions, including, but not limited to, increased investigative sampling of water quality and educational outreach to customers,” the advisory states. “Elevated levels of lead in the drinking water can cause health concerns.”

Watson said one of the best ways to reduce the amount of lead in your drinking water is to run the tap cold for three to five minutes before using the water to drink or for cooking. He said stagnant water in pipes that aren’t used very often are more likely to contain higher levels of lead than pipes where the water is circulated more often.

“It’s all about stagnation,” he said. “Stagnant water allows for more interaction between the water and the pipes.”

To further reduce your risk of lead exposure, the advisory recommends:

• Use cold water tap for drinking or cooking.

• Use bottled water to prepare baby formula.

• Do not boil your water as boiling will not reduce the amount of lead in water.

• Water is safe for bathing.

The advisory states that the Berrien County Health Department has detected no increase in lead levels in Benton Harbor children under the age of 7. In fact, the advisory states that “there is a downward trend of elevated blood levels continuing into 2018.”

The city is being required to collect water samples every six months to determine if “corrective actions are necessary to reduce corrosion in household plumbing.”

Residents will receive more notices about lead in the city’s water, states the advisory.

More information on the health effects of lead in drinking water can be found at www.michigan.gov/deqleadpublicadvisory.

Lead can cause brain and kidney damage and can “interfere with the production of red blood cells that carry oxygen to all parts of your body.”

“The greatest risk of lead exposure is to infants, young children, and pregnant women,” states the information on the MDEQ website. “Scientists have linked the effects of lead on the brain with lowered IQ in children. Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults.”

Questions about the water system, water testing, health concerns or getting your child’s blood lead level tested can be directed to the Benton Harbor Water Response Hotline at 1-800-815-5485 from 8:30 a.m. to 5 p.m.

Additional information can be found on the city's website at www.bhcity.us or the Berrien County Health Department website at www.bchdmi.org.

The city was notified in May that it received almost $300,000 in state grant money to replace lead and galvanized steel water service lines. At the time, Benton Harbor Water Superintendent Mike O'Malley estimated that 60 percent of the houses in Benton Harbor have lead and/or galvanized steel water lines from the main water line to the house.

Watson said the city needs to do a general inventory of the city's water service lines to determine how many are lead or galvanized steel. After that, he said, the rest of the money will be used to start replacing lead pipes.

He said state officials decided to replace galvanized steel pipes because it has been shown that lead can collect in them.

Watson said the city is responsible for the water lines up to the sidewalk. Homeowners are responsible for water lines from the sidewalk to the house. But this grant is allowing the city to replace water lines on private property.

Contact: lwrege@TheHP.com, 932-0361, Twitter: @HPWrege

I. 6. February 13, 2020 EGLE Corrosion Treatment Letter

STATE OF MICHIGAN

DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit for installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system. The treatment chemical permitted, based on a recommendation by Elhorn Engineering, was Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was 1.5 milligrams per liter (mg/L) as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City concludes the treatment is not achieving desired results quickly enough. The most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment.

The City met with representatives from EGLE on January 15, 2020, to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting and outline next steps for the City to pursue designation of optimized corrosion control treatment as required by Rule 604f of the administrative rules promulgated under Act 399.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60 certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This

designation is being made under R325.10604f(3)(d). The reason for this change is to speed up treatment effectiveness. EGLE's intent is to quickly put into place treatment that will more efficiently lower corrosion rates in the distribution system for greater protection of public health. This decision is based on corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system but, without further study, it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third-party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c) of the administrative rules promulgated under Act 399. This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immediately verify in writing to the department the valve has been closed according to the permit.

TRANSITION AND TIMELINE

Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

I. 6. February 13, 2020 EGLE Corrision Treatment Letter

STATE OF MICHIGAN

DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

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Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
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Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

Security settings or invalid file format do not permit using WS00503987-EPA4700_4_2_1-V2.1.pdf (578894 Bytes).

THIS NOTIFICATION IS ISSUED UNDER THE AUTHORITY OF ACTS 220 & 453, PA OF 1976 AS AMENDED

STATE OF MICHIGAN

DEPARTMENT OF CIVIL RIGHTS

350 OTTAWA NW
4TH FLOOR
GRAND RAPIDS, MI, 49503

NOTICE OF DISPOSITION AND ORDER OF DISMISSAL

EEOC #: C 23A-2018-10555C

MDCR #: 489669

Claimant:

Terrie Tabbert
21825 Dutch Settlement Street
Cassopolis, MI 49031

Respondent:

City of Benton Harbor
200 East Wall Street
Water Department
Benton Harbor, MI 49022

REASON FOR DISMISSAL:

This complaint alleges that the respondent discriminated against the claimant in violation of civil rights laws. The claimant submitted a written request for withdrawal indicating that this matter will be pursued in court.

It is therefore ordered that this complaint is dismissed.

Date Dismissed : October 22, 2019	Date Mailed : OCT 2 4 2019
/s/ Lori Vinson/Director, Civil Rights Operations	

RULES OF CIVIL RIGHTS COMMISSION AND DEPARTMENT RELATING TO RECONSIDERATION AND APPEAL

Rule 7.(1) ***A claimant may request of the department a reconsideration of its refusal to issue a charge. The request shall be in writing, state specifically, the grounds upon which it is based, and be filed within 30 days after the date of mailing of the notice of disposition of which reconsideration is requested. It shall be filed at any office of the department by personal delivery or by mail.***

(2) ***The department may authorize a hearing on the request for reconsideration at such time and place, and before such hearing commissioner or commissioners or hearing referee or referees as it or the director may detemine, and notice thereof shall be given to all parties to the proceedings.***

Rule 18. ***Any party claiming to be aggrieved by a final order of the commission or the department, including without limitation a refusal to issue a charge, may appeal to the circuit court of the State of Michigan having jurisdiction provided by law within 30 days of the date of service of an appealable order.***

Note: *To Secure a review by the U.S. Equal Employment Opportunity Commission of this dismissal, you must request a review in writing within 15 days of your receipt of this notice. Send your request to: EEOC Detroit District Office, 477 Michigan Ave., Suite 865, Detroit, MI 48226.*

EEOC Form 161 (11/16)

U.S. EQUAL EMPLOYMENT OPPORTUNITY COMMISSION

DISMISSAL AND NOTICE OF RIGHTS

To: Kevin C. Jacisin
11260 Sherman Ave
Warren, MI 48089

From: Detroit Field Office
477 Michigan Avenue
Room 865
Detroit, MI 48226

☐ *On behalf of person(s) aggrieved whose identity is CONFIDENTIAL (29 CFR §1601.7(a))*

EEOC Charge No.	EEOC Representative	Telephone No.
471-2020-00340	Anthony Warren, Investigator	(313) 226-6550

THE EEOC IS CLOSING ITS FILE ON THIS CHARGE FOR THE FOLLOWING REASON:

☐ The facts alleged in the charge fail to state a claim under any of the statutes enforced by the EEOC.

☐ Your allegations did not involve a disability as defined by the Americans With Disabilities Act.

☐ The Respondent employs less than the required number of employees or is not otherwise covered by the statutes.

☐ Your charge was not timely filed with EEOC; in other words, you waited too long after the date(s) of the alleged discrimination to file your charge

☒ The EEOC issues the following determination: Based upon its investigation, the EEOC is unable to conclude that the information obtained establishes violations of the statutes. This does not certify that the respondent is in compliance with the statutes. No finding is made as to any other issues that might be construed as having been raised by this charge.

☐ The EEOC has adopted the findings of the state or local fair employment practices agency that investigated this charge.

☐ Other *(briefly state)*

- NOTICE OF SUIT RIGHTS -

(See the additional information attached to this form.)

Title VII, the Americans with Disabilities Act, the Genetic Information Nondiscrimination Act, or the Age Discrimination in Employment Act: This will be the only notice of dismissal and of your right to sue that we will send you. You may file a lawsuit against the respondent(s) under federal law based on this charge in federal or state court. Your lawsuit **must be filed WITHIN 90 DAYS of your receipt of this notice**; or your right to sue based on this charge will be lost. (The time limit for filing suit based on a claim under state law may be different.)

Equal Pay Act (EPA): EPA suits must be filed in federal or state court within 2 years (3 years for willful violations) of the alleged EPA underpayment. This means that **backpay due for any violations that occurred more than 2 years (3 years) before you file suit may not be collectible.**

On behalf of the Commission

Kevin K. Sanford

for Michelle Eisele,
District Director

11.27.19
(Date Mailed)

Enclosures(s)

cc: City of Benton Harbor
c/o: Lisa Golliday
Human Resources Coordinator
200 E. Wall Street
Benton Harbor, MI 49022

NOTICE OF RIGHTS UNDER THE ADA AMENDMENTS ACT OF 2008 (ADAAA): The ADA was amended, effective January 1, 2009, to broaden the definitions of disability to make it easier for individuals to be covered under the ADA/ADAAA. A disability is still defined as (1) a physical or mental impairment that substantially limits one or more major life activities (actual disability); (2) a record of a substantially limiting impairment; or (3) being regarded as having a disability. *However, these terms are redefined, and it is easier to be covered under the new law.*

If you plan to retain an attorney to assist you with your ADA claim, we recommend that you share this information with your attorney and suggest that he or she consult the amended regulations and appendix, and other ADA related publications, available at http://www.eeoc.gov/laws/types/disability_regulations.cfm.

"Actual" disability or a "record of" a disability (note: if you are pursuing a failure to accommodate claim you must meet the standards for either "actual" or "record of" a disability):

- **The limitations from the impairment no longer have to be severe or significant** for the impairment to be considered substantially limiting.
- In addition to activities such as performing manual tasks, walking, seeing, hearing, speaking, breathing, learning, thinking, concentrating, reading, bending, and communicating (more examples at 29 C.F.R. § 1630.2(i)), **"major life activities" now include the operation of major bodily functions**, such as: functions of the immune system, special sense organs and skin; normal cell growth; and digestive, genitourinary, bowel, bladder, neurological, brain, respiratory, circulatory, cardiovascular, endocrine, hemic, lymphatic, musculoskeletal, and reproductive functions; or the operation of an individual organ within a body system.
- **Only one** major life activity need be substantially limited.
- With the exception of ordinary eyeglasses or contact lenses, **the beneficial effects of "mitigating measures"** (e.g., hearing aid, prosthesis, medication, therapy, behavioral modifications) **are not considered** in determining if the impairment substantially limits a major life activity.
- An impairment that is **"episodic"** (e.g., epilepsy, depression, multiple sclerosis) or "**in remission**" (e.g., cancer) is a disability if it **would be substantially limiting when active**.
- An impairment **may be substantially limiting even though** it lasts or is expected to last **fewer than six months**.

"Regarded as" coverage:

- An individual can meet the definition of disability if an **employment action was taken because of an actual or perceived impairment** (e.g., refusal to hire, demotion, placement on involuntary leave, termination, exclusion for failure to meet a qualification standard, harassment, or denial of any other term, condition, or privilege of employment).
- "Regarded as" coverage under the ADAAA no longer requires that an impairment be substantially limiting, or that the employer perceives the impairment to be substantially limiting.
- The employer has a defense against a "regarded as" claim only when the impairment at issue is objectively *BOTH* transitory (lasting or expected to last six months or less) *AND* minor.
- A person is not able to bring a failure to accommodate claim *if* the individual is covered only under the "regarded as" definition of "disability."

Note: Although the amended ADA states that the definition of disability "shall be construed broadly" and "should not demand extensive analysis," some courts require specificity in the complaint explaining how an impairment substantially limits a major life activity or what facts indicate the challenged employment action was because of the impairment. Beyond the initial pleading stage, some courts will require specific evidence to establish disability. For more information, consult the amended regulations and appendix, as well as explanatory publications, available at http://www.eeoc.gov/laws/types/disability_regulations.cfm.

Enclosure with EEOC
Form 161 (11/16)

INFORMATION RELATED TO FILING SUIT UNDER THE LAWS ENFORCED BY THE EEOC

(This information relates to filing suit in Federal or State court under Federal law. If you also plan to sue claiming violations of State law, please be aware that time limits and other provisions of State law may be shorter or more limited than those described below.)

PRIVATE SUIT RIGHTS -- Title VII of the Civil Rights Act, the Americans with Disabilities Act (ADA), the Genetic Information Nondiscrimination Act (GINA), or the Age Discrimination in Employment Act (ADEA):

In order to pursue this matter further, you must file a lawsuit against the respondent(s) named in the charge **within 90 days of the date you *receive* this Notice**. Therefore, you should **keep a record of this date**. Once this 90-day period is over, your right to sue based on the charge referred to in this Notice will be lost. If you intend to consult an attorney, you should do so promptly. Give your attorney a copy of this Notice, and its envelope, and tell him or her the date you received it. Furthermore, in order to avoid any question that you did not act in a timely manner, it is prudent that your suit be filed **within 90 days of the date this Notice was *mailed* to you** (as indicated where the Notice is signed) or the date of the postmark, if later.

Your lawsuit may be filed in U.S. District Court or a State court of competent jurisdiction. (Usually, the appropriate State court is the general civil trial court.) Whether you file in Federal or State court is a matter for you to decide after talking to your attorney. Filing this Notice is not enough. You must file a "complaint" that contains a short statement of the facts of your case which shows that you are entitled to relief. Courts often require that a copy of your charge must be attached to the complaint you file in court. If so, you should remove your birth date from the charge. Some courts will not accept your complaint where the charge includes a date of birth. Your suit may include any matter alleged in the charge or, to the extent permitted by court decisions, matters like or related to the matters alleged in the charge. Generally, suits are brought in the State where the alleged unlawful practice occurred, but in some cases can be brought where relevant employment records are kept, where the employment would have been, or where the respondent has its main office. If you have simple questions, you usually can get answers from the office of the clerk of the court where you are bringing suit, but do not expect that office to write your complaint or make legal strategy decisions for you.

PRIVATE SUIT RIGHTS -- Equal Pay Act (EPA):

EPA suits must be filed in court within 2 years (3 years for willful violations) of the alleged EPA underpayment: back pay due for violations that occurred **more than 2 years (3 years) before you file suit** may not be collectible. For example, if you were underpaid under the EPA for work performed from 7/1/08 to 12/1/08, you should file suit before 7/1/10 – *not* 12/1/10 -- in order to recover unpaid wages due for July 2008. This time limit for filing an EPA suit is separate from the 90-day filing period under Title VII, the ADA, GINA or the ADEA referred to above. Therefore, if you also plan to sue under Title VII, the ADA, GINA or the ADEA, in addition to suing on the EPA claim, suit must be filed within 90 days of this Notice and within the 2- or 3-year EPA back pay recovery period.

ATTORNEY REPRESENTATION -- Title VII, the ADA or GINA:

If you cannot afford or have been unable to obtain a lawyer to represent you, the U.S. District Court having jurisdiction in your case may, in limited circumstances, assist you in obtaining a lawyer. Requests for such assistance must be made to the U.S. District Court in the form and manner it requires (you should be prepared to explain in detail your efforts to retain an attorney). Requests should be made well before the end of the 90-day period mentioned above, because such requests do not relieve you of the requirement to bring suit within 90 days.

ATTORNEY REFERRAL AND EEOC ASSISTANCE -- All Statutes:

You may contact the EEOC representative shown on your Notice if you need help in finding a lawyer or if you have any questions about your legal rights, including advice on which U.S. District Court can hear your case. If you need to inspect or obtain a copy of information in EEOC's file on the charge, please request it promptly in writing and provide your charge number (as shown on your Notice). While EEOC destroys charge files after a certain time, all charge files are kept for at least 6 months after our last action on the case. Therefore, if you file suit and want to review the charge file, **please make your review request within 6 months of this Notice.** (Before filing suit, any request should be made within the next 90 days.)

IF YOU FILE SUIT, PLEASE SEND A COPY OF YOUR COURT COMPLAINT TO THIS OFFICE.

Security settings or invalid file format do not permit using WS00503987-EPA_KeyContacts-V1.1.pdf (287030 Bytes).

Security settings or invalid file format do not permit using WS00503987-SF424A-V1.0.pdf (332383 Bytes).

Security settings or invalid file format do not permit using WS00503987-SF424_2_1-V2.1.pdf (301634 Bytes).

From: Sarkipato, Ernest (EGLE)
To: Bolf, Michael (EGLE)
Subject: Elhorn rec email 11.20.18
Date: Wednesday, December 18, 2019 12:45:22 PM
Attachments: Elhorn rec email 11.20.18.pdf

600

Sarkipato, Ernest (DEQ)

From: mike@michonline.net
Sent: Tuesday, November 20, 2018 6:47 PM
To: Onan, Brandon (DEQ)
Subject: Benton Harbor informaion
Attachments: RWU Lead and Copper Compliance-Carus Webinar final.pdf; Carus 8600 Data Sheet.pdf; Carus 8600 SDS.pdf; Benton Harbor MI Oct30.pdf; benton harbor 11-18.doc

Hi Brandon, As discussed on the phone, I wanted to provide recommendations for a corrosion control program for the City of Benton Harbor. The product is Carus 8600 which is a 70/30 ortho/poly blend. The product weights 11.4 lbs and 33% total phosphate. The starting recommended dosage is 1.0 ppm as PO4. Attached is a case study, product literature and SDS sheets , water quality results, and a recommendation letter to the City of Benton Harbor. Please review and I look forward to having a phone conversation on Wednesday afternoon to discuss. Thanks much, Mike Enlow, Elhorn Eng. Co.

Mike E: ortho 0.7
poly 0.3

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE); Thurston, Brian (EGLE); Philip, Kris (EGLE); Lachance, Amy (EGLE); Klein, Jeremy (EGLE); Bolt, Jennifer (EGLE); Robinson, Krista (EGLE)
Subject:	FW: ACO items
Date:	Monday, August 12, 2019 10:59:13 AM
Attachments:	City of Benton Harbor Signed ACO and Transmittal Letter.pdf Inspection Photos BH 08092019.pdf

Updates from Friday's inspection in BH.

From: Sarkipato, Ernest (EGLE)
Sent: Monday, August 12, 2019 10:56 AM
To: 'DARWIN WATSON' <dwatson@cityofbentonharbormi.gov>
Cc: 'Darold Harlan' <dharlan@fv-operations.com>; momalley@cityofbentonharbormi.gov
Subject: ACO items

I appreciated the opportunity to spend time at the Benton Harbor water plant last Friday. Below is a summary of observations, also serving as a status update on the improvements at the water plant. Attached are photos taken during the inspection.

Monitoring Violations and CCR: EGLE staff are actively discussing a few outstanding compliance-related items, including missed samples and the recent CCR distribution. Please stay tuned for more on this.

Staffing: I had the chance to meet with Darold, who is the F&V guy for the distribution system. The decision was made recently to have distribution water guys work out of the water plant, which is a really effective way to bring some focus back to the distribution system which has suffered much neglect. Currently, they are focusing initial efforts on pursuing rate collection for accounts that are past due, starting with the highest amounts. This is essential, as revenue is fundamental. The water plant also has one new staff, giving them more options for completing maintenance activities. I sent a separate email on the cross connection program, which will be a focus in the coming months.

Finished Water Meter: The McCrometer insertion meter is installed as planned, and connected to SCADA along with a totalizer.

Corrosion Treatment: The phosphate feed pump was connected to the meter initially after installation, but two problems arose. First, for this setup all backwash water also passes through the meter, and the city was spending a lot of money on feeding corrosion chemical that was eventually heading for the backwash ponds. In addition, there was a PLC-level issue with the chem pump memory (not exactly sure the nature of the issue here). Currently, the phosphate is back to being fed when a high service pump is running. We will be analyzing the distributing residual data along with coupon testing to assess whether this system is sufficiently accurate. Bear in mind, we will be setting acceptable ranges for phosphate eventually, and the feed system will need to be accurate enough to stay within a specific range. Note, when I was there Doug measured orthophosphate, and it was between 1.4-1.5 mg/L, which is an excellent residual at the water plant tap. I'd like to see a bit more regularity in operators reading the scale twice a day and calculating the ppm dosed as well.

Alum: The bulk tank is now connected to the new day tank, and chemical pumps are installed with piping. The system is not yet running, as the permit application is still under review. Attached is a diagram and photo. The current plan is to have the operators fill the tank manually, and run the pumps manually. This is preferred by the operator.

SCADA: The scada was reviewed to ensure filter turbidity data was trending, as well as chlorine residual. Please note, the system alarms need to be reviewed to ensure low chlorine or high turbidity result in a call-out, particularly after hours in the case of low chlorine. Note, the photo of the

turbidity shows some wacky data around 8/5-8/6, but this was during plant shut-down. I'd be curious to know what that was caused by!

CL17: The online chlorine analyzer has been installed and is being trended in SCADA. Note, there appears to be daily variability in plant tap chlorine, confirmed by the cl17 as well as titrations in the lab. Shift operators are in the habit of 'boosting' the chlorine first thing in the day, and this practice should be discontinued. Stable chemical levels, particularly oxidants such as chlorine, are very important in the effort to build a passivation layer in the distribution system and minimize release of metals.

I am generally encouraged to see the staff together at the WTP, and see all the efforts to improve the water system on both the distribution and treatment ends. Thanks for all your hard work in these efforts. We hope to continue to support the city of BH in building a sustainable water system that is most protective of public health.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

March 8, 2019

CERTIFIED MAIL

The Honorable Marcus Muhammad
Mayor of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mayor Muhammad:

SUBJECT: Administrative Consent Order (ACO); City of Benton Harbor; WSSN: 00600

Enclosed please find a fully executed ACO between the City of Benton Harbor and the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), regarding the water supply at the City of Benton Harbor. The compliance schedule in this ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. The effective date of the ACO is March 5, 2019.

If you have any questions regarding the ACO, please contact me at 616-490-9590; lachancea1@michigan.gov; or DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Amy Lachance
Assistant Division Director
Drinking Water and Municipal Assistance Division

Enclosure
cc: Mr. Darwin Watson, City of Benton Harbor
Mr. Eric J. Oswald, DEQ
Mr. Brian Thurston, DEQ
Mr. Mike Bolf, DEQ
Mr. Ernie Sarkipato, DEQ
Mr. Dave Willard, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION

ADMINISTRATIVE CONSENT ORDER

In the matter of: DWMAD Order No. ACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME	OWNER☒	OPERATOR☐
City of Benton Harbor		
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
CONTACT NAME/TITLE: Darwin Watson, City Manager	PHONE #: 269-927-8408	

FACILITY NAME AND LOCATION

FACILITY NAME: Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER: 00600
FACILITY OWNER IF NOT IDENTIFIED ABOVE: City of Benton Harbor		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
COUNTY: Berrien		
CONTACT NAME: Darwin Watson	PHONE #: 269-927-8408	

1.1 This document results from allegations by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ alleges that the City of Benton Harbor, owner/operator of the city's public water supply, is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder.

1.2 Specific violations are referenced in the DEQ Significant Deficiency Violation Notice (SDVN) attached to this Administrative Consent Order (Consent Order) as Exhibit A. The Owner/Operator and the DEQ agree to resolve the violations set forth therein through entry of this Consent Order. The Owner/Operator agrees to resolve all compliance issues set forth in Exhibit A in accordance with the requirements contained in this Consent Order. This Consent Order, in its entirety, shall consist of Section I, the attached Sections II, III, and IV, Exhibit A, and any other referenced attachments, exhibits, or appendices. This Consent Order shall be considered null and void if it does not include, at a minimum, Sections I, II, III, and IV and Exhibit A. The Owner/Operator further agrees that this Consent Order shall become effective on the date it is signed by the DWMAD Director, designee of the DEQ Director.

1.3 The Owner/Operator agrees to pay a civil fine of $500 per day for failure to complete corrective actions as specified in Section II, Compliance Schedule, unless an extension has been approved under Section 4.14. Failure to make a timely payment constitutes a violation of this Consent Order.

1.4 The Owner/Operator agrees to make payment of all funds due pursuant to this agreement by certified check made payable to the "State of Michigan" and mailed to the Accounting Services Division, Cashier's Office for the DEQ, P.O. Box 30657, Lansing, Michigan 48909-8157. To ensure proper credit, all payments made pursuant to this Consent Order must include "Payment Identification Number RMD90044" on the check. The Owner/Operator agrees not to contest the legality of the civil fine.

Signatories

DEPARTMENT OF ENVIRONMENTAL QUALITY

Eric Oswald, Director
Drinking Water and Municipal Assistance Division

5-Mar-19
Date

I undersigned CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

2/25/2019
Date

SECTION II - COMPLIANCE SCHEDULE

IT IS THEREFORE AGREED AND ORDERED THAT the Owner/Operator shall take the following actions to prevent further violations of Act 399 and the administrative rules promulgated thereunder and/or to correct the significant deficiencies identified in the SDVN attached to this Consent Order as Exhibit A.

2.1 Submit to the DWMAD a completed rate study from a qualified professional consultant, along with a plan to implement rate increases as recommended by the study, no later than April 1, 2019.

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water no later than April 1, 2019.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

2.7 Submit to the DWMAD an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process, no later than May 1, 2019.

2.8 Submit an updated cross connection program for DWMAD approval, incorporating the City's plan for implementing control of residential accounts, and for obtaining adequate personnel to implement the City's cross connection control program, no later than June 1, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

2.10 Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants, no later than June 1, 2019.

2.11 Conduct professional inspection of the elevated tank interior and exterior no later than June 30, 2019.

2.12 Install working mussel control system at the intake no later than June 30, 2019.

2.13 Repair filter to waste valves no later than January 1, 2020.

Sections III and IV of this Consent Order shall not be altered in any way, including adding or eliminating any language, striking terms or parts of terms, retyping in whole or in part, or using a different format. Any changes to this document without written approval from the DEQ renders the Consent Order null and void.

SECTION III - STIPULATIONS

The Owner/Operator and the DEQ stipulate as follows:

3.1 The DEQ is authorized to enter this Consent Order requiring the Owner/Operator to comply with state law under Section 15 of Act 399.

3.2 The Owner/Operator consents to the issuance and entry of this Consent Order and stipulates that the entry of this Consent Order constitutes a final order of the DEQ and is enforceable as such under the appropriate provisions of state law identified in this Consent Order. The Owner/Operator agrees not to contest the issuance of this Consent Order and that the resolution of this matter by the entry of this Consent Order is appropriate and acceptable.

3.3 The Owner/Operator and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Owner/Operator that the law has been violated.

3.4 The Signatory to this Consent Order on behalf of the Owner/Operator agrees and attests that he/she is fully authorized to ensure that the Owner/Operator will comply with all requirements under this Consent Order.

3.5 The Owner/Operator shall achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section II of this Consent Order.

SECTION IV - GENERAL PROVISIONS

The Owner/Operator and the DEQ further stipulate as follows:

4.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Owner/Operator to comply with the requirements of Act 399 and the administrative rules promulgated thereunder.

4.2 The DEQ and the Owner/Operator consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to the provisions of Act 399.

4.3 This Consent Order in no way affects the Owner/Operator's responsibility to comply with any other applicable local, state, or federal laws or regulations.

4.4 The DEQ reserves its right to pursue appropriate action, including injunctive relief to enforce the provisions of this Consent Order, and applicable statutory fines for any violation of this Consent Order.

4.5 Nothing in this Consent Order is or shall be considered to affect any liability the Owner/Operator may have for natural resource damages caused by the

Owner/Operator's acts or omissions at the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

4.6 In the event the Owner/Operator sells or transfers the facility, he/she shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the Owner/Operator shall also notify the DWMAD Engineering Unit, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be submitted to the DWMAD Engineering Unit within 30 days of assuming the obligations of this Consent Order.

4.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their successors and assigns.

4.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

Reporting

4.9 The Owner/Operator shall make all submittals and written notifications required by this Consent Order, to the DWMAD Engineering Unit, DEQ, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503. The cover letter with each submittal or notification shall identify the specific paragraph and requirement of this Consent Order that the submittal or notification is intended to satisfy.

4.10 The Owner/Operator shall verbally report any violation(s) of the terms and conditions of this Consent Order to the DWMAD Engineering Unit Supervisor at 231-590-3430 by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with submittal of a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The Owner/Operator shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

Retention of Records

4.11 Upon request by an authorized representative of the DEQ, the Owner/Operator shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to applicable laws or rules. All such documents shall be retained by the Owner/Operator for at least a period of three years from the date of generation of the record unless a longer period of record retention is required by the applicable law or its rules.

Right of Entry

4.12 The Owner/Operator shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all

reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to Act 399 and the administrative rules promulgated thereunder or any other applicable statutory provision.

DEQ Approval of Submittals

4.13 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Owner/Operator, the following process and terms of approval shall apply:

a. All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

b. In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the reasons for such disapproval. The Owner/Operator shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

c. In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Owner/Operator to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

d. Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

e. Failure by the Owner/Operator to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the Owner/Operator to the enforcement provisions of this Consent Order.

f. Any delays caused by the Owner/Operator's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Owner/Operator's responsibility to comply with any other deadline(s) specified in this Consent Order.

g. No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted

by the Owner/Operator will be construed as relieving the Owner/Operator of his/her obligation to obtain written approval, if and when required by this Consent Order.

Extensions

4.14 The Owner/Operator and the DEQ agree that the DEQ may grant the Owner/Operator a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request to the DWMAD Engineering Unit no later than ten business days prior to the pertinent deadline and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the Owner/Operator from meeting the deadline(s).

c. A description of the measures the Owner/Operator has taken and/or intends to take to meet the required deadline(s).

d. The length of the extension requested and the specific date on which the obligation will be met.

No change or modification to this Consent Order shall be valid unless in writing from the DEQ and, if applicable, signed by both parties.

Termination

4.15 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the Owner/Operator shall submit a request consisting of a written certification that the Owner/Operator has fully complied with the requirements of this Consent Order and has made payment of any fines required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section II of this Consent Order, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the DWMAD Engineering Unit.

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Exhibit A
Administrative Consent Order

Enforcement Type	Issue Date
Significant Deficiency Violation Notice	October 3, 2018

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
GRAND RAPIDS DISTRICT OFFICE

C. HEIDI GRETHER
DIRECTOR

October 3, 2018

CERTIFIED MAIL

Mr. Marcus Muhammad, Mayor
Mr. Darwin Watson, City Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, MI 49022

SIGNIFICANT DEFICIENCY VIOLATION NOTICE
WSSN: 00600

Dear Sirs:

SUBJECT: City of Benton Harbor (City) - Water System Sanitary Survey and Significant Deficiency Violation Notice – Financial and Managerial Capacity

This letter will confirm meetings with Benton Harbor staff on multiple dates in 2017 and 2018; representing the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), and summarize the subsequent review and discussion of the water supply facilities serving the City of Benton Harbor (City). The purpose of these meetings and subsequent review is to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). **Findings from the survey, listed below, have led to the determination the water supply currently lacks the financial and managerial capacity to meet all the requirements of Act 399.** Findings of significant deficiency have been identified as having the potential to introduce contamination to the public water supply and must be addressed within 120 days or be outlined in a corrective action plan and schedule approved by this office.

Since the previous sanitary survey in 2015, staff at the City of Benton Harbor have made significant efforts to maintain and improve the historically neglected water system. The distribution pipe network alone represents $124 million in replacement value, according to the 2017 asset management program by Abonmarche. Along with the City's complex treatment plant, this represents a significant challenge for the City in terms of maintenance costs. Proper care and maintenance of the system is necessary to protect the health of all customers.

The major findings below indicate a number of areas needing immediate attention by the City, many of which have the potential to impact public health by allowing or introducing contamination to the water supply. Of utmost importance, a review of financial information finds the City presently lacks an adequate financial mechanism to conduct necessary improvements or hire necessary staff to properly maintain and operate the water system. **We strongly advise the City to work with a qualified financial consultant to identify the revenue necessary to support operation and maintenance and to implement effective revenue collection methodologies.** Investment from the City's rate payers is essential for resolving the below (significant) deficiencies and for ensuring the long term vitality of the water system assets.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	**Deficiencies Identified**
Treatment	**Significant Deficiencies Identified**
Distribution System	**Significant Deficiencies Identified**
Finished Water Storage	**Deficiencies Identified**
Pumps	Recommendations made
Monitoring & Reporting	**Significant Deficiencies Identified**
Management & Operations	**Significant Deficiencies Identified**
Operator Compliance	Recommendations made
Security	No Deficiencies or Recommendations
Financial	**Significant Deficiencies Identified**
Other	**Significant Deficiencies Identified**

The following significant deficiencies are violations of Act 399 with the potential to allow or introduce contamination to the public water supply, and must either be resolved within 120 days or be included in an approved corrective action plan.

D1. Our review included the City's asset management program, submitted in December 2017, as well as the bill payment and collections process. Current revenues are not sufficient to cover capital improvement costs, and necessary improvements identified in this survey are likely to increase operations and maintenance costs beyond the current revenues. In addition, the current water bill collection process is inadequate and creates a significant drain on staff resources and time, which would be better spent towards resolution of significant deficiencies and performance of routine maintenance activities. **In order to maintain the required financial capacity to operate a public water supply, the City must:**

a. Conduct a rate study with a qualified professional consultant, and implement findings to generate sufficient revenue to cover costs.
b. Implement a consistent and equitable program to minimize the number of unpaid bills, and streamline the collections process.

D2. An increasing trend in the number of violations of Act 399 in the past year indicates the need for increased managerial oversight of the water supply. In addition, maintenance of the water plant and distribution system components is severely lacking. The lack of separate designated distribution and plant managers prevents staff from spending adequate time and energy on managing the water system. **In order to maintain the managerial capacity to operate the public water supply and meet the requirements of Act 399, the City must hire separate certified operators to oversee the distribution system and the water treatment facility.**

D3. R 325.11008 (2) requires a sufficient primary coagulant dose shall be added to create a settleable or filterable floc at all times. Currently the City adds coagulant to an injection point in the raw water influent pipe rather than the engineered rapid mix basins in the new plate settler building. It has become apparent, through a near violation of turbidity standards in February of 2018, as well as an ongoing treatment technique violation of R 325.10610c, this coagulation practice is not acceptable to meet the requirements of Act 399. Lack of proper mixing also impacts the pathogen removal credit awarded to properly operated conventional treatment facilities. **Adequate rapid mix for the primary coagulant must be installed.**

The current raw water pH of Lake Michigan is above the optimum operating range of the City's current coagulant, aluminum sulfate. At these elevated pH ranges, iron based coagulants, such as ferric sulfate or ferrous sulfate may be more suited for creating a settleable or filterable floc. The City should hire a consultant to explore the steps necessary to explore a switch of the primary coagulant.

D4. R 325.10720 (3) requires continuous monitoring for residual disinfectant at an entry point to the distribution system (EPTD) on a continual basis, and requires the minimum to be recorded for each day. The chlorine analyzer at the City's EPTD was reading less than 0.2 mg/L, the minimum required residual under R325.10611a(2)(b). The readings were identified as unreliable by the operator, and are not recorded as required above. Moreover, plant staff were not familiar with the operational setpoints necessary to achieve sufficient disinfection. **Accurate chlorine analyzer must be in place, minimum levels recorded daily and reported to the DEQ, and connected to SCADA with callout alarms in the event of low residual.**

D5. R 325.11404 requires a water supply to develop a comprehensive control program for the elimination and prevention of all cross connections. The program must include education, inspection, preventer testing in all customer sectors including residential. In addition, an annual report summarizing activities must be submitted to the DEQ. The City has insufficient staff to conduct any activities for the last few years, as evidenced by the lack of annual reporting. **The City must dedicate a trained staff person to implement this program or obtain a contract with a qualified professional company to implement the program.**

D6. R325.11108 requires a water supply to have sufficient valves in the distribution system to minimize interruptions in service and minimize sanitary hazards during construction or repairs. In addition, R 325.11111 requires adequate records be maintained on the distribution system components including hydrants and valves. The City has struggled to conduct necessary inventory and maintenance on valves in the system. **A plan for valve inventory and maintenance must be submitted, approved and implemented consistently.**

D7. R 325.11105 requires a water supply distribution system to maintain a minimum pressure of 20psi throughout the system during emergencies such as firefighting, and allows the department to prohibit installation of fire hydrants in areas where fire flow is not sufficient. From our discussion with staff and through the hydrant flow testing activities conducted during the reliability study, a number of hydrants in town have no flow or zero flow. This may be related to closed valves in the system, which significantly impacts public safety should an emergency occur. **A plan for hydrant inventory and maintenance must be submitted,**

approved and implemented consistently.

D8. The water plant's supervisory control and data acquisition (SCADA) system is in need of upgrades to achieve the following requirements:

a. Storage and access to regulatory data such as EPTD chlorine residuals (R 325.10720), plant flow, and individual filter turbidity profiles (R10720a).
b. Alarming capabilities to call out during unstaffed hours for low chlorine residual, low tower level, high turbidity at the filter confluence point and other undesirable conditions.
c. Automation of water plant operations may be enhanced to allow staff to focus on maintenance activities.

The following deficiencies are also violations of Act 399, and must be resolved to return to compliance with Act 399.

D9. Install finished water meters at the water plant to facilitate accurate calculations and reporting of chemical treatment, calculation of non-revenue water, and more accurate calculation of CT.

D10. Significant amounts of unlined cast iron water main are in need of replacement. With funding in place, the City must prioritize replacement of old water main that is unreliable and undersized.

D11. The monthly operating report must accurately reflect the data collected at the water plant. For example, treated water has been estimated using raw water meters, and chlorine at the plant tap should be the minimum recorded for the day from the EPTD continuous analyzer as opposed to bench top analysis.

D12. Conduct a professional inspection on the elevated tank, including necessary maintenance and cleaning. This may be facilitated by installing variable frequency drive(s) on high service pumps, which would allow operating on pressure rather than on tower level.

If you have any information you would like us to consider regarding the significant deficiencies identified in this Significant Deficiency Violation Notice, please provide it in a written response by November 2, 2018.

Representatives from the City and DEQ met on September 14, 2018 to discuss preliminary findings of the sanitary survey, and to begin discussion of a corrective action plan such as an administrative consent order (ACO), to return to compliance. It is understood that a significant amount of time will be required to address many of these issues. Therefore, we recognize that this ACO contains a schedule, which is both systematic and flexible, to bring the City back into compliance with the SDWA and providing a safe and reliable source of drinking water to its residents. Upon hearing from the City of its desire to move forward with an ACO, we will forward a draft ACO for the City's review and comment. At that time, DEQ staff will be available to meet with City officials to discuss the ACO in an attempt to execute it prior to the 120 day deadline.

A reliable supply of quality drinking water is critical to the growth and strength of any community. We are committed to working with the City to improve the water distribution system and treatment plant. With a strong commitment and swift effort from the City, we believe these deficiencies can be resolved and lead to long term water system sustainability.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this Significant Deficiency Violation Notice, please contact me by telephone at 616-307-0261; by e-mail at sarkipatoe@michigan.gov; or DEQ-DWMAD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato, P.E.,
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division

Enclosure

cc: Berrien County Health Department
cc/enc: Mr. Mike O'Malley, Operator in Charge, City of Benton Harbor
Mr. Eric Oswald, Director, DEQ (via email)
Ms. Sue Maul, Enforcement Specialist, DEQ (via email)
Mr. Jon Bloemker, Engineering Unit Supervisor, DEQ (via email)

Figure 1 - CL17 installed on Plant Tap in Lab

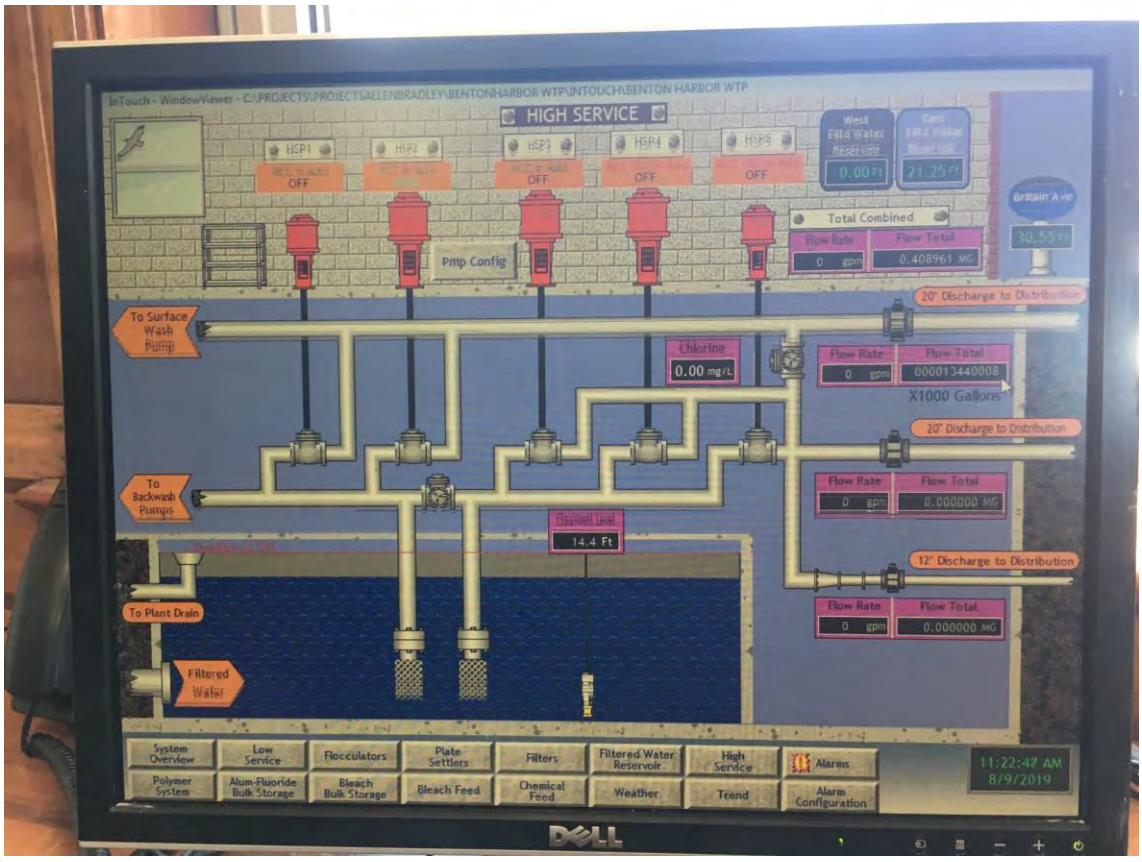

Figure 2 - SCADA with meter and totalizer

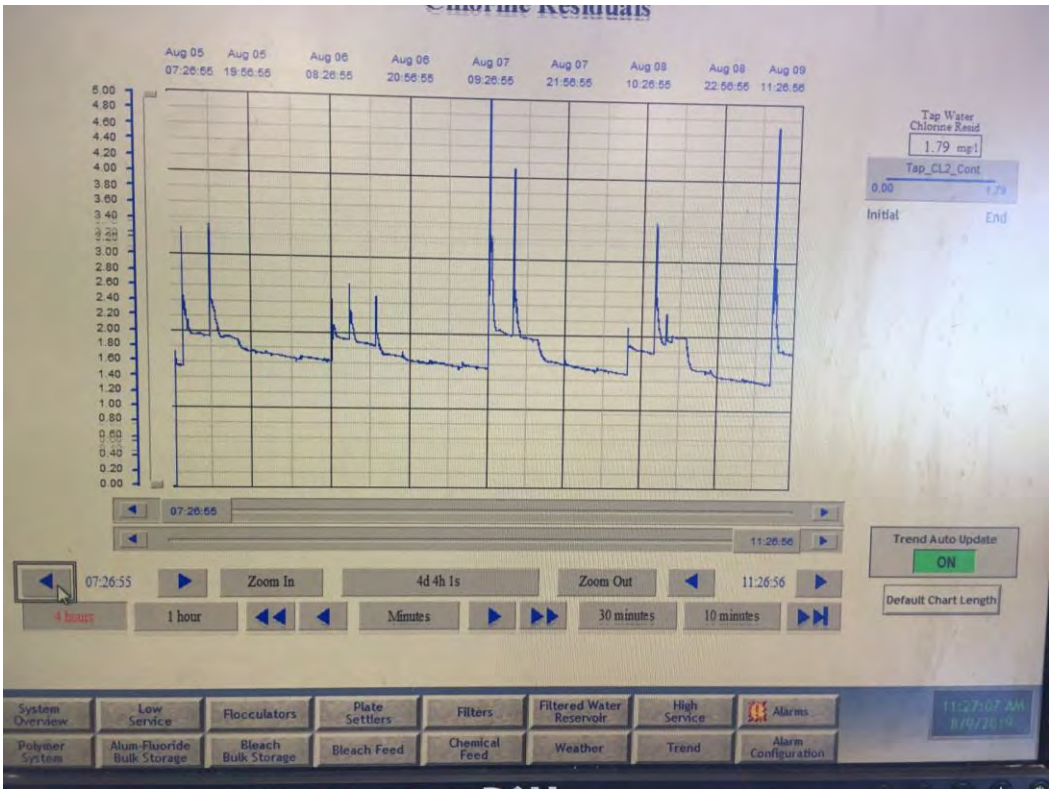

Figure 3a - SCADA with filter turbidity profiles

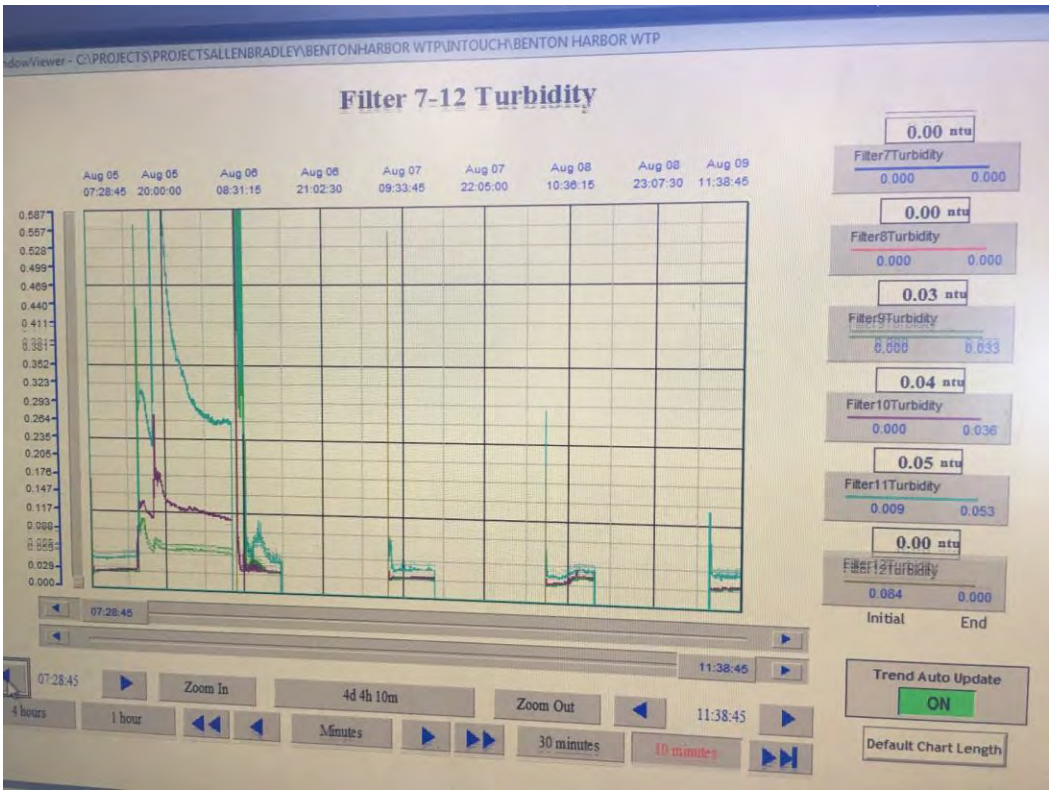

Figure 3b - SCADA with filtered turbidity trends

Figure 4 - Current Alum Feed location

Figure 5 - Phosphate Feed System

Figure 6 - Insertion flow meter

Figure 7 - Meter and PO4 feed location

Figure 8 - Proposed Alum Feed System

From:	Lachance, Amy (DEQ)
To:	Sarkipato, Ernest (DEQ); Thurston, Brian (DEQ); Onan, Brandon (DEQ); Bolf, Michael (DEQ)
Subject:	FW: ACTION: Bubble Up -- Benton Harbor Water Treatment Plant
Date:	Monday, January 14, 2019 3:16:39 PM
Attachments:	2019-01-14 Benton Harbor Water Treatment Plant.docx image003.png

FYI

From: Ruch, Suzann (DEQ) <RuchS@michigan.gov>
Sent: Monday, January 14, 2019 3:09 PM
To: DEQ-BusStop <DEQ-BusStop@michigan.gov>
Cc: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Subject: ACTION: Bubble Up -- Benton Harbor Water Treatment Plant
See attached.

Suzann J. Ruch

Senior Executive Management Assistant to Eric Oswald
Drinking Water and Municipal Assistance Division
Michigan Department of Environmental Quality
Constitution Hall, 4th Floor South Tower
525 W. Allegan Street, P.O. Box 30817
Lansing, MI 48909-7741
517-284-6544
ruchs@michigan.gov

☒ FYI ☐ ACTION

BUBBLE-UP REPORT TEMPLATE

Facility Name: Benton Harbor Water Treatment Plant

County: Berrien

Issue: State the issue or situation of concern. Be clear, factual and concise. Include dates of actions which occurred.

The DWMAD continues to work with the city of Benton Harbor (City) on compliance issues at their water treatment plant and a lead Action Level Exceedance (ALE). Recent communication with the City has indicated that they are not following through on their original public commitments (not required by law) to provide bottled water or filters to residents with high lead results. Additionally, although the City has mass-mailed required lead ALE language, DWMAD has recently learned that some direct communication by the City to its public may not be consistent with the health risks associated with lead exposure. DWMAD staff, along with the DHHS and the Berrien County Health Department, have offered to partner with the City to do additional sequential sampling and directly provide accurate supplementary public health information to Benton Harbor residents, but City officials have thus far rejected these offers and not provided addresses of all high lead results. In summary, while the City is making slow progress toward addressing their non-compliance issues, they have not entered into an enforceable compliance schedule and are not exploring all avenues to provide accurate information to their public.

Brief background/details: Provide concerns raised, DEQ actions with dates/timeline. Do use abbreviations.

The Benton Harbor Water Treatment Plant provides drinking water to just under 10,000 residents in Berrien County. They intake water from Lake Michigan and utilize conventional surface water treatment techniques prior to distribution to their customers.

An October 2018 Sanitary Survey detailed nine significant deficiencies in the plant, which have the potential to impact public health. A draft Administrative Consent Order with a compliance schedule has been provided to the City to address the outstanding issues, but this has not been signed to date. Additionally, several monitoring, reporting, and public notice violations have taken place during 2018. These have resulted in three mailings to water customers updating them on the compliance status of the water system.

Benton Harbor's 2018 lead and copper monitoring resulted in a lead ALE, declared in October 2018. Of the 30 residential lead samples taken, nine were over the current lead action level of 15 parts per billion (ppb). This resulted in a lead 90th percentile value of 22 ppb. In response to citizen requests, the City has collected several hundred additional samples, many with results above 15 ppb. Benton Harbor has no previous action level exceedance on record, does not currently add a corrosion inhibitor, and, according to operational records, has not experienced changes in source water or treatment. The DEQ is currently working with the City to add interim corrosion control treatment measures while they conduct a study to optimize corrosion control in their distribution system.

Public advisory and public education documents have been distributed as required. It is believed that all results have been communicated directly to the homeowners. The City has verbally committed to delivery of alternate water to homes with elevated results, though records have not been kept. DWMAD staff have recently learned that callers to the City are being told that the City is delivering "clean water right to the tap and you should have no trouble drinking it" after flushing.

Entities involved in the situation: List people involved and affiliations; e.g., legislator, media, business owner.

Most communications have involved DHHS, Berrien County Health Department (BCHD), the water supply and the DEQ. Ernie Sarkipato is the DWMAD engineer for this supply.

Senator:	Kim LaSata	☐ Involved	☒ Not Involved
Rep:	Pauline Wendzel	☐ Involved	☒ Not Involved

Recommendation for next steps (if appropriate):

DWMAD staff, along with DHHS and BCHD, are attempting to obtain the City's written communications to homeowners, along with the addresses of the high results. Further attempts will be made to partner with the City to provide accurate health information to the residents, as well as conducting sequential sampling at some homes to determine the effectiveness of flushing. DWMAD will also continue to follow up on the non-compliance issues, with emphasis on assisting the City in establishing corrosion control treatment to address the lead levels, as well as the remaining public education and transparency tasks triggered by the ALE. DWMAD enforcement staff will continue to pursue the entry of the Administrative Consent Order to establish a compliance schedule for the supply.

If additional actions are recommended, please advise.

Submitted by: Amy Lachance Date: January 14, 2019
Reviewed by: Eric Oswald Date: January 14, 2019

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc:	Sylvester, Matthew (EGLE)
Subject:	FW: BH Corrosion Study
Date:	Friday, March 5, 2021 7:34:00 AM
Attachments:	image001.png image002.png image003.png image004.png Reading List (EPA).docx 2021-03-03 BH Corrosion RFP.docx

---

I have made changes based on our conversation with Eric and George and Jeni at the weekly BH call (attached).

From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, March 3, 2021 4:30 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Subject: FW: BH Corrosion Study

Attached is the near-final RFP for BH corrosion study. Abonmarche has two questions, here's my proposed reply.

1. I don't think the EPA's OCCT technical rec document is appropriate to reference in this effort. I could send abonmarche the attached list of reading from EPA, which was provided in relationship to the August 2020 OCCT study workshop w/ Arcadis?
2. I think Abonmarche is feeling this open-ended type of RFP will result in an influx of miss-the-mark proposals. He may be right, though I think it would be easy to sort through those efficiently if that's the case.

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 3, 2021 3:47 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,

Please find attached, a draft version of the Corrosion Study RFP. I had a few additional comments listed below.

1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 25, 2021 10:36 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

Jason,

Our approach would probably be to allow the qualified consultant to propose the timeline, as it will depend on what methodologies they are proposing. If we give a bookend of 12 months, that will likely constrain their options. Can we extend that out to at least 18 months, but also indicate periodic check-ins?

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, February 24, 2021 1:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: BH Corrosion Study

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Ernie,

What would be a realistic timeframe to expect this type of corrosion study to be completed? Does it tie into any requirements from EGLE to the city in terms of hard deadlines? We had mentioned 12 months on the EPA application (expected to be completed by March 2022), which was on our EPA application from the fall.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager

D 269.926.4565
O 269.927.2295 ext. 171
C 269.876.9304
abonmarche.com

ABONMARCHE

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CONFIDENTIALITY NOTICE: This e-mail and any attachments are for the exclusive and confidential use of the intended recipient. If you are not the intended recipient, please do not read, distribute or take action in reliance upon this message. If you have received this e-mail in error, please notify us immediately and promptly delete this message and its attachments from your computer system. We do not waive any work product privilege by the transmission of this message.

Region 5 Suggested Reading for 2020 Workshop:

1. USEPA (US Environmental Protection Agency). (2016). Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems. EPA 816-B-16-003. USEPA Office of Water (4606M). https://www.epa.gov/sites/production/files/2019-07/documents/occtmarch2016updated.pdf
2. Tully J, DeSantis MK, Schock MR. Water quality–pipe deposit relationships in Midwestern lead pipes. AWWA Wat Sci. 2019;e1127. https://doi.org/10.1002/aws2.1127
3. Del Toral, M. A., Porter, A., & Schock, M. R. (2013). Detection and evaluation of elevated lead release from service lines: a field study. *Environmental science & technology*, *47*(16), 9300-9307. https://www.epa.gov/sites/production/files/2015-10/documents/lead-service-lines-study-20130723.pdf
5. Schock, Michael. (1996). Corrosion Inhibitor Applications in Drinking Water Treatment: Conforming to the Lead and Copper Rule. https://www.researchgate.net/publication/254547727_Corrosion_Inhibitor_Applications_in_Drinking_Water_Treatment_Conforming_to_the_Lead_and_Copper_Rule
6. Lytle, D. A., Schock, M. R., Wait, K., Cahalan, K., Bosscher, V., Porter, A., & Del Toral, M. (2019). Sequential drinking water sampling as a tool for evaluating lead in flint, Michigan. *Water Research*, *157*, 40-54. https://www.sciencedirect.com/science/article/abs/pii/S0043135419302647
7. Williams, Daniel & Parrett, Christopher & Schock, Michael & Muhlen, Christy & Donnelly, Peg & Lytle, Darren. (2018). Peer Reviewed Design and Testing of USEPA'S Flint Pipe Rig for Corrosion Control Evaluation. Journal - American Water Works Association. 109. 1. https://www.researchgate.net/publication/327605254_Peer_Reviewed_Design_and_Testing_of_USEPA'S_Flint_Pipe_Rig_for_Corrosion_Control_Evaluation
8. Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R. R., ... & Prescott, A. (2009). *Contribution of service line and plumbing fixtures to lead and copper rule compliance issues*. Water Environment Research Foundation. https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf
9. EPA. Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems (2010). Link: https://nepis.epa.gov/Exe/ZyNET.exe/P100DP2P.TXT

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT

City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be fully completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in the previous October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, further study is required to identify the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items shall be described and addressed in the Corrosion Study report to be provided to the City upon completion.

Commented [SE(1)]: Considered?

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (this will require an assessment of previous sample site codes to allow for data comparison)
3. Analyze key water quality parameters (WQPs):
    a. Phosphate (PO_4) dose and distribution concentration variability
    b. Chlorine (Cl) dose and residual variability
    c. pH and impacts on corrosion indices
4. Analysis of distribution system pipe scales on various materials
5. Solubility tests for a comparative study of treatment methods
6. Pipe loop testing and the effectiveness of corrosion treatment
7. Comparison with analogous water system water quality and corrosion control strategies
8. Evaluate single family home water use trends

City of Benton Harbor
200 E Wall Street
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For additional technical references, please refer to Attachment A

Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – March TBD
Consultant Award – April 2021
Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Terms and Conditions of this RFP:

1. Proposals must be submitted by 10:00 am on March TBD. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

3. The City Reserves the Right to accept or reject any or all proposals and award the contract in the best interest of the City.

4. Proposals, once opened, become public documents and may be subject to disclosure under the Freedom of Information Act.

5. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, "Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

6. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

From: Sarkipato, Ernest (EGLE)
To: Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc: Sylvester, Matthew (EGLE)
Subject: FW: BH Corrosion Study
Date: Wednesday, March 3, 2021 4:29:00 PM
Attachments: image001.png
image002.png
image003.png
image004.png
2021-03-03 BH Corrosion RFP.docx
Optimal Corrosion Control Treatment Evaluation Technical Recommendations.pdf
Reading List (EPA).docx

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1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche

D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 25, 2021 10:36 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

Jason,
Our approach would probably be to allow the qualified consultant to propose the timeline, as it will depend on what methodologies they are proposing. If we give a bookend of 12 months, that will likely constrain their options. Can we extend that out to at least 18 months, but also indicate periodic check-ins?
Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, February 24, 2021 1:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: BH Corrosion Study

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,
What would be a realistic timeframe to expect this type of corrosion study to be completed? Does it tie into any requirements from EGLE to the city in terms of hard deadlines? We had mentioned 12 months on the EPA application (expected to be completed by March 2022), which was on our EPA application from the fall.
Thanks,

Jason W. Marquardt, PE
Senior Project Manager
D 269.926.4565
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ABONMARCHE

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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT
City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be fully completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in the previous October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, without further study it is not certain to be the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items shall be described and addressed in the Corrosion Study report to be provided to the City upon completion.

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (i.e. look at subsequent samples from the same sample sites)
3. Analysis of distribution system pipe scales on various materials
4. Target water quality parameters (WQPs) for controlling copper corrosion
    a. Focus on Phosphate (PO_4) dose and distribution concentration variability
    b. Focus on Chlorine (Cl) dose and residual variability
    c. Focus on pH
5. Solubility tests
6. Pipe loop testing and the effectiveness of corrosion treatment.
7. Comparison of nearby water system water quality
8. Evaluate single family home water use trends

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Benton Harbor, MI 49022
Phone: (269) 927-8400

Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – March TBD
Consultant Award – April 2021
Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Terms and Conditions of this RFP:

1. Proposals must be submitted by 10:00 am on March TBD. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

3. The City Reserves the Right to accept or reject any or all proposals and award the contract in the best interest of the City.

4. Proposals, once opened, become public documents and may be subject to disclosure under the Freedom of Information Act.

5. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, "Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

6. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems

Office of Water (4606M)
EPA 816-B-16-003
March 2016 (Updated)

Disclaimer

This document provides technical recommendations to primacy agencies and public water systems (PWSs) in determining the most appropriate treatment for controlling lead and copper and complying with the corrosion control treatment (CCT) requirements of the Lead and Copper Rule (LCR) that are in place at the time of document publication.

The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does it change or substitute for those provisions and regulations. Thus, it does not impose legally binding requirements on EPA, states or the regulated community. This document does not confer legal rights or impose legal obligations upon any member of the public.

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The general descriptions provided here may not apply to a particular situation based upon the circumstances. Interested parties are free to raise questions and objections about the substance of these technical recommendations and the appropriateness of the application of these technical recommendations to a particular situation. EPA and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those described in this document, where appropriate.

Mention of trade names or commercial products does not constitute endorsement or recommendation for their use.

This is a living document and may be revised periodically without public notice. EPA welcomes public input on this document at any time.

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Table of Contents

Chapter 1 : Introduction 1

1.1 Purpose and Audience 1

1.2 Document Organization 2

1.3 How to Use this Document 3

Chapter 2 : Background Information 4

2.1 Regulatory Actions to Control Lead and Copper in Drinking Water 4

2.1.1 Lead and Copper Regulation 4

2.1.2 Control of Lead Content in Plumbing Components 6

2.2 Sources of Lead and Copper 8

2.2.1 Corrosion and Metals Release 8

2.2.2 Lead and Copper-Containing Material 10

2.3 Water Quality Factors Affecting Release of Lead and Copper 11

2.3.1 pH, Alkalinity and DIC 12

2.3.2 Corrosion Inhibitors 13

2.3.3 Hardness (Calcium and Magnesium) 14

2.3.4 Buffer Intensity 14

2.3.5 Dissolved Oxygen 15

2.3.6 Oxidation-Reduction Potential 16

2.3.7 Ammonia, Chloride, and Sulfate 17

2.3.8 Natural Organic Matter 18

2.3.9 Iron, Manganese, and Aluminum 19

2.4 Physical and Hydraulic Factors Affecting Release of Lead and Copper 20

2.4.1 Physical Disturbances 20

2.4.2 Hydraulic Factors 20

2.4.3 Water Use 21

2.4.4 Water Temperature 21

Chapter 3 : Corrosion Control Treatment for Lead and Copper 22

3.1 Available Corrosion Control Treatment Methods 22

3.1.1 pH/Alkalinity/DIC Adjustment 23

3.1.2 Phosphate-Based Inhibitors 25

3.1.3 Silicate Inhibitors 26
3.2 Technical Recommendations for Selecting Treatment Alternatives 26
3.2.1 Technical Recommendations for Reviewing Water Quality Data and Other Information (STEP 1) 28
3.2.2 Technical Recommendations for Evaluating the Potential for Scaling (STEP 2) 30
3.2.3 Technical Recommendations for Selecting One or More Treatment Option(s) (STEP 3) 31
3.2.4 Technical Recommendations for Identifying Possible Limitations for Treatment Options (STEP 4) 42
3.2.5 Technical Recommendations for Evaluating Feasibility and Cost (STEP 5) 45
3.3 Setting the Target Dose and Water Quality 45
3.3.1 pH/Alkalinity/DIC Adjustment 46
3.3.2 Phosphate-Based Inhibitors 47
3.3.3 Silicate Inhibitors 49
Chapter 4 : Review of Corrosion Control Treatment Steps under the LCR 50
4.1 Corrosion Control Treatment Steps for Systems Serving ≤ 50,000 People 51
4.1.1 System Serving ≤ 50,000 People Makes OCCT Recommendation (STEP 2) 53
4.1.2 Primacy Agency Determines Whether a Study Is Required for System Serving ≤ 50,000 People (STEP 3) 53
4.1.3 Primacy Agency Designates OCCT for System Serving ≤ 50,000 People (STEP 4) 54
4.1.4 System Serving ≤ 50,000 People Conducts Corrosion Control Study (STEP 5) 55
4.1.5 Primacy Agency Designates OCCT for Systems Serving ≤ 50,000 People (STEP 6) 61
4.2 Corrosion Control Steps for Systems Serving > 50,000 People 64
4.2.1 Systems Serving >50,000 People Conduct a Corrosion Control Study (STEP 1) 65
4.2.2 Primacy Agency Reviews the Study and Designates OCCT for System Serving > 50,000 People (STEP 2) 66
Chapter 5 : Requirements and Technical Recommendations for OCCT Start-Up and Monitoring 67
5.1 CCT Start-up 67
5.1.1 Start-up of pH/Alkalinity/DIC Adjustment 68
5.1.2 Start-up of Phosphate-Based Corrosion Inhibitors 68
5.2 Follow-up Monitoring during First Year of Operation 68
5.2.1 Follow-up Lead and Copper Tap Monitoring 69

5.2.2 Follow-up WQP Monitoring 69
5.3 Evaluating OCCT and Setting Optimal Water Quality Parameters 73
5.4 Required and Recommended Long-Term Corrosion Control Monitoring 74
Chapter 6 : Impacts of Source Water and Treatment Changes on Lead and Copper in Drinking Water 77
6.1 Review of LCR Requirements Related to a Change in Source or Treatment 77
6.2 Impacts of Source Water Changes 79
6.3 Impacts of Treatment Changes 79
6.3.1 Corrosion Control Treatment 80
6.3.2 Disinfection 80
6.3.3 Coagulation 81
6.3.4 Water Softening 82
6.3.5 Filtration 82
Chapter 7 : References 83

Appendix A: Glossary
Appendix B: Estimated Dissolved Inorganic Carbon (mg/L as C) based on Alkalinity and pH (with water temperature of 25 degrees C and TDS of 200)
Appendix C: Investigative Sampling to Determine the Source of Lead and Copper
Appendix D: Water Quality Data and Information Collection Forms
Appendix E: OCCT Recommendation Forms for Systems Serving ≤ 50,000 People
Appendix F: Tools for Conducting Corrosion Control Studies
Appendix G: Forms for Follow-up Monitoring and Setting OWQPs

Exhibits

Exhibit 2.1: Timeline of Regulatory Actions Related to Lead and Copper 5
Exhibit 2.2: Typical Water Service Connection that May Provide Sources of Lead (Sandvig et al., 2008) 11
Exhibit 2.3: Buffer Intensity as a Function of pH at Different DIC Values (Clement and Schock, 1998, Figure 1) 15
Exhibit 2.4: E_h-pH Diagram for a Lead-Water-Carbonate System. DS oxidant demand in upper box is 'distribution system oxidant demand' (Schock, 2007a; provided by author) 17
Exhibit 3.1: Typical Chemical Processes for pH/Alkalinity/DIC Adjustment 24
Exhibit 3.2: Theoretical Saturation pH for Calcium Carbonate Precipitation (USEPA, 2003) 31
Exhibit 3.3: Identifying the Appropriate Flowchart for Preliminary CCT Selection 32
Exhibit 4.1: Review of CCT Requirements and Deadlines for Systems Serving ≤ 50,000 People (§141.81(e)) 52
Exhibit 4.2: Recommended Checklist to Support Determination of the Need for a CCT Study for Systems Serving ≤ 50,000 People 54
Exhibit 4.3: Corrosion Control Study Requirements[1] 56
Exhibit 4.4: Recommended Checklist to Support Primacy Agency Determination of When to Require a Demonstration Study for Systems Serving ≤ 50,000 People 57
Exhibit 4.5: Possible Outline for a Desktop Study Report 59
Exhibit 4.6: Possible Outline for a Demonstration Study Report 60
Exhibit 4.7: Recommendations for Primacy Agency Review of Desktop Study 62
Exhibit 4.8: Recommendations for Primacy Agency Review of Demonstration Study 63
Exhibit 4.9: Summary of CCT Requirements and Deadlines for Systems Serving > 50,000 People (§141.81(e)) 64
Exhibit 5.1: Required Number of Sites for Follow-up Lead and Copper Tap Monitoring 69
Exhibit 5.2: Follow-up WQP Monitoring Requirements[1] and Recommendations 71
Exhibit 5.3: Required and Recommended Number of Sites for Follow-up WQP Tap Monitoring 72

Flowcharts

Flowchart 1a: Selecting Treatment for Lead only or Lead and Copper with pH < 7.2 33
Flowchart 1b: Selecting Treatment for Lead only or Lead and Copper with pH from 7.2 to 7.8 . 34
Flowchart 1c: Selecting Treatment for Lead only or Lead and Copper with pH > 7.8 to 9.5 35
Flowchart 1d: Selecting Treatment for Lead only or Lead and Copper with pH > 9.5 36
Flowchart 2a: Selecting Treatment for Copper Only with pH < 7.2..... 37
Flowchart 2b: Selecting Treatment for Copper Only with pH from 7.2 to 7.8 38
Flowchart 2c: Selecting Treatment for Copper Only with pH > 7.8..... 39
Flowchart 3a: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH < 7.2..... 40
Flowchart 3b: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH ≥ 7.2..... 41

Acronyms

AL	Action Level
ANSI	American National Standards Institute
AWWA	American Water Works Association
CCPP	Calcium Carbonate Precipitation Potential
CCT	Corrosion Control Treatment
COC	Chain of Custody
CSMR	Chloride-to-Sulfate Mass Ratio
CWS	Community Water System
DBP	Disinfection Byproduct
DBPR	Disinfection Byproducts Rule
DIC	Dissolved Inorganic Carbon
DO	Dissolved Oxygen
EDS	Energy Dispersive Spectroscopy
EMF	Electromotive Force
EPA	Environmental Protection Agency
HAA5	Haloacetic Acids
ICP-MS	Inductively Coupled Plasma Mass Spectroscopy
LCR	Lead and Copper Rule
LSI	Langelier Saturation Index
LSL	Lead Service Line
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
MCLG	Maximum Contaminant Level Goal
MDBPR	Microbial and Disinfection Byproducts Rules
NDWAC	National Drinking Water Advisory Council
NOM	Natural Organic Matter

NPDWR	National Primary Drinking Water Regulations
NSF	NSF International
NTNCWS	Non-transient, Non-Community Water System
OCCT	Optimal Corrosion Control Treatment
ORP	Oxidation-Reduction Potential
OWQP	Optimal Water Quality Parameter
POU	Point-of-use
PWS	Public Water System
RLDWA	The Reduction of Lead in Drinking Water Act of 2011
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
TDS	Total Dissolved Solids
TTHM	Total Trihalomethanes
VOC	Volatile Organic Compound
WQP	Water Quality Parameter
WRF	Water Research Foundation
WWTP	Wastewater Treatment Plant

Chapter 1: Introduction

1.1 Purpose and Audience

The purpose of this document is to provide technical recommendations to help primacy agencies and systems comply with corrosion control treatment (CCT) requirements of the Lead and Copper Rule (LCR), including designation of optimal corrosion control treatment (OCCT).[1] This document summarizes the regulatory requirements, and provides technical recommendations that can assist systems in complying with CCT steps and assist primacy agencies with evaluation of technical information from systems. It also includes background information on corrosion and CCT techniques. This document provides Excel-based ***OCCT Evaluation Templates*** that can be used to organize data and document decisions.

The technical recommendations provided in this document are consistent with previously published corrosion control guidance (USEPA, 1992a; USEPA, 1997; and USEPA, 2003). It is not intended to supersede prior guidance; those resources continue to provide technical information that may be relevant to, and further inform, decision-making. Instead, this document is intended to serve as an added resource, offering supplemental information gleaned from recent developments in the drinking water industry's understanding of lead and copper release and control. This includes:

- Influence of oxidation-reduction potential (ORP) on lead and copper release, and importance of Pb(IV) compounds for systems with lead service lines (LSLs).
- Importance of aluminum, manganese, and other metals on formation of lead scales and lead release.
- Impact of physical disturbances on lead release.
- Mechanisms and limitations of using blended phosphates for corrosion control.
- Target water quality parameters (WQPs) for controlling copper corrosion.
- Impacts of treatment changes, particularly disinfectant changes, on corrosion and corrosion control.

EPA recognizes that research is ongoing, and that the water industry's understanding of corrosion, metals release, and treatment strategies will continue to evolve. EPA will update this document periodically as new information becomes available and as time and resources allow.

[1] Note that for the purposes of this document, "optimal corrosion control treatment" or "OCCT" is only used when referring to the requirement in section 141.80(d) of the existing LCR for primacy agencies to designate optimal corrosion control treatment. Section 141.2 defines optimal corrosion control treatment as "the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations." The terms "optimal" or "optimized" may also be used in the manual to indicate the best conditions for preventing lead and copper from leaching into water.

1.2 Document Organization

The remainder of this document is organized as follows:

Chapter 2: Background Information provides a history of regulatory actions to reduce lead and copper exposure from drinking water, including efforts since the 1986 Safe Drinking Water Act (SDWA) Amendments to limit the amount of lead in plumbing materials. It also describes the sources of lead in water, including an overview of lead and copper corrosion and release mechanisms, and relative contribution of lead- and copper-containing materials. Lastly, this chapter provides an updated description of water quality and physical factors that influence lead and copper levels in drinking water.

Chapter 3: Corrosion Control Treatment for Lead and Copper describes the available CCT methods and provides approaches that can be used to identify CCT alternatives. The chapter also provides technical recommendations on setting treatment dose and water quality conditions.

Chapter 4: Corrosion Control Treatment Steps under the LCR reviews the CCT requirements under the LCR and provides additional technical recommendations for primacy agencies and systems to consider when meeting these requirements.

Chapter 5: OCCT Start-Up and Monitoring provides technical recommendations on CCT start-up, reviews requirements under the LCR and technical recommendations for follow-up monitoring during the first year of CCT implementation, reviews requirements for establishing optimal water quality parameters (OWQPs) under the LCR, and reviews LCR-required WQP and technical recommendations for additional corrosion control monitoring.

Chapter 6: Impacts of Source Water and Treatment Changes on Lead and Copper in Drinking Water reviews the requirements in the LCR for notification and approval of a source or treatment change. The chapter also provides technical information on how source and treatment changes can affect lead and copper release.

Chapter 7: References provides a full list of references that were used in the development of this document.

These chapters are supported by several appendices:

Appendix A provides a glossary of corrosion terms.

Appendix B provides a lookup table for systems to determine dissolved inorganic carbon (DIC) based on pH and alkalinity.

Appendix C provides technical recommendations on how to conduct investigative sampling and construct lead profiles to help identify the sources of lead and copper in a building water system.

Appendix D provides blank forms for data collection to support a system's OCCT recommendation and/or the corrosion control study.

Appendix E provides blank forms for systems to support OCCT recommendations to their primacy agencies.

Appendix F summarizes desktop and demonstration tools that can be used by systems when conducting a corrosion control study.

Appendix G provides blank forms for systems and technical recommendations for primacy agencies when reviewing system data and designating OWQPs.

1.3 How to Use this Document

Primacy agencies and systems can use the material in Chapters 2 and 3 as a technical reference to help understand corrosion and CCT and to evaluate CCT alternatives. Tools such as the flowcharts in Chapter 3 are intended for screening and are not meant to serve as substitutes for pilot studies and other site-specific investigations. Chapters 4 and 5 provide a review of the LCR regulatory requirements and provide additional technical recommendations to support primacy agencies and systems when a system serving 50,000 or fewer people exceeds the lead or copper action level (AL), or if a system increases its population to more than 50,000 and is subject to the CCT requirements of the LCR for the first time. Chapters 4 and 5 can also be useful for systems serving more than 50,000 people that previously installed CCT but have subsequent AL exceedances. Primacy agencies and systems can use the information in Chapter 6 to review the regulatory requirements related to notification and approval of a source or treatment change. They can also use the technical information in this chapter to determine how treatment changes could impact lead and copper release.

The Excel-based ***OCCT evaluation templates*** mirror the steps and tables in Chapters 4 and 5 and Appendices D through G. Primacy agencies can use the templates to document circumstances around an AL exceedance and review compliance deadlines for individual systems. They can also use the templates to support determinations of whether or not to require a CCT study, what kind of study to require, and to document their decisions. The templates provide electronic versions of the forms in Appendices D through G. Systems can use the forms to organize their data and information electronically and prepare submittals to their primacy agencies.

Chapter 2: Background Information

This chapter provides information on:

- Regulations to control lead and copper in drinking water;
- Sources of lead and copper;
- Water quality characteristics that impact corrosion of lead and copper and release of these metals into the water; and
- Physical and hydraulic characteristics of water systems that impact lead and copper release.

2.1 Regulatory Actions to Control Lead and Copper in Drinking Water

2.1.1 Lead and Copper Regulation

The national primary drinking water regulation that controls lead and copper in drinking water is the 1991 Lead and Copper Rule (LCR) (USEPA, 1991b), as amended. In the 1991 rulemaking, the Environmental Protection Agency (EPA) established maximum contaminant level goals (MCLGs) (zero for lead and 1.3 milligrams per liter (mg/L) for copper) and action levels (0.015 mg/L for lead and 1.3 mg/L for copper) in public water systems (PWSs). (See Exhibit 2.1 for a timeline of lead and copper regulations and related regulatory activities.) The lead or copper action level is exceeded if the concentration in more than 10 percent of water samples (i.e., the 90th percentile level) collected after a minimum stagnation period of 6 hours is greater than the respective action level. Samples from residences must be collected from cold water kitchen or bath taps and those collected from non-residential areas must be collected from interior taps (§141.86(b)(2)).[2] The number of samples to be collected depends on the size of the water system, as specified in the regulation. The 1991 LCR also established requirements that are triggered, in some instances, by exceedances of the action levels. These additional requirements include the installation and maintenance of corrosion control treatment (CCT) and source water monitoring/treatment, lead public education, and lead service line (LSL) replacement.

[2] Unless otherwise stated, all citations are in Title 40 of the Code of Federal Regulations (CFR).

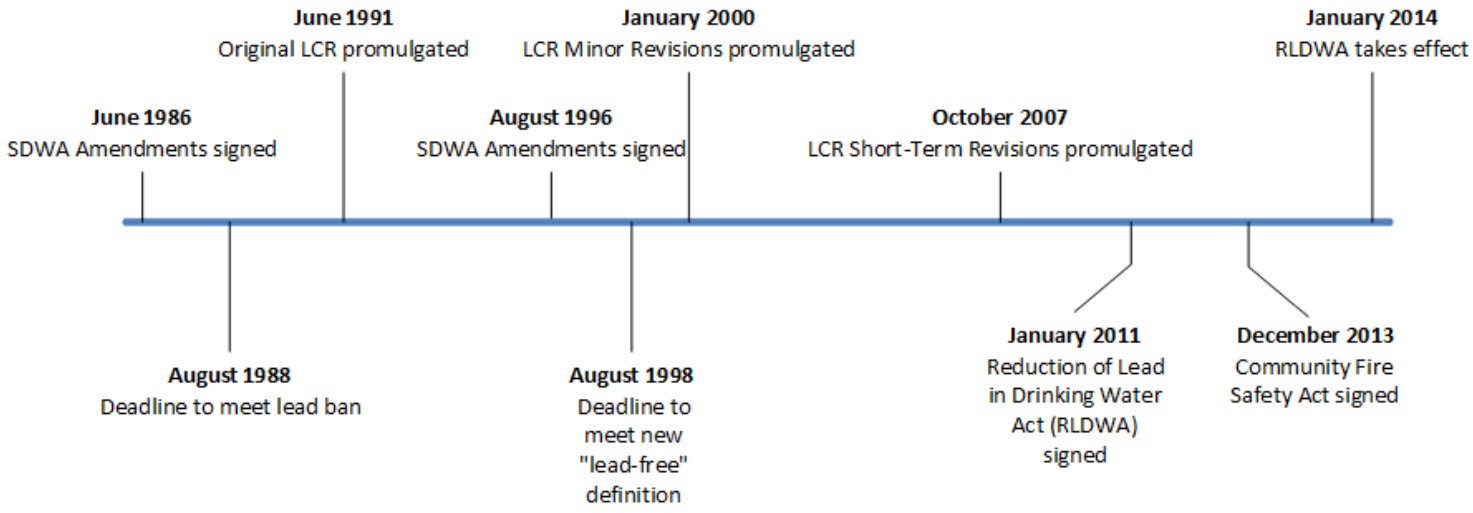


Exhibit 2.1: Timeline of Regulatory Actions Related to Lead and Copper

After the June 1991 LCR, EPA promulgated several technical amendments (USEPA, 1991c; USEPA, 1992b; USEPA, 1994; USEPA, 2004a) as well as more extensive revisions in January 2000 and October 2007 (USEPA, 2000; USEPA, 2007a). The goal of the January 2000 LCR Minor Revisions was to streamline requirements, promote consistent national implementation, and, in many cases, reduce monitoring and reporting requirements (USEPA, 2000). The goal of the 2007 LCR Short-Term Revisions was to enhance the implementation of the LCR in the areas of monitoring, treatment, consumer awareness, and LSL replacement, as well as to improve compliance with the public education requirements of the LCR (USEPA, 2007a).

2.1.2 Control of Lead Content in Plumbing Components

While the LCR regulates the amount of lead and copper in drinking water, the Safe Drinking Water Act (SDWA) also includes provisions aimed at reducing the amount of lead in plumbing components, which could result in lower lead levels in tap samples in the future. This section discusses key changes in SDWA to reduce lead in plumbing components. For additional information, see the references and web links provided herein.

The 1986 SDWA Amendments established requirements to minimize the lead content in source materials that are used in the conveyance and treatment of drinking water. Section 1417 of the 1986 SDWA Amendments banned the use of lead pipe and required the use of "*lead-free"* solders, fluxes, pipes and pipe fittings in the installation or repair of PWSs (also referred to as the "lead ban") (USEPA, 1987). Lead-free materials were defined as:

- Solders and fluxes with a lead content of ≤ 0.2 percent.
- Pipes and pipe fittings with a lead content of ≤ 8.0 percent.

The 1996 SDWA Amendments made it unlawful for anyone to introduce into commerce pipes, pipe or plumbing fittings or fixtures that are not lead free. The 1996 Amendments also required certain plumbing fittings and fixtures (endpoint devices) to be in compliance with a performance standard for lead release for plumbing fittings and fixtures.[3] This standard was satisfied by NSF International/American National Standards Institute (NSF/ANSI) Standard 61, Section 9,[4] which limited the amount of lead that can be leached from endpoint devices used for water intended for human consumption. After August 6, 1998, only those plumbing fittings and fixtures with a lead content of ≤ 8.0 percent that were in compliance with NSF/ANSI Standard 61, Section 9 by an ANSI-accredited certifier could be defined as *"lead-free"* (NSF, 2010).[5]

[3] For a summary of the 1996 Amendments revisions to the lead ban, refer to Section 118. www.congress.gov/bill/104th-congress/senate-bill/1316.

[4] Devices specifically listed in NSF Standard 61, Section 9 include kitchen and bar faucets, lavatory faucets, water dispensers, drinking fountains, water coolers, glass fillers, residential refrigerator ice makers, supply stops and endpoint control valves. Devices that were not covered by section 9 of NSF 61 were not subject to the NSF performance-based standard, but if they were covered by Section 1417, they were subject to the 8.0 percent lead limit.

[5] This commerce restriction does not apply to pipes used for manufacturing and industrial processing.

Plumbing materials meeting the lead-free definition of ≤ 8.0 percent lead were still found to contribute to lead levels measured at the tap (Sandvig et al., 2008). Thus, efforts to reduce the lead content of materials continued, notably in the States of California, Maryland, Massachusetts, and Vermont. In response, manufacturers developed non-leaded alloys containing very low levels of lead (less than 0.25 percent lead) that can be used in the manufacture of brass faucets, meters, and fittings. Many utilities have also developed their own specifications for non-leaded components (Sandvig et al., 2007).

In 2011, The Reduction of Lead in Drinking Water Act of 2011 (RLDWA) revised Section 1417 to:

(1) Redefine "*lead-free*" in SDWA Section 1417(d) to:
   - Lower the maximum lead content of the wetted surfaces of plumbing products such as pipes, pipe fittings, plumbing fittings and fixtures from 8.0% to a weighted average of 0.25%;
   - Establish a statutory method for the calculation of lead content; and
   - Eliminate the requirement that lead-free products be in compliance with voluntary standards established in accordance with SDWA 1417(e) for leaching of lead from new plumbing fittings and fixtures.

(2) Create exemptions in SDWA Section 1417(a)(4) from the prohibitions on the use or introduction into commerce for:
   - Pipes, fittings and fixtures that are used exclusively for non-potable services where the water is not anticipated to be used for human consumption (SDWA 1417(a)(4)(A)); and
   - "toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves that are 2 inches in diameter or larger." (SDWA 1417(a)(4)(B)).

A subsequent Act, The Community Fire Safety Act of 2013, signed on December 20, 2013, exempted fire hydrants from the new lead-free standard, and required EPA to consult with the National Drinking Water Advisory Council (NDWAC) on lead-free issues. Both The RLDWA and Community Fire Safety Act became effective on January 4, 2014. EPA has published a "Summary of The Reduction of Lead in Drinking Water Act and Frequently Asked Questions" that describes both of these Acts in more detail (USEPA, 2013).[6] On January 17, 2017, EPA issued a proposed rule to amend EPA's current regulations and reflect the changes to Section 1417 of SDWA as a result of the RLDWA.

Although the SDWA no longer requires third-party certification, some state or local laws require third-party certification. In addition, third-party certification bodies or agencies may be used by manufacturers to inform consumers which products meet a voluntary standard. One such standard, NSF/ANSI 372 is consistent with the requirements of the RLDWA. A third-party

[6] This document is available at http://nepis.epa.gov/Exe/ZyPDF.cgi/P100M5DB.PDF?Dockey=P100M5DB.PDF.

certification against this standard could be a useful way to identify a product as meeting the requirements of Section 1417. Products will bear the mark of the laboratory that has independently certified the product as meeting the standard. EPA published a brochure to help the public identify the various marks that indicate a product has been certified as lead-free to satisfy the new requirement of the Act: "How to Identify Lead-Free Certification Marks for Drinking Water System & Plumbing Materials" (USEPA, 2015a).[7] EPA also recommends that PWSs incorporate this NSF/ANSI standard into their contract specifications for materials installed in their treatment and distribution systems, and to encourage their consumers to purchase certified products.

2.2 Sources of Lead and Copper

Lead and copper are rarely present in raw water sources. They are primarily present at the customer's tap due to corrosion of lead and copper-based material. This section:

- Provides an overview of chemical and physical reactions that result in lead and copper release into drinking water (Section 2.2.1); and
- Discusses the relative contribution from supply lines and premise plumbing components (Section 2.2.2).

2.2.1 Corrosion and Metals Release

Corrosion in water systems is defined as the electrochemical interaction between a metal surface such as pipe wall or solder and water. During this interaction, metal is oxidized and transferred to the water or to another location on the surface as a metal ion. Depending on the material there are many forms of corrosion, but usually the most important for drinking water are: (1) uniform corrosion, where the electrochemical interaction occurs along the pipe wall, resulting in a relatively uniform loss of metal across the entire surface; (2) non-uniform corrosion, where metal is lost from a localized point, causing pitting and mounding in some cases; and (3) galvanic corrosion which comes from a coupling of dissimilar metals or internally in metallic alloys. While it is important to understand and control corrosion, the LCR is specifically concerned with controlling ***metals release*** (i.e., release of lead and copper) into the water. Metals release is a function of the reactions that occur between the metal ions released due to corrosion, and the physical, chemical, and biological characteristics of the water and the metal surface.

The form of lead and copper released into the water can be dissolved, colloidal, or particulate (i.e., bound up with other compounds such as iron and aluminum). Of great importance is the ***scale*** that builds up naturally on the metal surface. Pipe scales can be complex and can include two types of compounds: (1) passivating films that form when pipe material and water react directly with each other; and (2) deposited scale material that forms when substances in the water (e.g., iron, manganese, aluminum, calcium) precipitate out or sorb to, and then build up

[7] This document is available at http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.pdf.

on the pipe surface. Scales can have layers and are influenced by treatment history. The structure and compounds in the existing corrosion scale can influence the effectiveness of CCT.

Researchers have identified many different compounds on lead pipe scales depending on water quality and treatment history:

- In the absence of corrosion inhibitors, lead pipe scales are frequently dominated by compounds that result from the reaction of carbonate and divalent lead compounds (Pb^{++} or Pb(II)),[8] such as hydrocerussite [$(Pb_3(CO_3)_2(OH)_2$] and cerussite ($PbCO_3$) (Schock and Lytle, 2011). Plumbonacrite ($Pb_{10}(CO_3)_6(OH)_6O$) has been found to co-occur with Pb(II) carbonate compounds in scales and can be a predominant form in systems with high pH (>10) (DeSantis and Schock, 2014). Lead pipe scales may also include massicot and litharge (which are both forms of PbO) under higher alkalinity conditions (McNeill and Edwards, 2004). Carbonate containing scales are often off-white and slightly chalky when dry (Schock and Lytle, 2011).

- Newer research has confirmed that Pb(IV) compounds, i.e., lead oxide (PbO_2),[9] can be the predominant compounds in lead pipe scales under highly oxidative conditions[10] and under low organic matter conditions (Schock, 2007b; Schock, 2001; Schock and Giani, 2004; DeSantis and Schock, 2014).

- When orthophosphate is used, lead pipe scales are often dominated by crystalline Pb(II) orthophosphate compounds such as hydroxypyromorphite, $Pb_9(PO_4)_6$, or $Pb_3(PO_4)_2$. Scales in systems with blended phosphates do not follow the same trends as orthophosphate and seem to be influenced by calcium concentrations and phosphorus speciation (DeSantis and Schock, 2014).

Copper-based scales usually include cuprite (Cu_2O), cupric hydroxide ($Cu(OH)_2$), tenorite (CuO), and malachite ($Cu_2(OH)_2CO_3$). When orthophosphate is used, various copper phosphate scales may develop (Schock and Sandvig, 2006; Schock and Lytle, 2011)).

The characteristics of the scale and its structure dictate the amount of lead or copper that is released into the water. If conditions favor the formation of insoluble, adherent scale (i.e., scale that adheres well to the pipe wall), the rate of metals release will be low. However, if scales do not adhere well to the pipe wall or they are very soluble, the release of metals may be greater. Other compounds in the water including aluminum, iron, manganese, and calcium can significantly influence scale formation and properties. The type of scale will also dictate how

[8] Pb^{++}, Pb(II), or divalent lead is the ionic form of lead that is transferred from the material to the water during the corrosion process.

[9] Pb^{++++}, Pb(IV), or tetravalent lead is an ionic form of lead that forms lead oxide (PbO_2), the only Pb(IV) compound that has been identified in lead pipe scales. Throughout this manual, Pb(IV) and PbO_2 are used interchangeably.

[10] For example, systems that have a free chlorine residual of 2 mg/L or greater. See Section 2.3 for more information on how disinfection affects ORP of the water and how this affects the types of lead compounds in the scale.

susceptible it is to releasing particulate lead following physical disturbances (e.g., infrastructure work).

2.2.2 Lead and Copper-Containing Material

The main sources of lead and copper in drinking water are the materials used for supply pipes from the water main to the building (also called "service lines") and premise plumbing. These include lead and copper pipe, lead-based solder, and brass materials used in faucets and fittings.[11] Exhibit 2.2 shows plumbing components that may be potential sources of lead.[12]

Researchers have performed various studies to identify the relative contribution of these materials to lead and/or copper levels measured at the tap in standing samples (Gardels and Sorg, 1989; Lytle and Schock, 1996; Kimbrough, 2001; Kimbrough, 2007; Sandvig et al., 2008; Kimbrough, 2009). They have found that LSLs contribute a significant percentage of the lead in samples collected at the tap (under normal household usage conditions), and that brass may also be a significant source of lead and copper depending on the quality of the drinking water and the composition of and manufacturing process for the brass faucet or fitting. There are, however, many different types of alloys used in brass faucets and fittings. Each may react differently under different water qualities and chemistries, as well as water use patterns, which makes it difficult to identify specific brass components that might cause problems with respect to lead and/or copper release in any given PWS. Appendix C provides methods for diagnostic monitoring that can help pinpoint the source of lead for a specific building.

[11] Prior to the 1986 SDWA Amendments, 50:50 lead:tin solder could be used for potable applications. Brass alloys comprised of various amounts of copper and lead are used to manufacture pipes, pipe fittings, plumbing fittings, and fixtures (e.g., faucets and meters). As discussed in Section 2.1.2, the RLDWA of 2011 further limits the allowable lead content of these materials.
[12] Although the water utility often owns the portion of the supply pipe from the water main to the property boundary, the homeowner generally owns the portion from the property boundary or meter to the home and is responsible for premise plumbing. This makes lead and copper unique contaminants in that their source is under the control of the individual customer (except in the case of the portion of a LSL owned by the water utility).

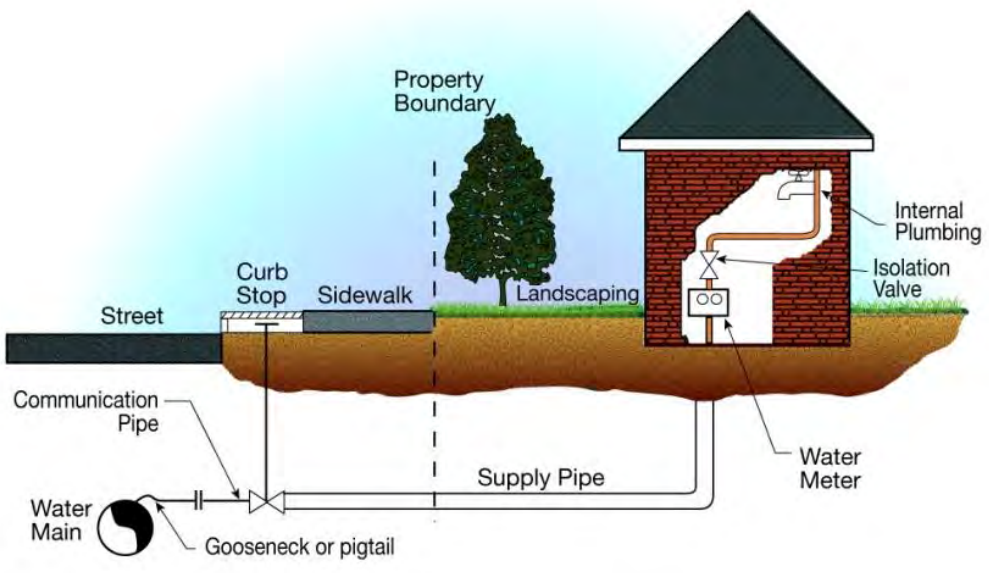


Exhibit 2.2: Typical Water Service Connection that May Provide Sources of Lead (Sandvig et al., 2008)

Copper pipe may be used for both the supply pipe (service line) and the interior piping. Brass fixtures typically are 60 – 90 % copper by weight. Copper release depends on water quality conditions (particularly pH, dissolved inorganic carbon (DIC), and oxidation-reduction potential (ORP)), the age of the copper pipe, and how long the water has been in contact with the pipe. Copper release is typically higher in newer copper plumbing (Cantor et al., 2000; Kimbrough, 2007; Schock and Lytle, 2011). The amount of time required for copper pipes to passivate (i.e., no longer release copper into the water) is highly dependent on water quality, particularly pH, alkalinity, and DIC.

New research has shown that iron and manganese can adsorb other metals such as lead. McFadden et al. (2011) showed that lead released from LSLs was adsorbed onto galvanized iron pipe in homes. Another study showed that iron- and manganese- rich scale provided a source of lead for more than four years after LSLs were fully removed (Schock, Cantor, et al., 2014). Thus, lead released "upstream" (e.g., from an LSL) can accumulate in these scales, providing a long-term source of lead even after LSLs and other lead-containing materials are removed. Residual aluminum in the finished water from the coagulation treatment step can also affect the type and stability of scales formed within LSLs (Schock, 2007b).

2.3 Water Quality Factors Affecting Release of Lead and Copper

New research conducted in recent years has continued to show the influence and importance of water quality on lead and copper levels in drinking water. Water quality can affect the rate of corrosion of lead and copper materials, the formation and characteristics of scales that form on lead and copper based materials, and ultimately, the release of metals into the water. New

findings have shed light on the effects on lead and copper levels of natural organic matter (NOM) and metals including iron, aluminum, and manganese. Alkalinity, pH, DIC, and corrosion inhibitors remain critical parameters that directly impact lead release. In addition, new research has shown the importance of ORP in certain types of waters.

Understanding the water quality conditions that impact the release of lead and copper in drinking water provides a foundation for making effective treatment decisions. This section describes the following parameters, how they can be measured or approximated, and how they can affect lead and copper release in drinking water:

- Alkalinity, pH, and DIC.
- Corrosion inhibitors.
- Hardness (calcium and magnesium).
- Buffer Intensity.
- Dissolved oxygen (DO).
- Oxidation reduction potential (ORP).
- Ammonia, chloride, and sulfate.
- Natural organic matter (NOM).
- Iron, aluminum, and manganese.

2.3.1 pH, Alkalinity and DIC

The pH of water is a measure of its acidity, otherwise known as its hydrogen ion concentration (H^+ or H_3O^+). Alkalinity is the capacity of water to neutralize acid. It is primarily the sum of carbonate, bicarbonate, and hydroxide anions in the water as shown in Equation 1 (Stumm and Morgan, 1981).

$$\text{Alkalinity} = 2CO_3^{2-} + HCO_3^- + OH^- - H^+ \qquad \textit{Equation 1}$$

DIC is an estimate of the total amount of inorganic carbon as shown in Equation 2 (Stumm and Morgan, 1981).

$$\text{DIC} = CO_2 + H_2CO_3 + CO_3^{2-} + HCO_3^- \qquad \textit{Equation 2}$$

Alkalinity and DIC are closely related. Most alkalinity comes from bicarbonate and carbonate ions in the water. Although water operators are more familiar with alkalinity, DIC is the parameter more closely related to corrosion because it directly measures the available carbonate species in the water that can react with lead and copper to form the passivating scales. The water's pH influences many other corrosion-related parameters (i.e., buffer capacity, alkalinity, ORP) and has a large influence on corrosion inhibitor effectiveness.

It is best to measure pH in the field at the time of sample collection using a calibrated instrument. EPA Method 150.1 emphasizes the importance of proper sampling technique - the pH of highly purified waters and the pH of waters that are not in equilibrium with the atmosphere are subject to changes as dissolved gases are either absorbed or desorbed. To

minimize these impacts, EPA recommends filling sampling containers completely and keeping them sealed prior to analysis (USEPA, 1982). Alkalinity is commonly measured by a certified laboratory and reported as mg/L as calcium carbonate ($CaCO_3$). DIC cannot be measured but can be predicted based on the pH, alkalinity, ionic strength, and temperature of the water, using the table in Appendix B. DIC is usually reported in mg/L as carbon (mg/L as C).There are optimal ranges of pH and DIC that result in the greatest formation of insoluble compounds in the scale, and in this way prevent the release of lead and copper. See Chapter 3 for technical recommendations on adjusting pH/alkalinity/DIC to prevent lead and copper release.

The pH, alkalinity, and DIC of water can be highly variable within the distribution system. The pH can fluctuate due to interactions between water and pipe material, microbiological activity, and changes in disinfectant residual. The water's ability to resist changes in pH is called its buffering capacity (also called buffer intensity). The carbonate and bicarbonate ions in the water provide this buffering; see Section 2.3.4 for additional information.

Regardless of the specific treatment used, understanding the pH and DIC range throughout a distribution system is an important part of maintaining corrosion control and minimizing the release of lead and copper.

2.3.2 Corrosion Inhibitors

Corrosion inhibitors are used not only to control lead and copper release, but also to prevent corrosion of iron pipe and other metals in the distribution system. The most common corrosion inhibitors used by water systems are phosphate-based, which means they have orthophosphate (PO_4^{3-}) in their formulation. Silicate-based corrosion inhibitors, which are mixtures of soda ash and silicon dioxide, have been used in a few cases.

Orthophosphate is commonly used for lead and copper control. Polyphosphates, which are polymers containing linked orthophosphate ions in various structures are used mainly for sequestering iron and manganese. They work by binding or coordinating the metals into their structures so they cannot precipitate on sinks or clothes. Polyphosphates can also sequester lead and copper, keeping them in the water and actually increasing the risk of exposure. Polyphosphates can revert to orthophosphate in the distribution system, but it is difficult to predict if and when this occurs. Research has confirmed that polyphosphates are generally ***not*** effective on their own for controlling the release of lead and copper (Holm and Schock, 1991; Cook, 1992; Dodrill and Edwards, 1995; Cantor et al., 2000). Blended phosphates, which contain a mixture of orthophosphate and polyphosphate, have been used for corrosion control and to sequester iron and manganese. Silicate-based inhibitors have been shown to successfully reduce lead and copper levels in first draw-samples at the tap (Schock, Lytle, et al., 2005), but their full-scale use has been limited.

See Chapter 3 for additional technical recommendations on using orthophosphate, blended phosphates, and silicate-based corrosion inhibitors for controlling lead and copper release.

2.3.3 Hardness (Calcium and Magnesium)

Hardness is primarily the sum of calcium and magnesium in water. It is a common water quality parameter measured in the laboratory and is typically reported as mg/L as $CaCO_3$ (calcium carbonate).

If finished water has high hardness, increasing the pH to control lead release can cause calcium carbonate precipitation, or scaling, in the distribution system. The Langelier Saturation Index (LSI), and other calcium carbonate-related indices such as the Ryznar Index and calcium carbonate precipitation potential (CCPP), can be used as indicators of scaling conditions (Schock and Lytle, 2011).[13] It is critical to note that, while these indices can be used to predict scaling potential as an adverse secondary impact of pH or alkalinity adjustment, they have no value as corrosivity indictors and should ***not*** be used to evaluate lead or copper control. The LSI is only important insofar as it provides information regarding the amount of pH adjustment that can be employed without causing precipitation.

In addition to contributing to scaling, calcium may be a particularly important component of scales laid down by blended phosphate corrosion inhibitors. See Chapter 3 for more information.

2.3.4 Buffer Intensity

Buffer intensity (also called buffer capacity) is a measure of the water's resistance to changes in pH, either up or down. It is defined as the concentration of base required to raise the pH one unit and has units of moles/L/unit pH. Buffer intensity depends on the alkalinity, DIC, and pH of the water. Exhibit 2.3 shows the relationship of pH and buffer intensity at different DIC values, with the highest buffer intensity at a pH of approximately 6.3 and minimum intensity at pH values between 8.0 and 8.5. Thus, waters with pH between 8 and 8.5 and low DIC (less than about 10 mg/L as C) have low buffer intensity and may have more variable pH within the distribution system, whereas waters outside this pH range will have higher buffer intensity and may exhibit less variability in pH levels in the distribution system. Increasing DIC in waters with pH values in the 8 – 8.5 range will not result in appreciable increases in buffer intensity. Additional buffer intensity may result when phosphate or silicate chemicals are dosed at a high concentration relative to DIC.

[13]The LSI is defined as the comparison between the measured pH of the water with the pH the water would have at saturation with $CaCO_3$.

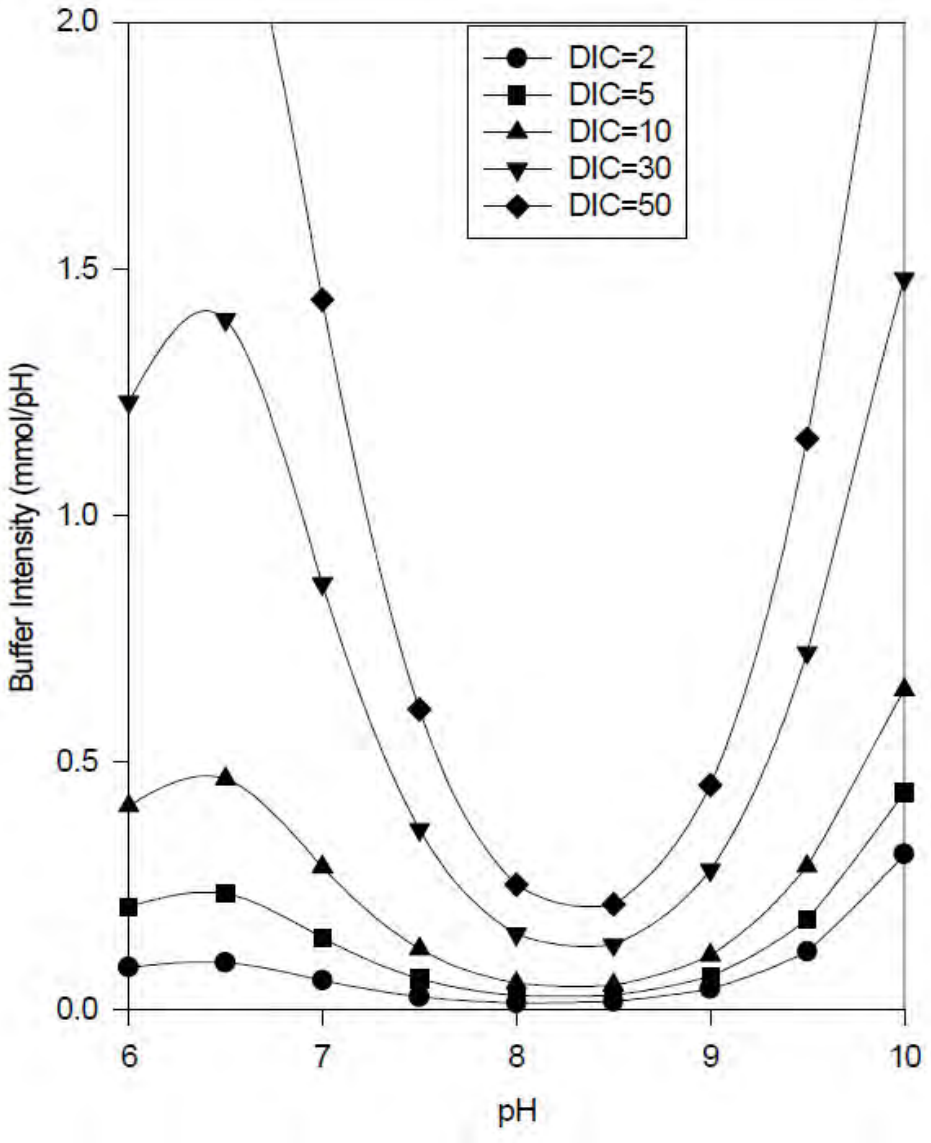


Exhibit 2.3: Buffer Intensity as a Function of pH at Different DIC Values (Clement and Schock, 1998, Figure 1)

2.3.5 Dissolved Oxygen

Oxygen is slightly soluble in water, seldom reaching dissolved concentrations above 15 mg/L. In ground water, DO can vary depending on the geochemistry and hydrogeology of the aquifer. Deep ground water or shallow ground water in areas where the recharge area has silty or clayey soils may have no DO. Shallow ground water in areas with fractured rock or sandy soils may contain higher concentrations of DO. Surface waters are generally more oxygenated, especially flowing sources (i.e., rivers). Stagnant water and waters with low DO content, however, can create oxygen-deficient conditions in some cases. The DO concentration depends

on water temperature, but typical well-aerated water will have a DO concentration of about 8 or 9 mg/L. DO concentrations can be measured in the field using a calibrated DO meter.

DO concentration affects the solubility of iron, manganese, lead, and copper. Some ground water systems add dissolved oxygen through aeration processes to oxidize iron and manganese so that they can be removed through precipitation. Increasing DO in the water can increase copper corrosion, converting Cu(I) to Cu(II). However, water with high DO levels may provide corrosion benefits under some circumstances, by facilitating the production of different and more protective lead oxide scales than would have been formed under low DO conditions (see Section 2.3.6 on Oxidation-Reduction Potential for more information).

2.3.6 Oxidation-Reduction Potential

Oxidation-reduction potential, also called redox potential or ORP, is the electric potential required to transfer electrons from one compound (the oxidant) to another compound (the reductant). It is considered a quantitative measure of the state of oxidation in water treatment and distribution systems. Like pH, ORP is a fundamental characteristic of aqueous systems and affects how water interacts with solid substances such as metal pipe material. It is commonly measured using a platinum reference electrode and reported in units of volts (V) or millivolts (mV). Measured ORP values are often normalized with respect to the standard hydrogen electrode and reported as electric potential (E_h) by taking into account a material-specific conversion factor, generally provided by the electrode manufacturer or found in reference textbooks (Copeland and Lytle, 2014).

ORP varies with pH, temperature, and DIC, but is fundamentally driven by the type and concentration of disinfectant in the water (e.g., chlorine or chloramines) and the DO concentration. Laboratory studies by James et al. (2004) and Copeland and Lytle (2014) showed that ORP values are highest for free chlorine and chlorine dioxide, and that ORP decreases with increasing pH from 7 to 9, regardless of the oxidant used. Copeland and Lytle (2014) found an E_h range of 0.51 V (no disinfectant and pH of 9) to 1.02 V (chlorine disinfection and a pH of 7). In general, the influence of free chlorine on ORP is much greater than that of DO. As a result, for systems using a free chlorine residual in the distribution system, DO's influences on ORP are minor.

Under certain conditions, ORP can have a dramatic impact on lead release. Exhibit 2.4 shows the theoretical E_h and pH conditions that favor different dissolved and solid forms of lead. The hatched areas represent lead solids, and the un-hatched areas are lead complexes that are in solution. It is important to note that E_h-pH diagrams are based on theory, and the positions of the boundaries can vary depending upon the data used to construct them. Thus, these diagrams should be used to understand relationships and interpret field data, and not for predicting lead release.

Exhibit 2.4 shows that Pb(II) solids exist theoretically at low E_h values at typical pH levels in drinking water. At higher E_h values (> 0.7 V) and in the absence of corrosion inhibitors or other

interfering surface deposits, PbO_2 (a Pb(IV) solid) could form on lead pipe surfaces. PbO_2 is insoluble and would prevent lead from being released to the water. Water quality changes that cause a reduction in pH or ORP from a change in disinfection practices (e.g., switching from chlorine to chloramines in the distribution system), however, can cause PbO_2 to convert to Pb(II) compounds and release lead into the water.

The high E_h values needed for PbO_2 formation may be found in systems that have a high chlorine residual (i.e., > 2 mg/L as free chlorine) for extended periods of time. PbO_2 has been observed to form between pH 7 and 9.5, with formation occurring more quickly at higher pH values. Field testing has shown that the amount of lead released from PbO_2 scales is very low and close to lead levels for non-lead pipes (Schock, Triantafyllidou, et al., 2014; Triantafyllidou et al., 2015).

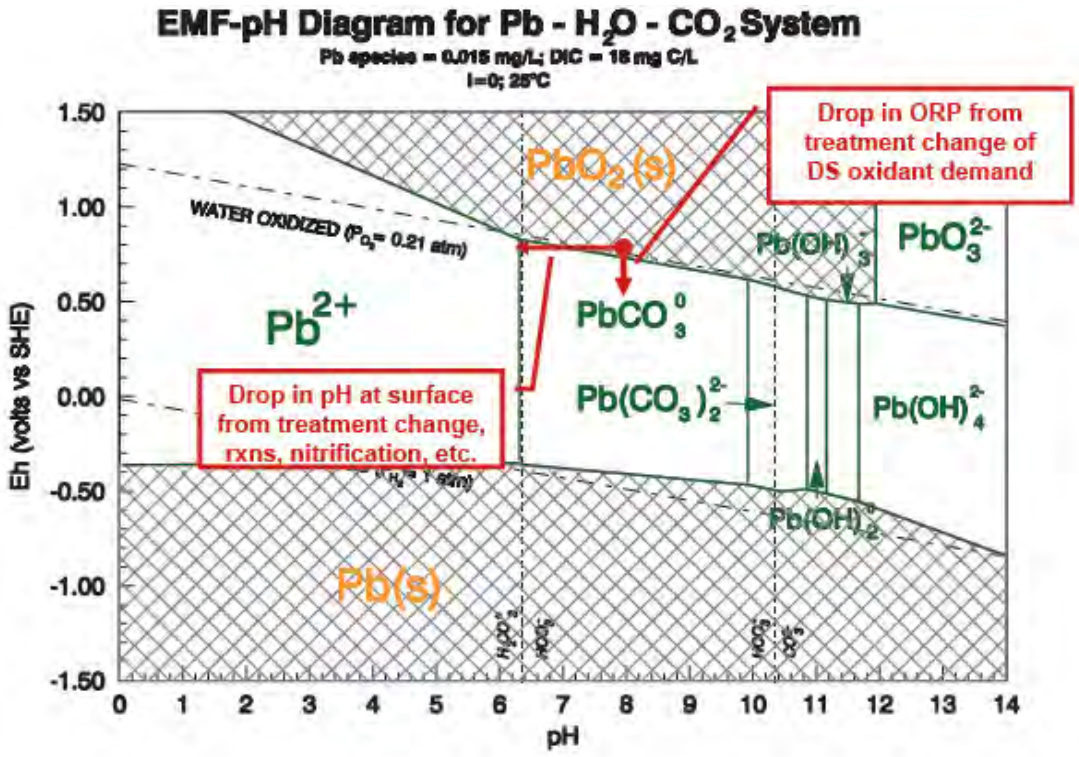


Exhibit 2.4: E_h-pH Diagram for a Lead-Water-Carbonate System. DS oxidant demand in upper box is 'distribution system oxidant demand' (Schock, 2007a; provided by author)

2.3.7 Ammonia, Chloride, and Sulfate

Excess ammonia (NH_3) may occur in the distribution system due to elevated source water ammonia levels and/or if the system uses chloramines for disinfection. The presence of excess ammonia can lead to nitrification in the distribution system. Nitrification occurs when nitrifying bacteria convert ammonia into nitrite and nitrate, which may lower the pH and alkalinity of the water. This can accelerate brass corrosion and cause problems with lead release (Uchida and

Okuwaki, 1999; Douglas et al., 2004). Ammonia may also form compounds with lead and copper, which can interfere with the effectiveness of CCT.

Research has shown that the ratio of chloride (Cl^-) to sulfate (SO_4^{2-}) in the water can be an indicator of potential lead release. An evaluation of LCR tap sampling data from 12 drinking water utilities collected as part of a Water Research Foundation (WRF) project found that all of the water systems with chloride-to-sulfate ratios less than 0.58 met the 90th percentile action level for lead, whereas only 40 percent of the systems with chloride/sulfate ratios greater than 0.58 met the lead action level (Reiber et al., 1997). More recent research has shown that that lead leaching increased when the chloride-to-sulfate mass ratio approached 0.4 to 0.6 (Nguyen et al., 2010; Nguyen et al., 2011); however, further increasing the chloride-to-sulfate mass ratio above 0.7 may not necessarily be an indicator of increased lead release (Wang et al., 2013). Lower chloride-to-sulfate ratios may be indicative of lower lead release due to the formation of an insoluble sulfate precipitate with lead. Higher ratios may result in the formation of a soluble chloride complex, where lead is galvanically connected to another metal such as copper (Nguyen et al., 2010; 2011).

The chloride and sulfate content in water can change with a switch from sulfate-based coagulants (such as aluminum sulfate (alum) and ferric sulfate) to chloride-based coagulants (such as ferric chloride). Conversely, a change from ferric chloride to alum may increase the sulfate content in the water, potentially reducing lead release. Other scenarios that may affect lead release by altering the chloride and sulfate concentration in the water (and hence the chloride-to-sulfate mass ratios) include blending of desalinated seawater, using anion exchange, or brine leaks from on-site hypochlorite generators (Nguyen et al., 2010; 2011). Galvanic connections and galvanic corrosion can occur in the distribution system with the use of lead solder on copper pipes, or from partial lead line replacements (Oliphant, 1983; Gregory, 1985; Reiber, 1991; Singley, 1994; Lauer, 2005; Nguyen et al., 2010; Triantafyllidou and Edwards, 2011; Clark et al., 2013; Wang et al., 2013).

2.3.8 Natural Organic Matter

NOM is a complex mixture of organic compounds that occur in both ground and surface water sources, but are more prevalent in surface water. NOM is difficult to measure, so utilities often use UV_{254} (specific absorption, the ratio of UV absorption to organic carbon concentration) as a surrogate (APHA, AWWA, and WEF, 2005).

The impact of NOM on metals release is unclear. NOM in finished water can help form the protective films that reduce corrosion, but it has also been shown to react with corrosion products to form soluble complexes with lead, which may increase lead levels in the water (Korshin et al., 1996, 1999, 2000, 2005). Organic matter can also provide nutrients for microorganisms, exacerbating problems with biofilm growth and depleting chlorine residuals. This additional microbial growth can cause microbially-induced copper corrosion (pinhole leaks)

through localized decreases in pH or, in the case of sulfate-reducing bacteria, through the formation of sulfide (Schock and Lytle, 2011).

2.3.9 Iron, Manganese, and Aluminum

Iron and manganese are present in many ground water sources and in the lower depths of some thermally stratified lakes and reservoirs. While there is no health-based maximum contaminant level for these metals, EPA has established secondary maximum contaminant levels (SMCLs) for iron and manganese of 0.3 mg/L and 0.05 mg/L, respectively. These SMCLs are based on aesthetic issues (red water, staining of clothing). While aluminum occurs naturally in groundwater and soil due to the erosion of aluminum-bearing minerals (USEPA, 2006a), it is more frequently found in drinking waters treated with alum for coagulation. It can also be an impurity in lime. Aluminum can color water, so EPA has set a SMCL of 0.05 to 0.2 mg/L.[14] Iron, manganese, and aluminum are common water quality parameters that can be measured by a certified laboratory.

Systems that increase pH for lead and/or copper control may experience black or red water complaints due to oxidation of iron and manganese in the distribution system. Iron and manganese removal at the treatment plant, or possibly the use of sequestering agents or silicates, can be used in these cases (see Chapter 3 for more information).

New research has shown that manganese and iron can react with dissolved lead and form deposits on lead service lines and other pipes in premise plumbing. In the well-studied case of Madison, WI, manganese that accumulated on pipe scales (up to 10 percent by weight of scale composition) captured dissolved lead and later released it back into the drinking water (Schock, Cantor, et al., 2014). Manganese can also interfere with the formation of PbO_2 and other passivating films (Schock, Cantor, et al., 2014).

Aluminum can interfere with orthophosphate effectiveness by forming aluminum phosphate precipitates, which reduce the amount of orthophosphate available for lead and copper control. Aluminum phosphate precipitates also have the potential to form scales on the interior of piping systems that may reduce the effective diameter of the pipes, resulting in loss of hydraulic capacity and increases in system headloss and operational costs (AWWA, 2005).

The 2006 EPA Report, Inorganic Contaminant Accumulation in Potable Water Distribution Systems notes that, “Based on scale sample analysis from 10 water utilities that practice alum coagulation, Snoeyink et al. (2003) confirmed that aluminum is frequently a major component of lead pipe scale” (USEPA, 2006a). These scales, however, are generally not as stable compared to orthophosphate scales and are prone to sloughing with changes in flow or water quality, or when lead service lines are physically disturbed during routine maintenance and

[14] “While EPA encourages utilities to meet a level of 0.05 mg/l for aluminum where possible, the Agency still believes that varying water quality and treatment situations necessitate a flexible approach to developing the SMCL. What may be appropriate in one case may not be appropriate in another. Hence, a range was developed for the aluminum SMCL.” (USEPA, 1991a).

repair activities. These dislodged scales can release metals that may become entrapped in the interior (premise) plumbing and/or the faucet screen, potentially increasing lead and copper levels in the water (Schock, 2007b).

2.4 Physical and Hydraulic Factors Affecting Release of Lead and Copper

In addition to water quality parameters, physical factors such as pipe disturbances, hydraulics, water use, and water temperature can affect lead and copper levels at the customer's tap. Understanding these factors can help primacy agencies and systems interpret lead and copper data and evaluate the effectiveness of OCCT.

2.4.1 Physical Disturbances

Field sampling has shown that physical disturbances to LSLs related to infrastructure work can result in lead release. Del Toral et al. (2013) found that most lead sampling results above the LCR lead action level of 0.015 mg/L occurred at sites with physical disturbances compared to undisturbed sampling sites.[15] Lower water usage at the disturbed sites may have also been a factor in the higher lead levels found.

Any physical disturbance to the premise plumbing system, from service to tap, can cause lead particulate release. Physical disturbances resulting in lead particulate release can occur during:

- Meter installation or replacement.
- Auto-meter-reader installation.
- Service line repair or partial replacement.
- External shut-off valve repair or replacement.
- Significant street excavation directly in front of the house.
- Repair or replacement of home plumbing fixtures or piping.

When any part of a home plumbing system is drained for repair work, or when infrastructure upgrades or repairs are completed (e.g., main breaks), air may get into the lines and scour deposits from the service lines to the tap. Tap flushing to remove air bubbles can disrupt pipe scales and release lead, copper and other accumulated material in the scales.

2.4.2 Hydraulic Factors

High water velocity can help reduce lead and/or copper by transporting the corrosion inhibitor to pipe surfaces at a higher rate; however, in some cases it can increase lead and/or copper corrosion by increasing the rate at which the oxidants in water come into contact with the metal surface. High water velocity can cause corrosion in copper pipes, and can also mobilize loosely adherent scale and cause sporadic lead release (Schock, 1999). Low water velocity in

[15] Sampling included first draw and lead profile sampling. The percent of samples with lead levels greater than 0.015 mg/L was 36% for sites with known disturbances (13 sites and 327 samples), 37 % for indeterminate sites where the disturbance could not be verified (2 sites, 81 samples), and 2% for undisturbed sites (16 sites, 372 samples).

areas of low water usage can reduce the effectiveness of the corrosion control inhibitor in forming a passivating scale. Increased water age due to less frequent use can cause water quality changes such as reductions in pH and loss of free chlorine residual that could exacerbate corrosion as well as microbial problems.

Other hydraulic factors that can affect lead and copper release into the customer's service line or a building's plumbing include flow reversals and hydraulic pressure transients. Pressure transients may occur when valves are closed to perform maintenance (Friedman et al., 2010) or due to backflow from a cross connection. Residential backflow is more common than previously thought, according to a recent study that identified backflow events in 5 percent of homes with backflow sensing meters (Schneider et al., 2010). Hydraulic pressure transients may occur when there are sudden changes in water velocity due to valves slamming shut, power outages, or pump start/stop cycles (Friedman et al., 2010).

2.4.3 Water Use

The effectiveness of corrosion control inhibitors depends on delivery of the inhibitors to the pipe wall to form the passivating scale. Reductions in water use may adversely affect this process. Also, as stated above, increased water age from less frequent use can cause water quality changes, such as reductions in pH and loss of free chlorine residual, that can exacerbate corrosion as well as microbial problems.

2.4.4 Water Temperature

Water temperature effects are complex and depend on the water chemistry and type of plumbing material. More lead is often mobilized during warmer weather seasons, although temperature effects can vary depending on water quality conditions and plumbing configuration. For example, as reported by Schock and Lytle (2011), orthophosphate reacts more quickly at higher temperatures, so reduction in lead levels may take longer in colder months than in warmer months. Higher temperature can also exacerbate copper corrosion, although elevated temperature has been found in some instances to facilitate a better passivating copper pipe scale (Schock and Lytle, 2011).

Seasonal changes in water temperature can result in significant changes in water quality and can impact lead and copper release. Because of the many reactions happening in the distribution system, it is difficult to generalize temperature's impacts. Water systems should collect water quality and lead and copper data throughout the year to determine their own trends.

Chapter 3: Corrosion Control Treatment for Lead and Copper

This chapter provides technical information on available corrosion control treatment (CCT) methods for lead and copper (Section 3.1), technical recommendations for identifying treatment alternatives for individual systems (Section 3.2), and technical recommendations for identifying target water quality and dosages for treatment alternatives (Section 3.3). The information in this chapter can be used to support systems and primacy agencies in meeting CCT requirements of the Lead and Copper Rule (LCR). Note that this chapter provides background information and technical recommendations - see Chapters 4 and 5 for a review of the required CCT steps under the LCR and when CCT requirements apply.

3.1 Available Corrosion Control Treatment Methods

Alkalinity and pH adjustment have been used by many systems for corrosion control. The discussion of this method is expanded in this section to include dissolved inorganic carbon (DIC) adjustment because all three parameters are a better indicator of corrosion control effectiveness than pH and alkalinity alone.

Phosphate-based corrosion inhibitors have been widely used to control lead and copper release. Their applications for corrosion control have been updated in this chapter to include more recent information on chemical formulations, optimal pH ranges, and limitations to their use.

Information on the use and effectiveness of silicate-based corrosion inhibitors continues to be limited and more research is needed. They may be effective in reducing lead and copper release in some cases, however, so they are included as a treatment technique in this chapter.

Calcium hardness adjustment is not discussed in this chapter because newer research has shown that calcium carbonate films only rarely form on lead and copper pipe and are not considered an effective form of corrosion control (Schock and Lytle, 2011; Hill and Cantor, 2011). Calcium hardness is important, however, in evaluating the amount of pH adjustment that can be made without causing calcium carbonate precipitation and resultant scaling problems in the distribution system.

New research has found that lead service lines (LSLs) with PbO_2 scales can have very low lead release (levels as low as or lower than those found when orthophosphate treatment is used (Schock, Cantor, et al., 2014; Triantafyllidou et al., 2015)). This new information has significant implications for management of treatment and distribution systems to minimize the release of lead. Questions remain, however, on how systems and primacy agencies can ensure that disinfectant residuals required for the formation and maintenance of PbO_2 scales are maintained in LSLs throughout the distribution system. This may be a particular challenge with homes that go unoccupied for an extended period of time. Therefore, formation of PbO_2 scale is not included in this section as a corrosion control technique. If systems have PbO_2 scales,

they should be very careful about making disinfection changes (see Chapter 6 for more information).

The remainder of this sub-subsection describes the specific chemical/physical methods that can be used for pH/alkalinity/DIC adjustment, phosphate-based corrosion inhibitors, and silicate-based corrosion inhibitors.

3.1.1 pH/Alkalinity/DIC Adjustment

As noted in Chapter 2, there are ranges of pH, alkalinity, and DIC that result in formation of insoluble compounds in the scale and in this way prevent the release of lead and copper (see Section 3.3.1 for recommended target pH/alkalinity/DIC ranges). Adjustment of pH/alkalinity/DIC can be accomplished by chemical or non-chemical means. Typical chemicals used for pH/alkalinity/DIC adjustment for corrosion control are listed in Exhibit 3.1. Additional information and guidance on pH adjustment methods are provided in USEPA (1992a) and Hill and Cantor (2011).

In addition to chemical methods, pH/alkalinity/DIC adjustment can be accomplished using limestone contactors or aeration. Limestone contactors, which are enclosed filters containing crushed high-purity limestone, have been used at small systems because they are relatively easy to operate. As the water passes through the limestone, the limestone dissolves, raising the pH, alkalinity, DIC, and calcium of the water. An empty bed contact time of 20 to 40 minutes is typically used to optimize pH and alkalinity adjustment. If a high pH is needed, other media types (e.g., dolomite, dolomitic materials) may be available regionally. The pH can be hard to control in limestone contactors and can depend on initial water quality and type of limestone used. When using limestone contactors, it is important to limit influent water quality to properly control effluent water chemistry. Suggested values for the influent are pH < 7.2, calcium < 60 mg/L, and alkalinity < 100 mg/L (Hill and Cantor, 2011). For influent pH > 7.2, carbon dioxide can be added prior to the contactors. Limiting iron, manganese, and aluminum is also recommended to prevent filter fouling. Limestone contactors can also be used for iron removal but require backwash capabilities to remove iron that accumulates on the limestone. Recommendations on the design and application of limestone contactors can be found on the following Environmental Protection Agency (EPA)-funded website www.unh.edu/wttac/WTTAC_Water_Tech_Guide_Vol2/limestone_intro.html. Calcite filters are a similar treatment that operate using the same principles as limestone contactors, except that they use a finer material that is housed in a cartridge. For the purposes of this document, “limestone contactor” is the generic term used to represent any filtration process of calcite-containing material used to add pH, alkalinity, and DIC to the water.

Aeration is a non-chemical method for adjusting pH where air is introduced into the water. Aeration is the only method that ***reduces*** excess DIC by removing carbon dioxide, which results in an increase in pH. Aeration systems include Venturi injector systems, tray systems, packed tower systems, and diffuse bubble systems. They can be designed to remove other constituents

such as iron, manganese, radon, volatile organic compounds (VOCs) and hydrogen sulfide (H_2S). Aeration is most effective when there is an adequate carbon dioxide concentration in the water (4 - 10 mg/L CO_2), and the pH is < 7.2 (Spencer and Brown, 1997; Lytle et al., 1998; Spencer, 1998; AWWA, 1999; Schock et al., 2002; AWWA, 2005).

Exhibit 3.1: Typical Chemical Processes for pH/Alkalinity/DIC Adjustment

Chemical	Use	Composition	Alkalinity Change	DIC Change[1]	Notes
Baking Soda, $NaHCO_3$ (sodium bicarbonate)	Increases alkalinity with moderate increase in pH.	98% purity. Dry storage with solution feed.[2]	0.60 mg/L as $CaCO_3$ alkalinity per mg/L as $NaHCO_3$ [2, 3, 4]	0.14 mg/L as C per mg/L as $NaHCO_3$	Good alkalinity adjustment chemical but expensive.[2]
Carbon Dioxide, CO_2	Lowers pH. Converts hydroxide to bicarbonate and carbonate species.	Pressurized gas storage. Fed either through eduction or directly.[2]	None [2]	0.27 mg/L as C per mg/L as CO_2	Can be used to enhance NaOH or lime feed systems.[2]
Caustic Potash, KOH (potassium hydroxide)	Raises pH. Converts excess carbon dioxide to carbonate alkalinity species.	KOH is available as a 45% solution.[5] Has a low freezing point and may be stored at higher concentrations.	0.89 mg/L as $CaCO_3$ alkalinity per mg/L as KOH [3, 4]	None	pH control is difficult when applied to poorly buffered water.[5] Is a hazardous chemical, requires safe handling and containment areas.
Caustic Soda, NaOH (sodium hydroxide) [6]	Raises pH. Converts excess carbon dioxide to carbonate alkalinity species.	93% purity liquid bulk, but generally shipped and stored at < 50% purity to prevent freezing.[2]	1.25 mg/L as $CaCO_3$ alkalinity per mg/L as NaOH [3, 4]	None	pH control is difficult when applied to poorly buffered water.[2] Is a hazardous chemical, requires safe handling and containment areas.
Hydrated Lime, $Ca(OH)_2$ (calcium hydroxide) [7]	Raises pH. Increases alkalinity and calcium content (i.e., hardness).	95 to 98% purity as $Ca(OH)_2$. 74% active ingredient as CaO. Dry storage with slurry feed.[2]	1.35 mg/L as $CaCO_3$ alkalinity per mg/L as $Ca(OH)_2$ [3, 4]	None	pH control is difficult when applied to poorly buffered water. Slurry feed can cause excess turbidity. O&M is intensive.[2]
Potash, K_2CO_3 (potassium carbonate)	Increases alkalinity with moderate increase in pH.	Dry storage with solution feed.[5]	0.72 mg/L as $CaCO_3$ alkalinity per mg/L K_2CO_3 [3, 4]	0.09 mg/L as C per mg/L as K_2CO_3	More expensive than soda ash but more soluble and easier to handle.[5]

Chemical	Use	Composition	Alkalinity Change	DIC Change[1]	Notes
Soda Ash, Na_2CO_3 (sodium carbonate)	Increases alkalinity with moderate increase in pH.	95% purity. Dry storage with solution feed.[2]	0.94 mg/L as $CaCO_3$ alkalinity per mg/L as Na_2CO_3 [3, 4]	0.11 mg/L as C per mg/L as Na_2CO_3	More pH increase compared with $NaHCO_3$, but less costly.[2] Has increased buffer capacity over hydroxides.
Sodium Silicates, Na_2SiO_3	Moderate increases in alkalinity and pH.	Available in liquid form mainly in 1:3.2 or 1:2 ratios of Na_2O:SiO_2.[8]	Depends on formulation	None	More expensive than other options but easier to handle than lime and other solid feed options. Has additional benefits in sequestering or passivating metals.[8]

Notes and adapted sources:

[1] Calculated by the formula DIC Change = 12 x (moles carbon/mole compound) / molecular weight of compound.

[2] USEPA, 1992a

[3] Wachinski, 2016

[4] Simon, 1991

[5] USEPA, 2003

[6] Caustic potash (KOH), or potassium hydroxide, is an alternative that does not add sodium to water.

[7] Lime is available as hydrated or slaked lime ($Ca(OH)_2$) and quicklime (CaO).

[8] Schock, 1996

3.1.2 Phosphate-Based Inhibitors[16]

As noted in Chapter 2, phosphate-based corrosion inhibitors are chemicals that have orthophosphate in their formulation.[17] Orthophosphate reacts with divalent lead and copper (i.e., Pb^{++} and Cu^{++}) to form compounds that have a strong tendency to stay in solid form and not dissolve into water. The extent to which orthophosphate can control lead and copper release depends on the orthophosphate concentration, pH, DIC, and the characteristics of the existing corrosion scale (e.g., whether it contains other metals such as iron or aluminum).

Orthophosphate is available as phosphoric acid, in salt form (potassium or sodium), and as zinc orthophosphate. Phosphoric acid (H_3PO_4) is a common form that is available in concentrations between 36 and 85 percent. Because it is an acid, it requires special handling and feed facilities. Zinc orthophosphate inhibitors typically have zinc: phosphate weight ratios between 1:1 and 1:10. Recent research found that zinc orthophosphate did not provide additional lead and

[16] As noted in Chapter 2, polyphosphates, which are used mainly as sequestrants for iron and manganese, have not been found to be effective on their own to control lead and copper release.

[17] Orthophosphate concentration can be measured as P (phosphorus) or PO_4 (phosphate). It is very important to be clear about which measurement is being used. An orthophosphate concentration of 3 mg/L as PO_4 is roughly equivalent to 1 mg/L as P.

copper control compared to orthophosphate (Schneider et al., 2010). The zinc did, however, provide better corrosion protection for cement at low alkalinity/hardness/pH conditions.

Blended phosphates are a mix of orthophosphate and polyphosphate, with the orthophosphate fraction ranging from 0.05 to 0.7. It is possible that blends can provide both sequestration of metals and reduce metals release (Hill and Cantor, 2011). It is important to note that blended phosphates may not function as corrosion inhibitors strictly on the basis of concentration and relative amount of orthophosphate. See Section 3.3 for more information and recommended special considerations for using blended phosphates.

3.1.3 Silicate Inhibitors

Silicate inhibitors are mixtures of soda ash and silicon dioxide. These treatment chemicals are available in liquid or solid form (AwwaRF, 1990; Reiber et al., 1997; USEPA, 2003). They have been shown in a few cases to reduce lead and copper levels in first draw, first liter tap samples (LaRosa-Thompson et al., 1997; Schock, Lytle, et al., 2005). They have not been used in many full-scale plants because they have traditionally been more expensive than phosphate-based inhibitors and can require high doses.

The mechanisms by which silicate inhibitors control lead and copper release have been debated in the literature. Silicates may form an adherent film on the surface of the pipe that acts as a diffusion barrier. Silicates will also increase the pH of the water, which may reduce lead and copper release. The effectiveness of the formation of a diffusion barrier depends on pre-existing corrosion products on the scale to provide a site for the binding of the silicate layer (LaRosa-Thompson et al., 1997).

Silicates are defined by a weight ratio of SiO_2:Na_2O. A ratio of 3.22 is typical, although sodium silicate solutions with ratios as low as 1.6 are commercially available (Schock and Lytle, 2011; Schock, Lytle, et al., 2005).

3.2 Technical Recommendations for Selecting Treatment Alternatives

The process that systems must follow before the primacy agency designates OCCT is established in the LCR and differs in part based on system size. All systems, however, must recommend to the primacy agency a treatment option for designation as OCCT. This section contains technical recommendations to support primacy agencies, water systems, and if applicable, outside technical consultants in evaluating treatment alternatives to control lead and copper release. These technical recommendations may be particularly useful for systems serving 50,000 or fewer people when developing their OCCT recommendation, or for larger systems identifying corrosion control alternatives for further study. See Chapters 4 and 5 for a review of CCT requirements under the LCR.

This section includes flowcharts to support the corrosion control selection process. These flowcharts are based on the 1997 EPA document, *Guidance for Selecting Lead and Copper*

Control Strategies (1997) and the revised guidance with the same name, published in 2003. This section reflects new research related to the control of copper corrosion and blended phosphates, as well as new research related to corrosion control in systems with raw water iron and manganese. These flowcharts are intended to serve as a general screening tool for identifying potential alternatives. They are not meant to substitute for pilot studies and other site-specific investigations or preclude the use of other technologies identified by the system, primacy agency, or technical experts. It is the system and primacy agency's responsibility to assess the pros and cons of each treatment alternative, and to ensure its optimization once installed.

The following technical recommendations are discussed in this section:

- STEP 1. Review Water Quality Data and Other Information.
- STEP 2. Evaluate Potential for Scaling.
- STEP 3. Select One or More Treatment Option(s).
- STEP 4. Identify Possible Limitations for Treatment Options.
- STEP 5. Evaluate Feasibility and Cost.

Section 3.3 follows with technical recommendations on setting dose and target water quality parameters. Special considerations for systems with LSLs, small systems, and systems with multiple sources are provided below.

- Considerations for ***systems with LSLs:*** Systems with LSLs may want to evaluate the feasibility and cost effectiveness of fully removing all LSLs (utility-side and customer-side). Full LSL removal has several operational benefits - for example, systems using orthophosphate may be able to reduce their dose when LSLs have been fully removed. Also, removing the source of lead reduces the vulnerability of the system to unexpected changes in lead release due to future water quality changes.

- Considerations for ***very small community water systems (CWSs) and non-transient, non-community water systems (NTNCWSs):*** Systems that directly control 100 percent of their plumbing fixtures and components may want to consider physically replacing all lead-containing or copper plumbing materials. Systems should verify that the new components are certified *"lead-free"* according to current standards (See Section 2.1 for the definition of "lead-free"). Point-of-use (POU) treatment units, if they meet the SDWA requirements, may be an option in limited circumstances.[18] Note systems that select plumbing replacement or POU devices must continue the CCT steps described in

[18] For additional information refer to: 1) the preamble to the 2007 LCR Short-Term Revisions (USEPA, 2007a); and 2) *Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems*, EPA 815-R-06-10 (USEPA, 2006b). https://nepis.epa.gov/Exe/ZyPDF.cgi/P1009UBF.PDF?Dockey=P1009UBF.PDF.

Section 4.1 unless they are deemed optimized.[19] In cases where very small CWSs and NTNCWSs are identifying CCT, it may be beneficial to consider technologies that are easy to operate (e.g., limestone contactors, aeration) and select chemicals that are easy to store and work with, such as baking soda.

- Considerations for ***systems with more than one source:*** Many systems will have unique source and treatment scenarios that make system-wide corrosion control recommendations difficult. It may be prudent for systems with multiple wells or multiple sources, or systems that purchase waters of differing quality that enter the distribution system at various locations, to determine the most appropriate treatment separately for each source then undertake a system-wide evaluation of the most effective way to implement and operate corrosion control.

It is also important to recognize the potential limitations of treatment in chronic low water usage homes and homes that have been unoccupied for extended periods of time. The treatment may not be effective at lowering lead and/or copper levels at these sites, which can pose an ongoing risk to these residents. Systems can consider other potential actions they or residents can take to address the potential risk at these sites.

3.2.1 Technical Recommendations for Reviewing Water Quality Data and Other Information (STEP 1)

Lead and Copper Data

The forms in Appendix D can be used to organize lead and copper tap sampling data for system and primacy agency review. In addition to their own data, systems and primacy agencies should review any additional lead and copper data collected by others (e.g., universities).

Systems and primacy agencies should consider evaluating the dates and locations of individual sample results above the lead or copper action level(s) to determine if there are any spatial or temporal patterns. These results could be compared to water quality data collected at nearby distribution system locations at similar times to determine if they coincided with unusual water quality (e.g., changes in pH, corrosion inhibitor concentration, or microbiological activity). Systems should determine if sample results above the action level(s) coincided with a change in treatment or source. Lastly, systems should compare these sample results to previous rounds of lead and copper tap monitoring to see if there is a reoccurring pattern of lead and/or copper occurrence above the action level(s) at specific locations.

Systems may want to talk to residents where the sample results were above the action level(s) to discuss the resident's sampling procedure, ask for information on water use patterns and stagnation time prior to sampling, and ask about any physical disturbances that may have

[19] One way for systems serving 50,000 or fewer people to be deemed to have optimized corrosion control is they conducted lead and copper tap monitoring for two consecutive 6-month monitoring periods without a lead or copper action level exceedance (§141.81(b)(1)).

occurred prior to sampling (e.g., building renovations and other construction work on the property). A good way to collect information ahead of time is on a comprehensive chain of custody (COC) form. The COC form, given to the resident to send in with the sample, can be designed to collect information on sampling procedure, stagnation time, and flushing time. Talking with residents about their sample results provides an opportunity for systems to discuss one-on-one with consumers the public health implications of lead and copper and ways in which residents can reduce their exposure.[20]

For locations with sample results above the action level(s), systems and primacy agencies may want to consider additional sampling[21] to determine the source of the lead so that the system and property owner might consider site-specific remediation in addition to actions required by the regulations. See Appendix C for technical recommendations on investigative sampling methods to determine the source of lead and copper.

Other Water Quality Data and System Information

Systems and primacy agencies should collect and review water quality data and other system information pertinent to corrosion of lead and copper containing materials. Systems can use the forms in Appendix D to organize available water quality data and information and submit it to their primacy agency.

Analysis of a broad range of water quality constituents can be a very cost effective approach to identification of appropriate treatment technologies. For example:

- Having very accurate pH and alkalinity/DIC data is important for assessing the feasibility of such simple treatments as aeration or limestone contactors.
- Having calcium, magnesium, sulfate, iron, manganese, and other water quality data may help define constraints on pH adjustment, phosphate dosing, use of packed tower aerators, membranes or other processes, because of scale buildup issues.
- Knowing whether arsenic or radon is present in the source water will dictate CCTs that are compatible with the removal processes for those contaminants. For example, aeration can be used for radon removal as well as for pH adjustment for corrosion control, potentially reducing or eliminating the need for chemical treatment.
- If iron and/or manganese are present, they can interfere with the effectiveness of CCT. A combination of a removal process or filtration following oxidation (e.g.,

[20] Note that systems must conduct public education as required by the LCR when they exceed the lead action level (§141.85). Public education guidance for CWSs is provided in the document, "Implementing the Lead Public Education Provisions of the Lead and Copper Rule: A Guide for Community Water Systems" (USEPA, 2008a) and in a similarly titled guidance for NTNCWSs (USEPA, 2008b).

[21] All lead and copper tap sample results from the system's sampling pool collected within the monitoring period must be included in the 90th percentile calculation along with any samples where the system is able to determine that the site selection criteria in §141.86(a)(3)-(8) for the sampling pool are met. Other lead and copper tap data such as from customer requested sampling, investigative sampling, and special studies also must be submitted to the primacy agency (USEPA, 2004c; §141.90(g)).

aeration/disinfection) might be cost-effective and would reduce or eliminate the need for sequestration. Similarly, iron removal processes can often remove arsenic if present.

Primacy agencies and systems can use the information in Chapter 2 to review the data and identify water quality and physical factors that may be contributing to lead and/or copper release. When lead and copper monitoring data appear to be at odds with corrosion control theory, additional unknown factors may be involved. Those critical factors can only be determined by more specific evaluation and studies, such as direct examination of the pipe scales, additional data collection and evaluation, or examining the physical layouts of individual sampling sites.

3.2.2 Technical Recommendations for Evaluating the Potential for Scaling (STEP 2)

The presence of calcium in the water may limit the system's ability to raise the pH due to scaling problems in the distribution system. Scaling can clog pipes, reduce carrying capacity, and cause the water to be cloudy. Before selecting possible treatments, EPA recommends that systems and primacy agencies identify the ***saturation pH*** for calcium carbonate for the system. Maintaining the pH below the saturation pH should help to minimize, although not eliminate, the potential for precipitating calcium carbonate. It is important to note that other constituents in the water such as trace metals, natural organic matter (NOM), ligands, and phosphates can affect calcium carbonate precipitation rates and result in a higher or lower saturation pH.

The steps for determining the saturation pH are as follows:

- Determine the DIC of the water. If DIC data are not available but alkalinity and pH are known, use the table in Appendix B to determine the target DIC (in mg/L as carbon).
- Determine the finished water calcium concentration in mg/L. If this is not known but the system has total hardness data, approximate the calcium concentration by dividing the finished water hardness (as mg/L $CaCO_3$) by 2.5.
- On Exhibit 3.2, find the intersection of DIC on the x-axis (in "mg C/L") and calcium on the y-axis (in "mg Ca/L"). Find the pH curve closest to the intersection. This is the saturation pH for the system.

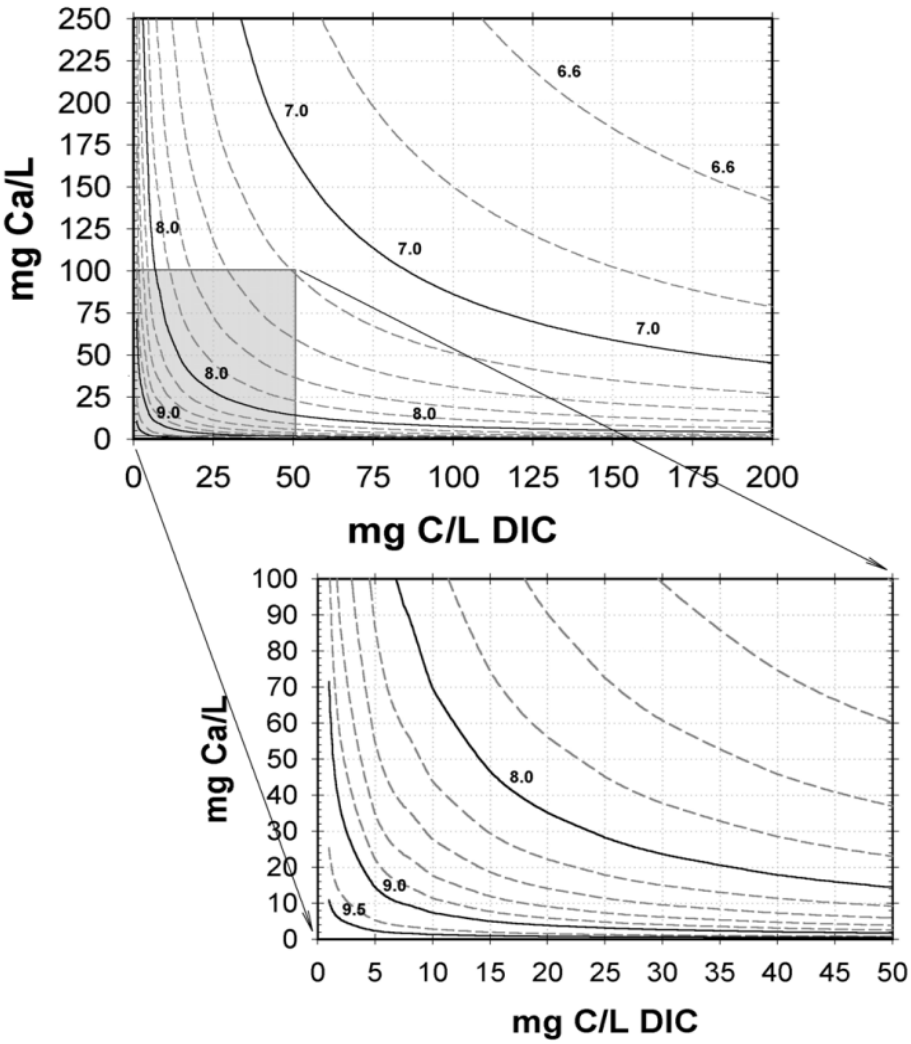


Exhibit 3.2: Theoretical Saturation pH for Calcium Carbonate Precipitation (USEPA, 2003)

Notes:
Solid lines are pH in whole numbers. Dashed lines are pH increments of 0.2
Calcium values are in mg Ca/L. To approximate calcium concentration (in mg Ca/L) from a measured hardness (as mg/L $CaCO_3$), divide the hardness value by 2.5.

3.2.3 Technical Recommendations for Selecting One or More Treatment Option(s) (STEP 3)

Systems and primacy agencies can use Flowcharts 1a through 3b in this section to select candidates for CCT. Exhibit 3.3 is a starting point for systems and primacy agencies to select the most appropriate flowchart for their situation based on whether the system has iron and/or manganese in finished water, is treating for lead and/or copper, and on pH in the distribution system.

These flowcharts were originally developed as a tool for small systems in EPA's 2003 revised guidance manual on selecting lead and copper corrosion strategies (USEPA, 2003), but they can

be useful for all system types. The flowcharts have been updated to reflect new research conducted since 2003.

These flowcharts are a screening tool and are not meant to substitute for pilot studies and other site-specific investigations. They are meant to indicate likely possibilities and do not include information on optimizing any of the treatments. In particular, systems with LSLs should work with their primacy agencies to select treatment that most effectively reduces lead release from the service line and should also consider full LSL replacement as recommended earlier in this chapter. Also, as stated elsewhere in this document, the presence of other chemicals in the finished water such as aluminum, iron, manganese, and calcium may interfere with CCT and point to a need for additional studies and/or alternative control options.

Additional information on setting water quality parameters and dose for the treatment options is provided in Section 3.3.

Exhibit 3.3: Identifying the Appropriate Flowchart for Preliminary CCT Selection

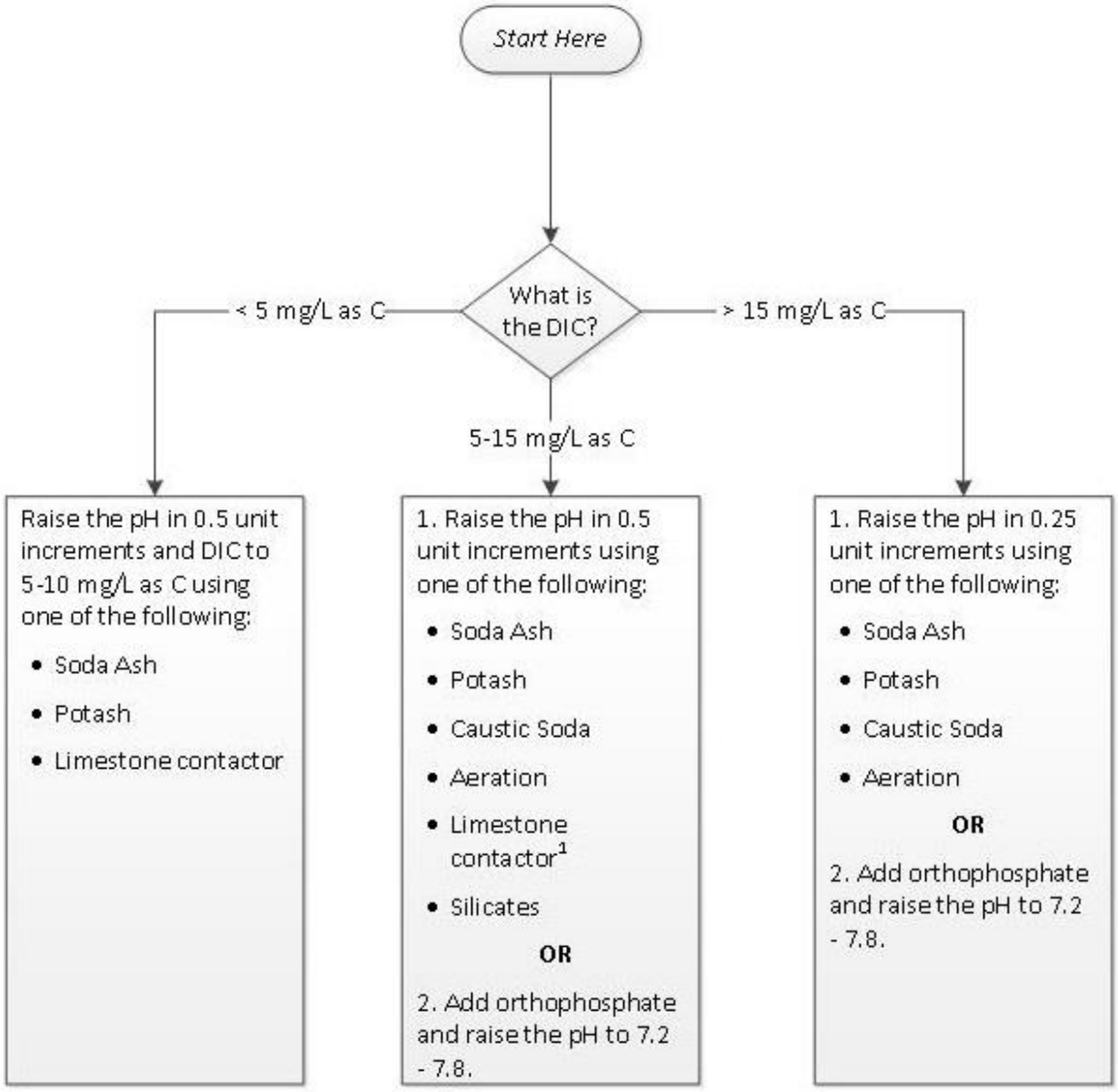
Is iron or manganese present in finished water?[1]	What is the contaminant to be addressed?	What is the finished water pH?	Use This Flowchart[2]
No	Lead only, or Both Lead and Copper	< 7.2	**1a**
		7.2 - 7.8	**1b**
		>7.8 - 9.5	**1c**
		>9.5	**1d**
	Copper only	< 7.2	**2a**
		7.2 - 7.8	**2b**
		>7.8	**2c**
Yes	Lead and/or Copper	< 7.2	**3a**
		≥ 7.2	**3b**

Notes:

[1] Flowcharts 3a and 3b present several treatment options for lead and copper that also reduce iron and manganese. Systems can also consider removing iron and manganese first, then using flowcharts 1a through 2c to control for lead and/or copper.

[2] As discussed in Section 3.1.1, the term "limestone contactor" generically identifies filtration processes where calcite-containing materials are used to add pH, alkalinity, and DIC to water.

Flowchart 1a: Selecting Treatment for Lead only or Lead and Copper with pH < 7.2

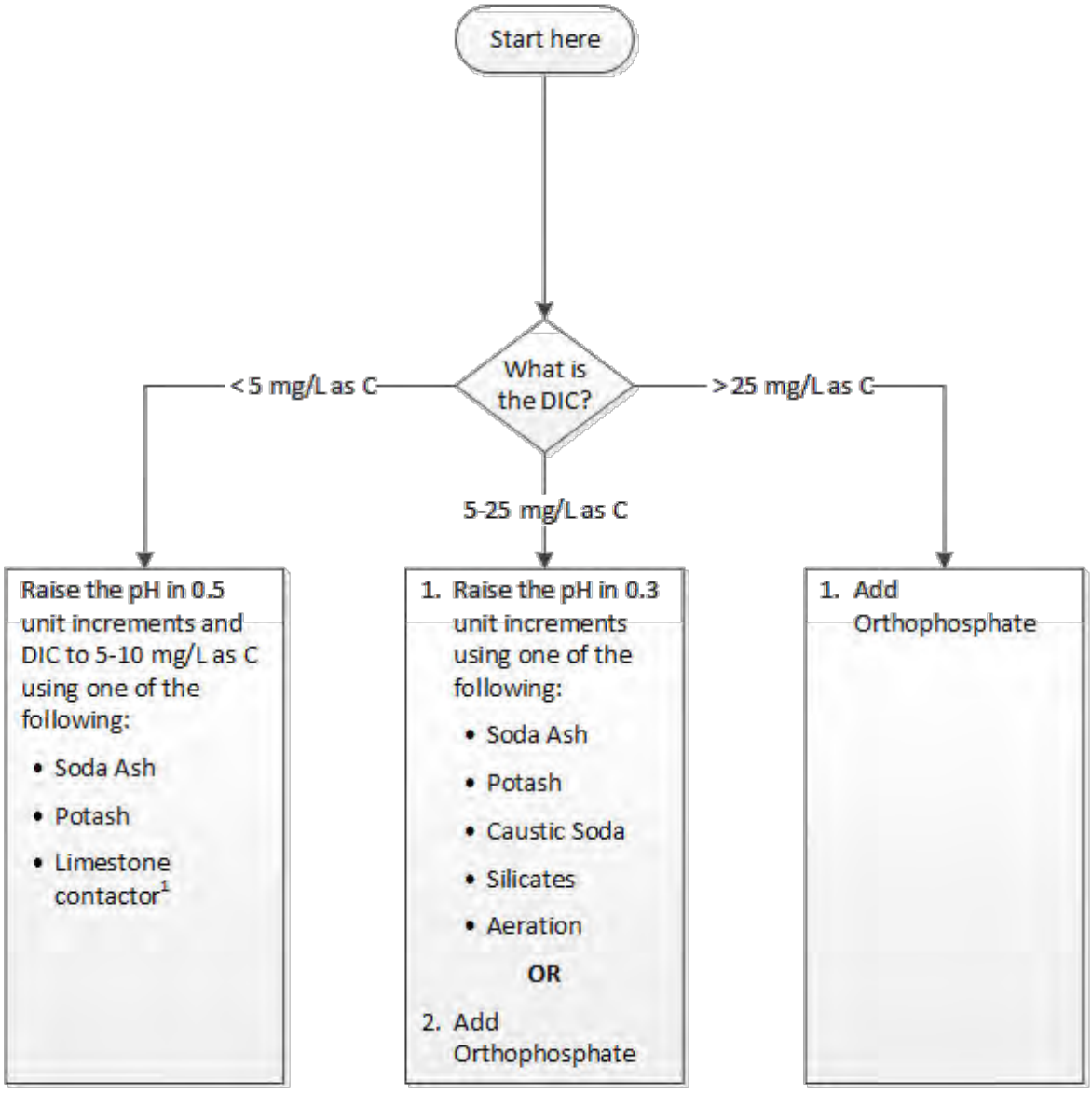


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K2CO3)
Soda ash = sodium carbonate (Na2CO3)

Footnotes:

1. Limestone contactors may not be appropriate when DIC > 10mg/L as C.

Flowchart 1b: Selecting Treatment for Lead only or Lead and Copper with pH from 7.2 to 7.8

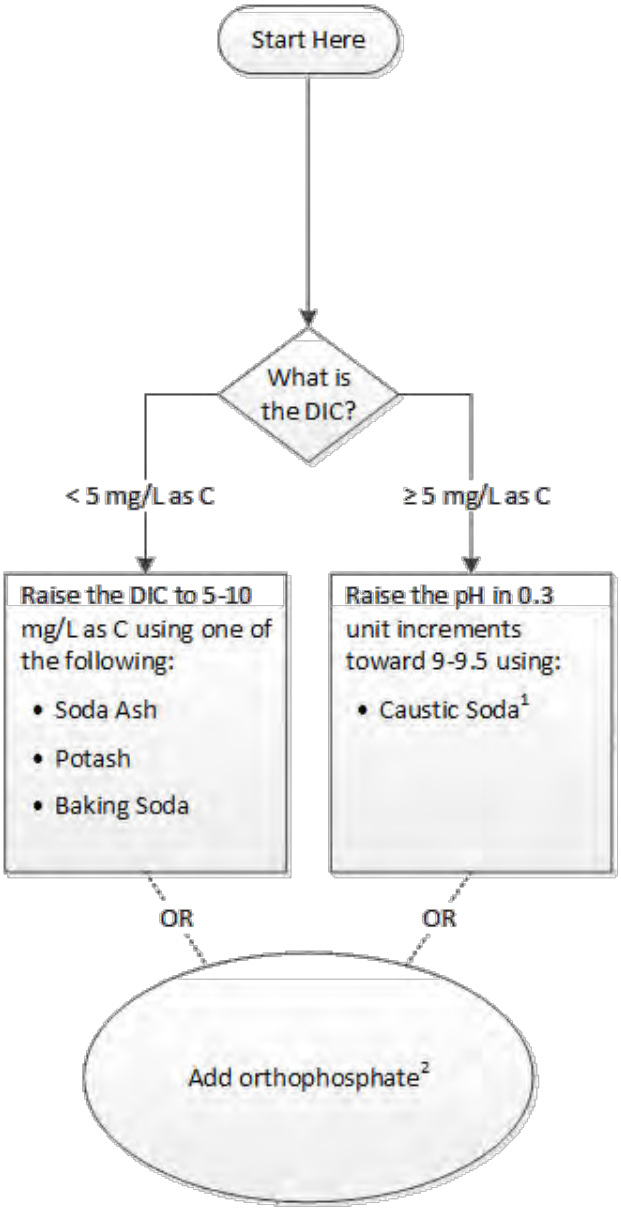


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

1. Carbon dioxide feed before the limestone contactor may be necessary.

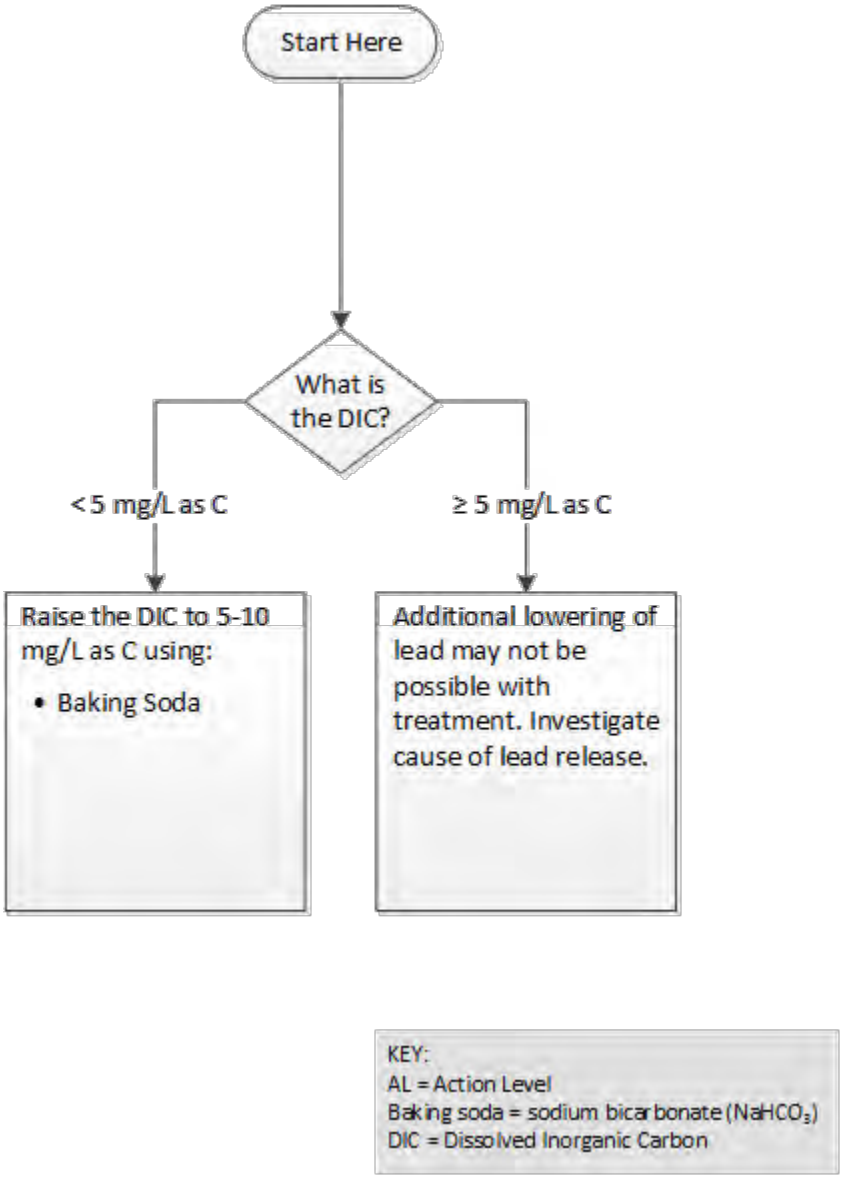
Flowchart 1c: Selecting Treatment for Lead only or Lead and Copper with pH > 7.8 to 9.5



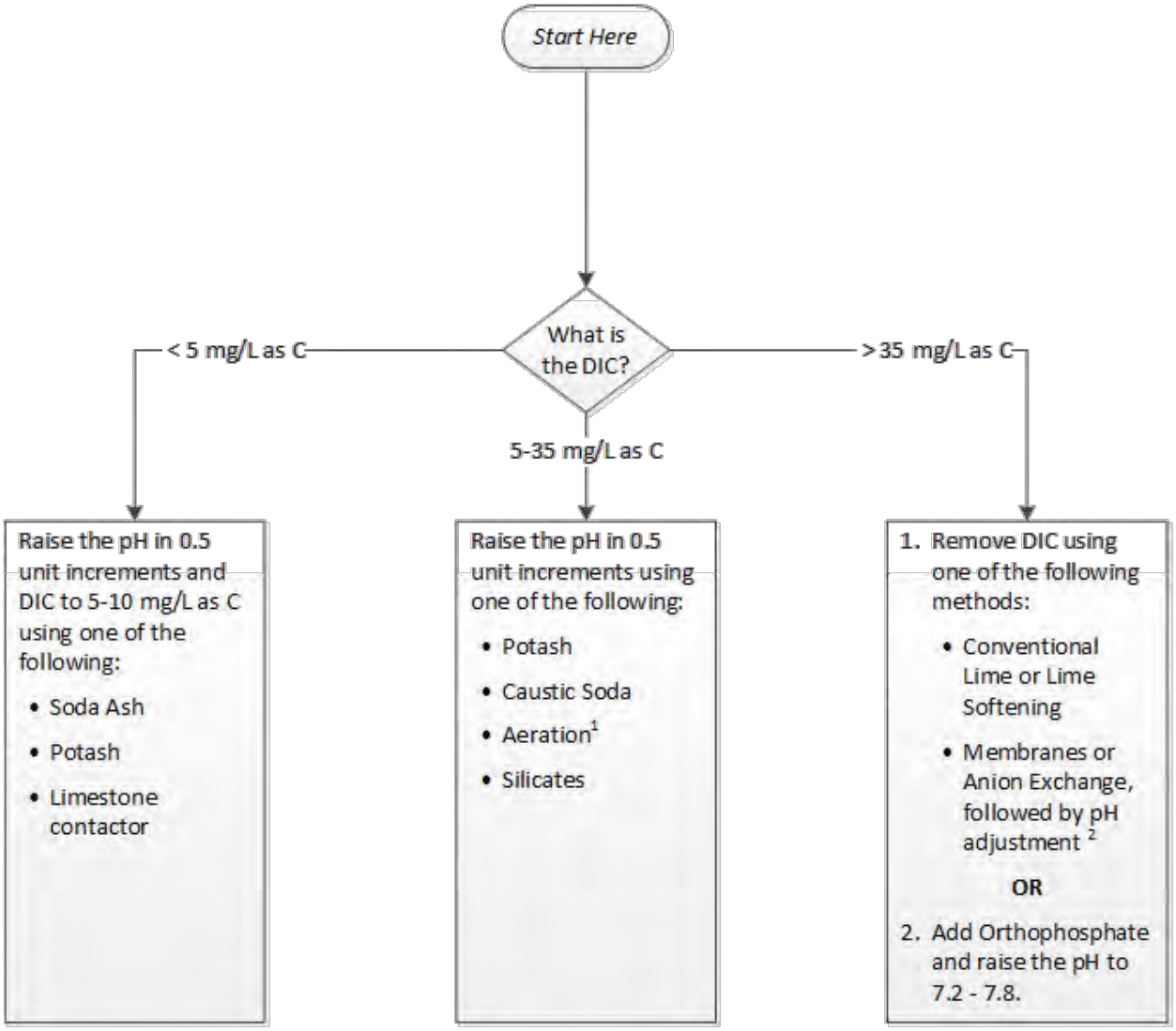
KEY:
AL = Action Level
Baking soda = sodium bicarbonate ($NaHCO_3$)
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:
1. Systems with copper plumbing may experience copper pitting problems when operating at pH 9 – 9.5 and DIC of 5 – 15. Orthophosphate may be a better option for these systems.
2. Optimal pH range for orthophosphate is 7.2 - 7.8 but phosphate may be effective at higher pH depending on dose. Orthophosphate effectiveness is lowest in the pH range of 8 – 8.5. Systems should also avoid this range because of inadequate buffering in the distribution system.

Flowchart 1d: Selecting Treatment for Lead only or Lead and Copper with pH > 9.5



Flowchart 2a: Selecting Treatment for Copper Only with pH < 7.2

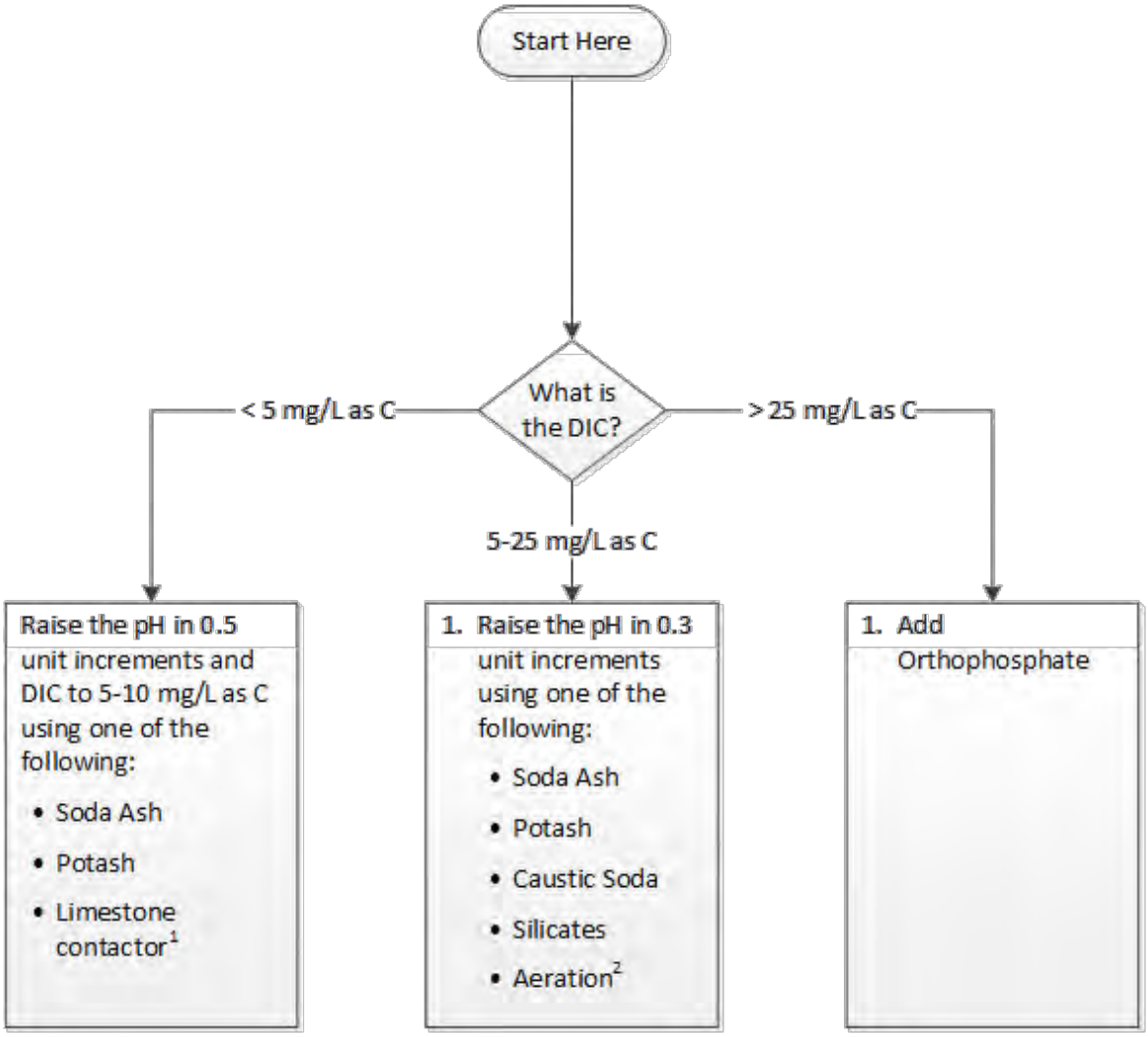


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

1. May be most appropriate at higher end of DIC range
2. To achieve optimal levels, consider treating less than 100 percent of the water (i.e., split stream).

Flowchart 2b: Selecting Treatment for Copper Only with pH from 7.2 to 7.8

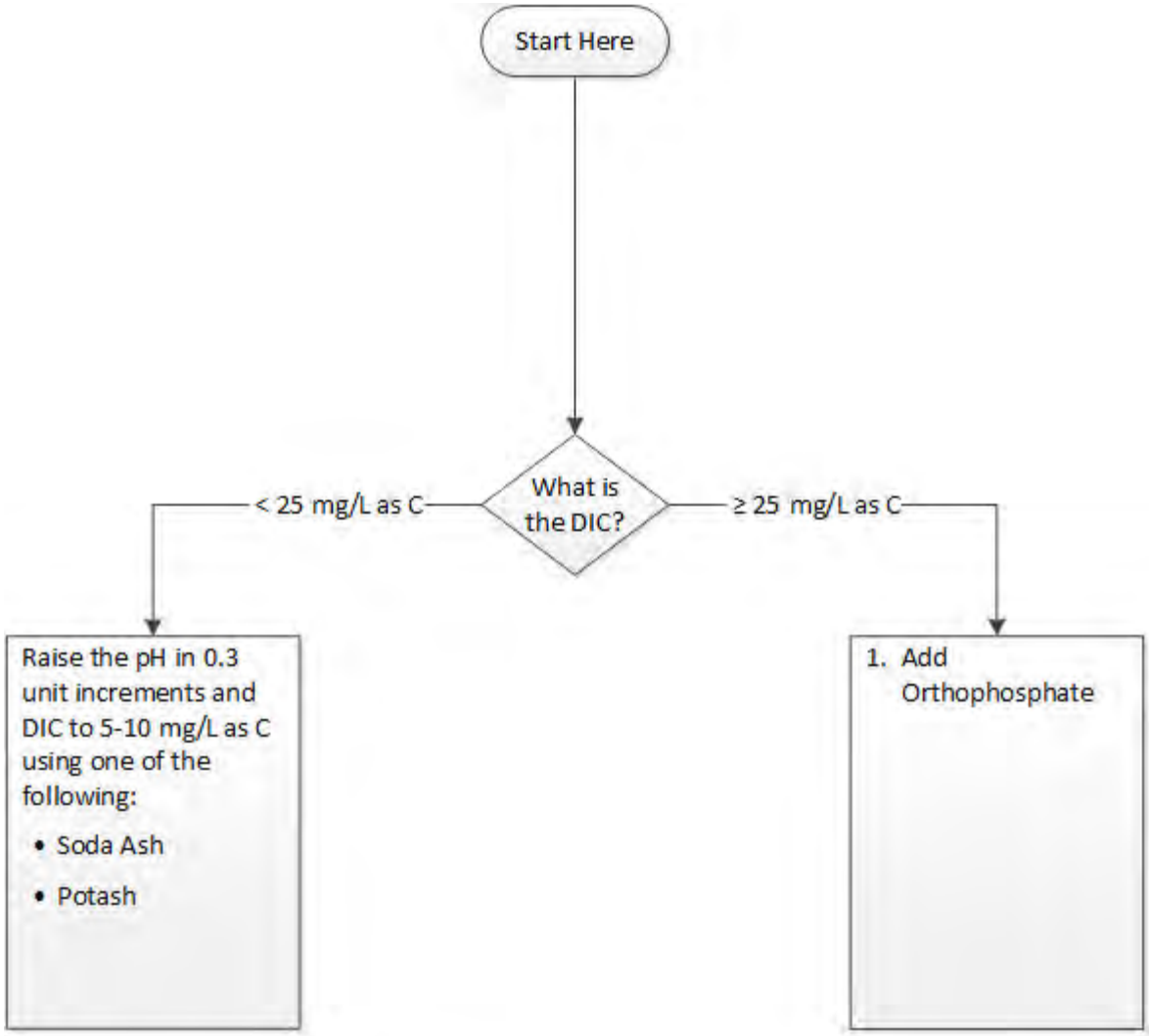


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

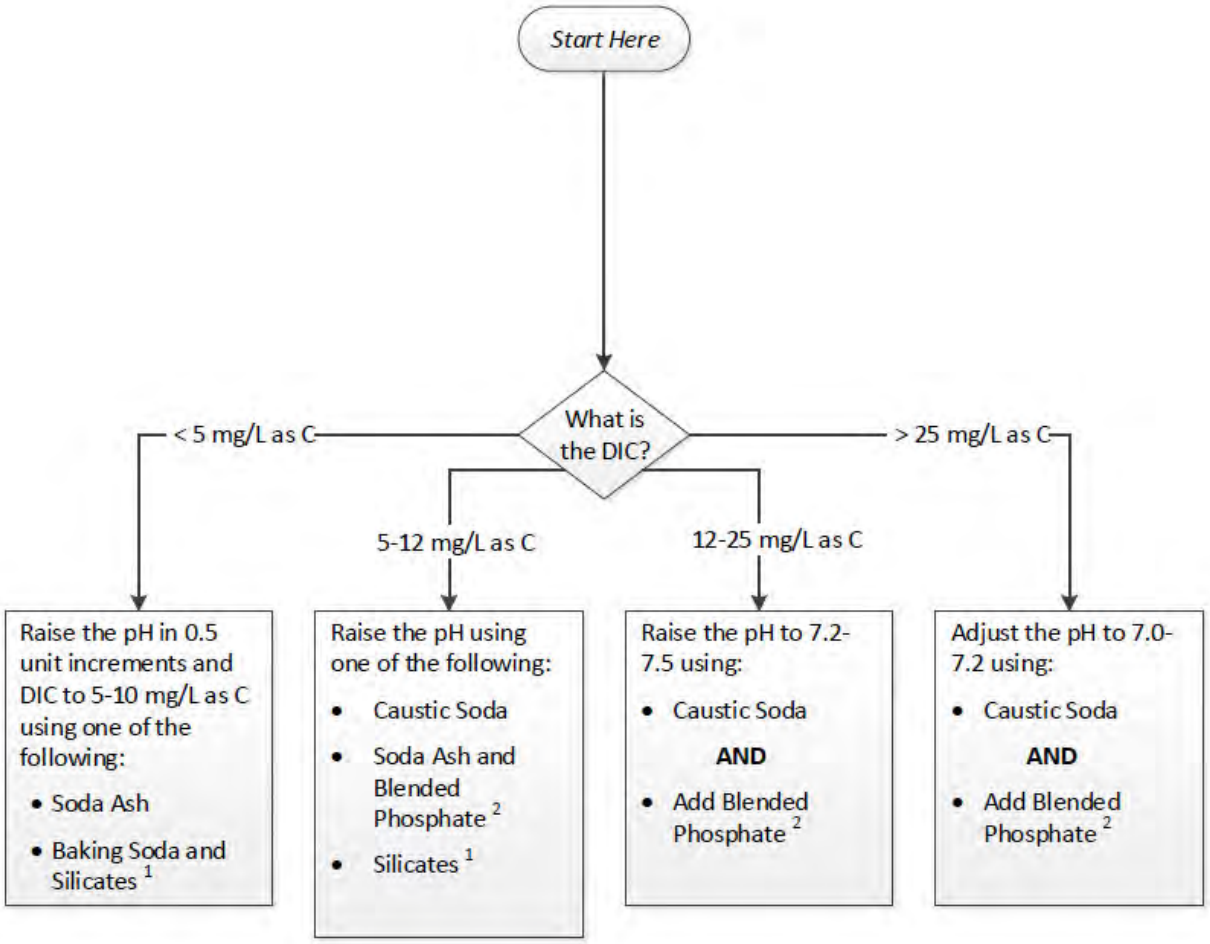
1. Carbon dioxide feed before the limestone contactor may be necessary.
2. May be most appropriate at higher end of DIC range

Flowchart 2c: Selecting Treatment for Copper Only with pH > 7.8



KEY:
AL = Action Level
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Flowchart 3a: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH < 7.2

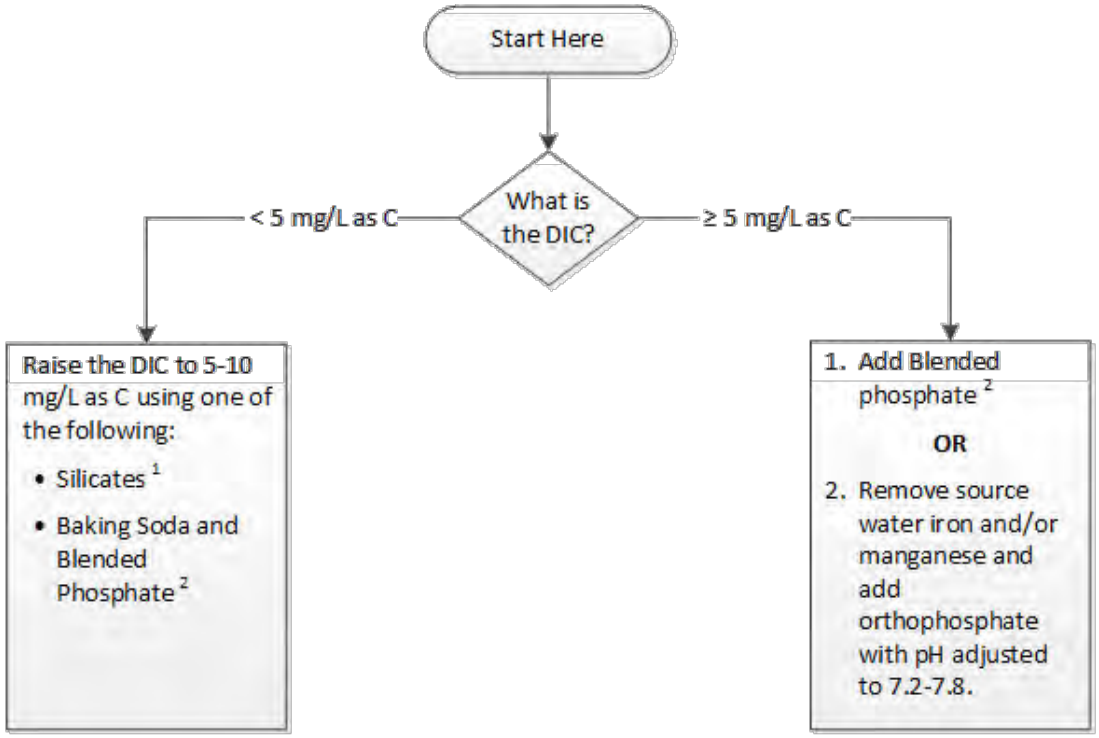


KEY:
AL = Action Level
Baking soda = sodium bicarbonate ($NaHCO_3$)
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

1. Silicates are most effective when combined iron and manganese concentrations are less than 1.0 mg/L.
2. The effectiveness of blended phosphate varies based on the formulation. Additional evaluation and/or monitoring is recommended. See Section 3.3.2 for additional discussion.

Flowchart 3b: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH ≥ 7.2



KEY:
AL = Action Level
Baking soda = sodium bicarbonate ($NaHCO_3$)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon

Footnotes:

1. Silicates are most effective when combined iron and manganese concentrations are less than 1.0 mg/L.
2. The effectiveness of blended phosphate varies based on the formulation. Additional evaluation and/or monitoring is recommended. See Section 3.3.2 for additional discussion. Blended phosphates are less effective for controlling copper at DIC greater than 25 mg/L as C.

3.2.4 Technical Recommendations for Identifying Possible Limitations for Treatment Options (STEP 4)

Once the treatment option(s) are selected from the flowcharts, review the information in this section to identify secondary impacts and possible constraints. Many of these constraints can be overcome with additional treatment modifications at the water treatment plant or wastewater treatment plant (WWTP). Observations and actions to address secondary impacts can be documented using Form E.2 in Appendix E.

Possible Limitations of pH/alkalinity/DIC Adjustment

Although many systems have successfully adjusted pH, alkalinity, and DIC to control lead and copper release, this corrosion control method has secondary impacts that may limit its use. Because silicate addition raises the pH of the water, secondary impacts for this treatment option are similar to the secondary impacts of raising pH for controlling lead and copper release.

Three factors that could limit the use of pH/alkalinity/DIC adjustment and silicates are: (1) optimal pH for other processes, particularly disinfection; (2) calcium carbonate precipitation; and (3) oxidation of iron and manganese. Observations and actions to address secondary impacts can be documented using Form E.2 in Appendix E.

(1) Optimal pH for other processes

Different treatment processes within the plant such as coagulation and disinfection have different target pH ranges. Determining the proper location to add a pH and/or alkalinity adjustment chemical should be considered in light of other process objectives.

Adjusting pH for corrosion control can affect disinfection performance and compliance with Surface Water Treatment Rules and possibly the Ground Water Rule (for those ground water systems that are required to provide 4-log virus inactivation). For systems that use chlorine for primary disinfection, increasing the pH prior to the chlorine contact chamber may reduce disinfection performance and require an increase in chlorine dose or contact time to meet the required CT.[22] For systems that consider contact time in the piping prior to the first customer as part of their CT calculation, a higher chlorine dose may be needed to meet CT. To minimize disinfection impacts, systems should adjust pH for corrosion control after CT has been achieved if possible. A system that plans to make a significant change to its disinfection practice to comply with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), such as a change in disinfectant type or process, must develop disinfection profiles and calculate disinfection benchmarks for *Giardia lamblia* and viruses (§§141.708-709).

[22] CT is chlorine concentration multiplied by contact time. Required CT for chlorine is very dependent on pH, with greater CT required at higher pH levels.

Changing the pH and/or alkalinity may also impact the ability of a system to maintain a disinfectant residual in the distribution system. In most cases however, increasing the pH for corrosion control can help maintain the disinfectant residual because the disinfectant will react at a slower rate with metals being released at the pipe surface.

Changes in pH can also affect formation of disinfection byproducts (DBPs). Total trihalomethanes (TTHM) formation tends to increase at higher pH levels, while formation of haloacetic acids (HAA5) tends to decrease. See the EPA Simultaneous Compliance Guidance Manual for the Stage 2 and LT2 Rules (USEPA, 2007b) for more information on how pH changes can impact DBP formation.

(2) Calcium Carbonate Precipitation

If the finished water has high hardness (specifically the calcium portion of hardness), raising the pH and DIC may cause calcium carbonate to precipitate in the distribution system, clogging hot water heaters and producing cloudy water. Calcium carbonate precipitation is site-specific and depends on many factors; therefore, a system evaluation should be conducted as described in Step 2 above.

If calcium carbonate precipitation is determined to be a potential problem, systems can take one of the following approaches:

- Choose a different CCT method such as using phosphate-based corrosion inhibitor,
- Remove DIC with ion exchange or membrane filtration, or
- Add softening to remove calcium.

(3) Oxidation of Iron and Manganese

Iron and manganese in oxidized form can agglomerate into larger particles causing aesthetic problems in water distribution systems, resulting in black and/or red water complaints. Dissolved oxygen and chemical oxidants such as chlorine may oxidize iron and manganese, and increasing the pH can increase the rate of oxidation. The two standard approaches for these situations are removing iron and manganese at the plant, or sequestering it. Wherever possible, removal of source water iron and manganese is the preferred approach. A common removal strategy is aeration or chlorination followed by filtration. Aeration will also raise the pH so this strategy may meet the system's goals of both iron and manganese removal and pH adjustment for reducing lead and copper release.

Sequestering agents such as polyphosphates and sodium hexametaphosphate may reduce black and/or red water complaints from iron and manganese oxidation, but may also cause increases in lead and copper levels measured at the tap (Schock, 1999; Cantor et al., 2000; Edwards and McNeil, 2002). Vendors often recommend blended phosphates as a lead and copper control strategy for systems with elevated iron and manganese. Blended phosphates include both polyphosphate and orthophosphate in different percentages. Blended phosphates

should be used with caution; see Section 3.3 for more information. Silicates can also be used to sequester iron and manganese depending on their concentration in the raw water (Schock et al., 1996; Kvech and Edwards, 2001).

Possible Limitations of Phosphate-Based Corrosion Inhibitors

Although phosphate-based corrosion inhibitors are used widely by water systems, there are limitations to their application. Two factors that could limit the use of phosphate-based corrosion inhibitors are: (1) reactions with aluminum; and (2) impacts on wastewater treatment plants. Observations and actions to address secondary impacts can be documented using Form E.2 in Appendix E.

(1) Reactions with Aluminum

Aluminum can occur in the distribution system as an impurity introduced with lime or when a system uses alum for coagulation. As noted in Section 2.3.9, aluminum can interfere with orthophosphate effectiveness by forming aluminum phosphate ($AlPO_4$) precipitates, which reduces the amount of orthophosphate available for lead and copper control. Aluminum phosphate precipitates can result in smaller pipe diameters, increased head-loss, and increased operational cost (AWWA, 2005). Although aluminum may also provide some protection of lead surfaces by forming films with hydroxide, silicate, or phosphate, these films are prone to sloughing when there are changes in flow or water quality or when LSLs are physically disturbed during routine maintenance and repair activities. These dislodged scales can release metals that may become entrapped in the interior (premise) plumbing, potentially increasing lead and copper levels in the water (Schock, 2007b).

(2) Impacts on Wastewater

Because of problems with nutrient enrichment of surface waters in the United States, there has been concern about adding phosphate-based corrosion inhibitors to drinking water because it will increase the phosphorus loading to the wastewater treatment plant. Some wastewater utilities have stringent limits on the amount of phosphorus that can be discharged to receiving waters and remove it at the plant using biological and/or chemical treatment. Regardless of the situation, it is important that systems communicate with wastewater treatment personnel and evaluate potential impacts of adding phosphate-based corrosion inhibitors before making the final treatment selection and setting the target dose.

Survey findings from 14 utilities showed that adding a phosphate-based corrosion inhibitor increased the phosphorus load to the wastewater treatment plant by 10 to 35 percent, with a median of 20 percent (Rodgers, 2014). Slightly less than half of the survey's respondents removed phosphorus at the WWTP (Rodgers, 2014). This percentage might increase in the future. Rodgers (2014) reported that in 2013, five states had statewide phosphorus limits for lakes and reservoirs.

Phosphorus can be removed at the WWTP using biological or chemical means. In the District of Columbia, the Blue Plains WWTP added more ferric chloride to chemically remove phosphorus after an orthophosphate corrosion inhibitor was added to drinking water; the additional cost was minor compared to their overall operations budget (Cadmus Group, 2004). Wastewater utilities can also use biological phosphorus removal or a combination of biological and chemical removal techniques.

Prior to selecting a phosphate-based corrosion inhibitor, water systems and primacy agencies should work with wastewater utility personnel to estimate the additional phosphorus load to the WWTP and assess if the load could cause the plant to exceed permit limits or cause other operational problems. Additional information on nutrient enrichment and phosphorus removal strategies can be found in EPA's Nutrient Control Design Manual (USEPA, 2010a).

Use of a zinc orthophosphate corrosion inhibitor can increase zinc loading to the WWTP. Schneider et al. (2011) noted that, based on three case studies, most of the zinc in zinc orthophosphate makes its way into the wastewater treatment stream. Although many systems have successfully used zinc orthophosphate for corrosion control, zinc can inhibit biological wastewater treatment processes, particularly nitrification and denitrification. Moreover, EPA has set limits for zinc in processed sludge that is land applied (USEPA, 2004b). Schneider et al. (2011) notes that "The results of the utility case studies indicate that release of zinc in wastewater residuals and/or receiving streams can be a concern for some utilities." Water systems and primacy agencies should work with wastewater utility personnel to determine if additional zinc loading may be an issue.

3.2.5 Technical Recommendations for Evaluating Feasibility and Cost (STEP 5)

Systems should consider operability, reliability, system configuration, and other site-specific factors when evaluating CCT alternatives. In cases where more than one treatment option can meet the OCCT definition of the rule,[23] systems may want to consider cost factors including costs for capital equipment, operations, and maintenance.

3.3 Setting the Target Dose and Water Quality

This section provides technical recommendations on setting the target dose and water quality for pH/alkalinity/DIC adjustment, phosphate-based corrosion inhibitors, and silicate inhibitors. Note that the recommendations provided in this section are intended as generalized guidelines for the reader's reference. The characteristics of individual systems (e.g., water quality, distribution system configuration, sources of lead and copper, etc.) may warrant considering other values that are distinct from those provided below. For these reasons, they should not be interpreted or prescribed as default minimums and/or maximums.

[23] As noted in Chapter 1 and Appendix A, the LCR defines OCCT as "the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations." (§141.2)

3.3.1 pH/Alkalinity/DIC Adjustment

As explained previously, the pH, alkalinity, and DIC of the water have a significant influence on lead and copper release. As a reminder, these three parameters are interrelated – if you know two of them, you can estimate the third using the table in Appendix B. The following discussion provides technical recommendations for determining the target pH, alkalinity, and DIC when controlling for lead only or lead and copper, or when controlling for copper only.

To Control for Lead Only or Lead and Copper

The following technical recommendations can assist with the establishment of target pH, alkalinity, and DIC ranges for controlling lead only, or both lead and copper release in drinking water systems. Note that in general, lower pH levels can be used when controlling only for copper release – see the next section for guidelines for those systems that do not have a lead release problem but are targeting copper corrosion control only. Note also that the guidelines below are based on formation of adherent lead carbonate scales based on Pb(II) chemistry[24].

- The target pH should be **8.8 to 10**. Systems with lead service lines that are not using a corrosion inhibitor should consider increasing the pH to **9.0 or greater**. Note that lower pH values, particularly between 8.2 and 8.5, can result in poor buffer intensity of the water (regardless of DIC levels) and wide swings in distribution system pH. See Section 2.3.4 for additional discussion of buffer intensity.

- Sufficient alkalinity and DIC are needed to form the protective scale and provide buffer intensity, but too much can solubilize lead. These factors should be considered when determining a target alkalinity/DIC range. The graph in Exhibit 2.3 can be used to evaluate the effect of DIC on buffer intensity and identify a minimum DIC range for the system's target pH. In general, the higher the pH is in the 8.8 to 10 range, the less DIC is needed to buffer the water. Information on the relationship between DIC and lead solubility is provided in Schock and Lytle (2011) for a modeled water. Lead solubility increases (i.e., more lead is released into the water) with increasing DIC concentrations above approximately 20 mg/L (as C). Schock and Lytle (2011, Figure 20-21) show minimum lead solubility at DIC between 5 and 10 mg/L as C.

As a reminder, increasing the pH to 8.8 – 10 may cause calcium carbonate precipitation if calcium is present, see Section 3.2.2 for additional discussion.

To Control for Copper Only

Adjustment of pH/alkalinity/DIC for copper control can generally be achieved at a lower target pH (as low as 7.8) than the pH needed for lead control. Copper corrosion can be controlled at even lower pH levels (i.e., between 7.0 and 7.8), but alkalinity and DIC become the limiting factors. Schock and Lytle (2011) note that hard, high alkalinity ground waters are often

[24] For more information on Pb(II) chemistry and also influences of Pb(IV) scale, see Sections 2.2.1 and 2.3.6.

aggressive towards copper and hard to treat with pH adjustment because of calcium carbonate precipitation potential. These waters may not be candidates for pH/alkalinity/DIC adjustment and warrant considering orthophosphate or possibly removal of DIC through ion exchange, membranes, or aeration.

3.3.2 Phosphate-Based Inhibitors

The effectiveness of orthophosphate treatment depends on many factors, including phosphate dose, pH, DIC, and other constituents in the water (e.g., aluminum, iron, manganese). As noted earlier, polyphosphates alone should *not* be used to treat for lead and copper; they are mainly used to sequester iron and manganese. Special considerations for use of blended phosphates are provided at the end of this section.

Conventional wisdom is that orthophosphate treatment for controlling lead and copper should target residual concentrations of **0.33 to 1.0 mg/L as P** (1.0 to 3.0 mg/L as PO_4)[25] at the tap when pH is within the range of **7.2 to 7.8**. ***Higher orthophosphate doses*** (1.0 to 1.2 mg/L as P, or 3 to 3.5 mg/L PO_4 and higher) may be needed under the following circumstances:

- To control lead release from LSLs.
- To control copper corrosion from new copper pipe in high DIC water.
- To mitigate copper pitting in some water qualities.
- If the system has aluminum carry-over from alum coagulation and/or presence of iron, manganese, and/or magnesium in finished water.

While the pH range of 7.2 to 7.8 is still considered optimal, systems ***should not*** automatically reduce the pH of their water if it is 8 or higher when starting orthophosphate treatment. Orthophosphate may be effective at pH as high as 9, although dose requirements may not be the same as for pH from 7.2 to 7.8. Laboratory results suggest that less effective control of lead release occurs between pH 8 and 8.5 than either above or below that range (Schock et al., 1996; Miller, 2014). Systems should therefore avoid operating between pH 8 and 8.5, if possible, to control for lead release. For copper, orthophosphate effectiveness is not strongly affected by pH when pH is between 7 and 8; dose is much more important.

Systems and primacy agencies should also consider the DIC of finished water when determining the target orthophosphate dose. In general, orthophosphate is more effective at low DIC (<10 mg C/L). Also, the pH is less important for lead control in low DIC waters.

Note that the target orthophosphate concentration is the level needed to control corrosion in ***premise plumbing***. Because orthophosphate will react with metals and other compounds, the concentration leaving the treatment plant may need to be higher to achieve the target

[25] Note that these concentrations are a general point of reference; they are not intended to be interpreted or universally prescribed as default minimums or maximums. Characteristics of individual systems (e.g., water quality, distribution system configuration, sources of lead and copper, etc.) may warrant consideration of other target concentrations, distinct from those provided above. Systems may also benefit from supplemental diagnostic monitoring to verify optimization.

concentration at the tap. In particular, aluminum (e.g., that was carried over from alum coagulation) can react with orthophosphate and reduce the amount available in premise plumbing. During start-up, systems should be prepared to adjust the dose at the treatment plant to meet the target dose at the tap throughout the distribution system. See Chapter 5 for additional recommendations on start-up of orthophosphate treatment.

Some systems have started orthophosphate treatment using a higher passivation dose, followed by a lower maintenance dose for long-term treatment. Hill and Cantor (2011) recommend that the passivation dose be 2 to 3 times higher than the target maintenance dose in order to build up a protective film as quickly as possible. The amount of time needed for the initial passivation dose to form adequate scale is unknown, and will vary depending on the system's specific water quality. Lead levels may continue to decline for years after an optimal orthophosphate dose has been applied, due to the slow rate of scale formation.

Systems with LSLs should evaluate whether the orthophosphate dose is enough to passivate disturbed LSLs in a timely manner. Routine maintenance or repairs such as water main replacements, meter installations, service line and shut-off valve replacements, and leak repairs may disrupt LSL scales and result in high lead levels. When evaluating the success of OCCT, systems and primacy agencies should consider the impact of these physical disturbances on lead levels at the tap (Del Toral et al., 2013). In addition, when establishing a maintenance dosage, it is important to consider other factors such as homes with chronically low water use that have LSLs. Ongoing diagnostic monitoring at these sites before and after treatment installation or adjustment can provide useful information for establishing a proper maintenance dose.

Special Consideration for Blended Phosphates

Blended phosphates have been used for corrosion control and to sequester iron and manganese. Blended phosphates have been shown to be effective for reducing lead levels; however, the lead corrosion scale may not be as robust as the scale created by orthophosphate and, thus, may be more susceptible to physical disturbances and low water use conditions (Del Toral et al., 2013; Wasserstrom et al., 2017). It is unclear if blended phosphates work well to control copper corrosion, especially at high alkalinities.

The effectiveness of blended phosphates cannot be based on the orthophosphate concentration in the blend for the following reasons:

- Blended phosphates control corrosion by creating a barrier film from the interaction of calcium and aluminum in the bulk water with phosphorus containing compounds (Wasserstrom et al., 2017). Thus, calcium and aluminum play a role in effectiveness.

- If the polyphosphate portion of the blend has a high affinity for sequestering lead or copper, it may counteract the benefit of the orthophosphate portion in forming solid lead and copper compounds.

The percent of orthophosphate in the blend can vary widely (from 5 to 70 percent (Hill and Cantor, 2011)). Blended phosphate should contain a minimum orthophosphate concentration of 0.5 mg/L as P (1.5 mg/L as PO_4) as a starting point for evaluation. The orthophosphate ratio in the blend and/or the dose may need to be increased to provide adequate lead control. In some cases, however, simply adding more blended phosphate may not be effective because, if there is excess polyphosphate available beyond what is bound up with other constituents in the water, it can sequester the lead and copper. EPA recommends a demonstration study, additional monitoring, or both for systems that recommend blended phosphates to control lead release.

3.3.3 Silicate Inhibitors

The effectiveness of silicate inhibitors depends on silicate level, pH, and DIC of the water. Adding silicates can raise the pH, so lead and copper level reductions may occur due to an increase in pH as well as passivation. In addition to providing lead and copper control, silicates can sequester iron and manganese if the levels of these constituents are not too high (not greater than 1 mg/L combined) (Schock et al., 1996; Schock, Lytle, et al., 2005).

Many systems have not considered silicate inhibitors for lead and copper control due to the lack of research and field information proving its effectiveness, the estimated operating costs and high dosage rates required, and the time it takes to reduce lead concentrations (Hill and Cantor, 2011).The literature does report a successful case study for a small system in Massachusetts that instituted chlorination and sodium silicate addition in three wells to address LCR compliance and intermittent red water problems (Schock, Lytle, et al., 2005). An initial silicate dosage rate of 25-30 mg/L was effective for reducing lead and copper levels by 55 and 87 percent, respectively, and raised the pH from 6.3 to 7.1. LCR compliance was achieved when the silicate dosage rate was increased to 45-55 mg/L at two wells which raised the pH to 7.5. In another study, Vaidya (2010) found that sodium silicate significantly reduced lead and copper release in bench-scale studies using coupons from 30 to 35-year-old distribution pipes.

Relatively high silicate doses (in excess of 20 mg/L) may be required to control lead release (Schock, Lytle, et al., 2005). A startup dose of 24 mg/L is recommended, followed by a gradual reduction after 60 days to a maintenance dose of 8 to 12 mg/L (Schock and Lytle, 2011; Hill and Cantor, 2011). Chloride, calcium, and magnesium concentrations in the water can affect the optimum dose (Hill and Cantor, 2011). A review of several case studies and literature reports suggested that a pre-existing layer of corrosion products on the pipes was required in order for silicate to properly form a protective layer, at least in copper pipes (LaRosa-Thompson et al., 1997). Similar to phosphate-based inhibitors, it is important to maintain continuous dosing of the silicate inhibitor to ensure effective corrosion control.

Chapter 4: Review of Corrosion Control Treatment Steps under the LCR

Corrosion control treatment (CCT) requirements under the Lead and Copper Rule (LCR) differ depending on the system size (i.e., population served). Most systems serving more than 50,000 people were required to meet a series of deadlines beginning in 1993 to determine optimal corrosion control treatment steps (OCCT) and install OCCT by January 1, 1997.[26] Any system that served 50,000 or fewer people at the time of the LCR, but that grew in population or combined with another system so that they now serve more than 50,000 people (called systems ***newly*** serving more than 50,000 people for the purposes of this document) must also complete CCT steps. Because the regulatory deadlines for systems serving more than 50,000 people have passed, systems newly serving 50,000 people must follow the schedule for systems serving 3,301-50,000 people.[27] Systems serving 50,000 or fewer people are not required to conduct CCT steps under the LCR unless they exceed the lead and/or copper action level (AL).

This chapter presents a review of CCT steps as required by the LCR along with additional technical recommendations to systems and primacy agencies for the following categories of systems:

- Those serving 50,000 or fewer people that exceed the lead and/or copper AL (Section 4.1).
- Systems newly serving more than 50,000 people (Section 4.2).
- Existing systems serving more than 50,000 people that previously installed CCT but have subsequent action level exceedances (Section 4.2).

Chapter 5 follows with a review of LCR requirements and provides additional technical recommendations for CCT installation, startup, follow-up monitoring, and long-term corrosion control monitoring.

These sections are supported by the following appendices:

- Appendix D contains forms that can be used by systems to submit water quality data and system information to the primacy agency.
- Appendix E contains OCCT recommendation forms for systems serving 50,000 or fewer people.
- Appendix F summarizes tools available for conducting a corrosion control study.

Systems and primacy agencies can use the ***OCCT evaluation templates*** to complete many of the tables in the appendices related to their OCCT determination. The templates also provide an

[26] All systems serving more than 50,000 people are required to conduct CCT steps unless they are deemed to have optimized corrosion control under §141.81(b)(2) or (b)(3).

[27] The schedule for completing CCT was clarified in the guidance manual, *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (USEPA, 2010b) as footnote 1 in Exhibit I-1. It specifies that a "system whose population exceeds 50,000 after July 1, 1994, must follow the schedule for medium-size systems, beginning with the requirement to complete a corrosion control study."

opportunity for primacy agencies to customize forms and to enter specific dates for compliance milestones. As a reminder, requirements in this section are based on the LCR as of the date this document was published.

4.1 Corrosion Control Treatment Steps for Systems Serving ≤ 50,000 People

Exhibit 4.1 summarizes the required CCT actions and deadlines when a system serving 50,000 or fewer people exceeds the lead and/or copper action level. The column furthest to the right shows the related section or Chapter where relevant technical recommendations are provided for the system or primacy agency.

It is important to note that in accordance with the LCR, systems serving 50,000 or fewer people have no more than ***6 months*** from the end of the monitoring period in which they had the AL exceedance to recommend OCCT to their primacy agency. The primacy agency then determines if a study is needed. If a study is not required, the primacy agency designates the OCCT within 24 months from the end of the monitoring period in which the system had the AL exceedance for those serving 3,300 or fewer people or within 18 months for those serving 3,301 to 50,000 people. If the primacy agency requires a study, the system must complete the study within 18 months after the primacy agency required the study to be conducted, after which the primacy agency designates the OCCT.

Also note that in accordance with the LCR, systems serving 50,000 or fewer people can discontinue the steps outlined in Exhibit 4.1 whenever their 90th percentile levels are at or below both ALs for two consecutive six-month monitoring periods. However, if these systems then exceed the lead or copper AL, they must recommence completion of the applicable CCT steps beginning with the first treatment step that was not completed in its entirety. The primacy agency may require a system to repeat treatment steps previously completed by the system where the Agency determines that this is necessary to properly implement the treatment requirements.

Exhibit 4.1: Review of CCT Requirements and Deadlines for Systems Serving ≤ 50,000 People (§141.81(e))

Requirement	Timetable for Completing Corrosion Control Treatment Steps[1]	Section Where Technical Recommendations Can Be Found
STEP 1: System exceeds the lead or copper action level (AL).		
STEP 2: System recommends OCCT.	Within 6 months[2]	Section 4.1.1
STEP 3: Primacy agency decides whether system must perform a corrosion control study. If system must conduct a corrosion control study, go to Step 5. If not, go to Step 4.	Within 12 months[2]	Section 4.1.2
STEP 4: Primacy agency designates OCCT for systems that were not required to conduct a study. Go to Step 7.	• Within18 months[2] for systems serving 3,301-50,000 people • Within 24 months[2] for systems serving ≤ 3,300 people	Section 4.1.3
STEP 5: System completes corrosion control study.[3]	Within 18 months after primacy agency requires that such a study be conducted	Section 4.1.4
STEP 6: Primacy agency designates OCCT.[3]	Within 6 months after completion of Step 5	Section 4.1.5
STEP 7: System installs OCCT.	Within 24 months after the primacy agency designates such treatment	Section 5.1
STEP 8: System conducts follow-up sampling for 2 consecutive 6-month periods.	Within 36 months after the primacy agency designates OCCT	Section 5.2
STEP 9: Primacy agency designates OWQPs.[4]	Within 6 months after completion of Step 8	Section 5.3
STEP 10: System conducts continued WQP and lead and copper tap sampling.	The schedule for required monitoring is based on whether the system exceeds an AL and/or complies with OWQP ranges or minimums	Section 5.4

Notes:

[1] Systems serving 50,000 or fewer people can discontinue these steps whenever their 90th percentile levels are at or below both action levels for two consecutive six-month monitoring periods. However, if these systems then exceed the lead or copper action level, they must recommence completion of the applicable CCT steps.

[2] The required timetable (i.e., number of months) for completing Steps 2, 3, and 4 represent the number of months after the end of the monitoring period during which the lead and/or copper action level was exceeded in Step 1.

[3] These steps only apply to systems that were required to conduct a corrosion control study.

[4] If a small or medium system has installed corrosion control treatment, the primacy agency is obligated to fulfill Step 9. The primacy agency shall review the system's installation of treatment and designate optimal water quality parameters within 6 months after completion of Step 8, in accordance with 141.81(e)(7) and 141.82(f).

4.1.1 System Serving ≤ 50,000 People Makes OCCT Recommendation (STEP 2)

The LCR does not specify precisely how systems serving ≤ 50,000 are required to develop their OCCT recommendation. To help systems evaluate CCT alternatives and make their recommendation, EPA has provided technical information and recommendations in Chapter 3. Systems can use the forms in Appendix D to organize water quality data and other information and forms in Appendix E to document the results of their assessment and submit their data and recommendation to the primacy agency. Note that primacy agencies may also require a system to collect additional data/information under §141.82(a).

4.1.2 Primacy Agency Determines Whether a Study Is Required for System Serving ≤ 50,000 People (STEP 3)

Primacy agencies should review the data provided by the system (using forms in Appendices D and E) for completeness. If data are not sufficient to make a CCT determination, the primacy agency can request additional information from the system.

Once primacy agencies have reviewed the data and OCCT recommendation, they should determine if a study is needed. Exhibit 4.2 provides a checklist to support the primary agency in determining whether or not to require a CCT study. If more than two questions are answered "Yes," the primacy agency should consider requiring a study. Importantly, as stated in EPA's LCR guidance, EPA recommends that primacy agencies require all systems with ***lead service lines*** to conduct a corrosion control study.

If the primacy agency does not require a study, their next step is to designate OCCT (go to Section 4.1.3). Section 4.1.4 provides technical recommendations to support primacy agencies in the event that a corrosion control study is required.

Exhibit 4.2: Recommended Checklist to Support Determination of the Need for a CCT Study for Systems Serving ≤ 50,000 People

Category	Question	Response (YES or NO)
Presence of LSLs	Does the System have lead service lines?[1]	
pH stability	Is the range of pH values measured at the Entry Point > 1.0 pH units (Range = Max entry point pH – Min entry point)?	
	Is the range of pH values measured in the Distribution System > 1.0 pH units (Range = Max pH – Min pH)?	
Iron Deposition Potential	Is average Entry Point iron > 0.3 mg/L?	
	Is average Distribution System iron > 0.3 mg/L?	
Manganese Deposition Potential	Is average Entry Point manganese > 0.05 mg/L?	
	Is average Distribution System manganese > 0.05 mg/L?	
Calcium Carbonate Deposition Potential	Is average Hardness > 150 mg/L as $CaCO_3$? *Entry point of distribution system values may be used.*	
Chloride-to-Sulfate Mass Ratio (CSMR) Issues	Is the CSMR for either Entry Point or Distribution System data > 0.6? *Use Average Chloride Level divided by the Average Sulfate Level.*	
Source Water Changes in the Future	Did the system indicate that there may be source water changes in the future?	
Treatment Process Changes	Did the system indicate that there may be treatment process changes in the future including changes in coagulant?	

Note:
[1] If the system has LSLs, EPA guidance recommends the primacy agency require a study.

4.1.3 Primacy Agency Designates OCCT for System Serving ≤ 50,000 People (STEP 4)

As stated in the LCR, if the primacy agency determines that a study is not required, they must either approve the OCCT option recommended by the system or designate alternative CCT(s) from among those listed in §141.82(c)(1) (§141.82(d)). They must do this ***within 18 months*** after the end of the monitoring period during which the system exceeds the lead or copper AL for systems serving more than 3,300 people, ***and within 24 months*** for systems serving 3,300 or fewer people. Primacy agencies can use information in Chapters 2 and 3 to help make this determination.

The primacy agency must notify the system of its OCCT decision in writing and explain the basis for the determination (§141.82(d)(2)). The primacy agency should work closely with the system to determine the implementation approach and follow-up monitoring (See Chapter 5 for technical recommendations).

4.1.4 System Serving ≤ 50,000 People Conducts Corrosion Control Study (STEP 5)

As stated in the LCR and summarized in Exhibit 4.1, systems are required to complete the corrosion control study ***within 18 months*** of the primacy agency's determination that a study is required. Exhibit 4.3 summarizes corrosion control study requirements for systems from the LCR. Following the exhibit are: (1) technical recommendations for primacy agencies on what type of study to require; (2) technical recommendations for systems on study tools and other considerations; and (3) technical recommendations for systems on corrosion control study reporting.

Exhibit 4.3: Corrosion Control Study Requirements[1]

Corrosion Control Study Component	LCR Requirements
Corrosion Control Study Tools	Systems must evaluate the effectiveness of each CCT specified in §141.82(c)(1) and, if appropriate, combinations of treatments using either pipe rig/loop tests, metal coupon tests, partial-system tests, or analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration (§141.82(a) and (c)(2)).
Monitoring Requirements	Systems must measure the following water quality parameters in any tests before and after evaluating the CCTs: Lead, copper, pH, alkalinity, calcium, conductivity, orthophosphate (when an inhibitor containing a phosphate compound is used), silicate (when an inhibitor containing a silicate compound is used), and water temperature (§141.82(c)(3)).
Identification of Constraints	Systems must identify all chemical or physical constraints that limit or prohibit the use of a particular CCT and document such constraints with at least one of the following (§141.82(c)(4)): • Data and documentation showing that a particular CCT has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or • Data and documentation demonstrating that the water system has previously attempted to evaluate a particular CCT and has found that the treatment is ineffective or adversely affects other water quality treatment processes.
Effects on Other Treatment Processes	Systems must evaluate the effect of the chemicals used for CCT on other water quality treatment processes (§141.82(c)(5)).
Reporting	On the basis of an analysis of the data generated during each evaluation, the water system must recommend to the primacy agency in writing the treatment option that the corrosion control studies indicate constitutes OCCT for that system. Systems must provide a rationale for their recommendation along with all supporting documentation (§141.82(c)(6)).

Note:

[1] Corrosion control studies may be required by the primacy agency. If they are, specific requirements for conducting the studies apply regardless of system size. They are from the LCR and are current as of the date of this publication.

(1) Technical Recommendations Regarding Type of Corrosion Control Study

There are several potential approaches to a CCT study. A study can be approached as a "desktop study" based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration, or a "demonstration study" using at least one of the following study tools: pipe rig/loop tests, metal coupon tests, or partial system tests. Systems serving 50,000 or fewer people may be able to satisfy CCT study requirements by performing a desktop study of analogous systems. Exhibit 4.4 provides a recommended checklist for primacy agencies to use when evaluating case-specific factors that may warrant requiring those systems to perform a demonstration study instead.

Exhibit 4.4: Recommended Checklist to Support Primacy Agency Determination of When to Require a Demonstration Study for Systems Serving ≤ 50,000 People

Question	Response (YES or NO)	Recommended Next Step
1. Does the system serve more than 10,000?		If **Yes**, consider requiring a ***demonstration study***. If **No**, continue to question 2.
2. Are lead service lines present in the system?		If **Yes**, consider requiring a ***demonstration study***. If **No**, continue to questions 3-5.
3. Does the system have multiple sources of water?		If the answer to any of these questions is **Yes**, consider requiring a ***desktop study***.
4. Is the system planning future treatment changes?		
5. Is the system planning future source water changes?		

(2) Corrosion Control Study Tools

Appendix F describes tools that can be used for conducting desktop and demonstration corrosion control studies. It includes the study tools required by the rule (analyses based on documented analogous treatments (desktop study); or pipe rig/loop tests, metal coupon tests, or partial-system tests (demonstration studies)) – along with other tools such as pipe scale analysis and models that can be used to supplement the requirements. The appendix is not meant to be exhaustive – other tools might also be useful for determining the most effective CCT for the system.

Note that systems conducting desktop studies must at a minimum evaluate ***analogous treatments at other systems*** of similar size, water chemistry, and distribution system configuration to meet the corrosion control study requirements of the LCR.

(3) Corrosion Control Study Reporting

The system must provide the primacy agency with its recommended OCCT option along with the rationale for its recommendation and supporting documentation as described §141.82(c)(1) – (6). The system must also identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment and document such constraints with at least one of the following (§141.82(c)(4) and (c)(6)):

- Data and documentation showing that a particular CCT has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or

- Data and documentation demonstrating that the water system has previously attempted to evaluate a particular CCT and has found that the treatment is ineffective or adversely affects other water quality treatment processes.

The system must also evaluate the effect of the chemicals used for CCT on other water quality treatment processes (§141.82(c)(5) and (c)(6)).

EPA recommends that the system submit to the primacy agency a report that includes the required information identified above and additional data and analyses as follows:

- Options for addressing identified constraints, so that the system would be able to achieve and maintain OCCT, meet other water quality goals, and remain in compliance with all applicable drinking water regulations.

- The corrosion control study's conclusion (i.e., the recommended treatment) and a target level for pH, alkalinity, and corrosion inhibitors (if used).

- Recommended operating ranges for key parameters (pH, alkalinity, and inhibitor (if used)) both at the entry point and in the distribution system.

- Treatment chemicals and dosages that will be used to maintain OCCT, recommendations for quality assurance testing of chemicals, and follow-up monitoring recommendations.

- The system's plan for treatment start-up (see Sections 3.3 and 5.1 for technical recommendations for start-up of pH/alkalinity/dissolved inorganic carbon (DIC) adjustment and phosphate-based corrosion inhibitor treatment).

Exhibit 4.5 and Exhibit 4.6 provide possible outlines for desktop and demonstration study reports, respectively.

Exhibit 4.5: Possible Outline for a Desktop Study Report

Executive Summary

- **I. Introduction**
- **II. Project Background**
- **III. Review of Existing Information**
  - A. Water System Information (provide a system schematic)
  - B. Water Quality Data
    1. Raw water
    2. Entry Point
    3. Distribution system
    4. Tap
  - C. Pipeline and Plumbing Materials
  - D. Summary of Water Quality Complaints
  - E. Analogous System Information
- **IV. Potential Causes of Elevated Lead and/or Copper Levels in the System**
- **V. Identification and Assessment of Corrosion Control Alternatives**
- **VI. Evaluation of Corrosion Control Alternatives**
  - A. Performance
  - B. Constraints
  - C. Recommended OCCT

Exhibit 4.6: Possible Outline for a Demonstration Study Report

Executive Summary

- **I. Introduction**
- **II. Project Background**
- **III. Review of Existing Information**
  - A. Water System Information (provide a system schematic)
  - B. Water Quality Data
    1. Raw Water
    2. Entry Point
    3. Distribution System
    4. Tap
  - C. Pipeline and Plumbing Materials
  - D. Summary of Water Quality Complaints
  - E. Analogous System Information
- **IV. Special Studies**
  - A. Bench Scale Studies
    1. Methods and Materials
    2. Results
  - B. Pipe Loop Studies
    1. Methods and Materials
    2. Results
  - C. Partial System Testing
    1. Methods and Materials
    2. Results
- **V. Potential Causes of Elevated Lead and/or Copper Levels in the System**
- **VI. Identification and Assessment of Corrosion Control Alternatives**
- **VII. Evaluation of Corrosion Control Alternatives**
  - A. Performance
  - B. Constraints
  - C. Recommended OCCT

4.1.5 Primacy Agency Designates OCCT for Systems Serving ≤ 50,000 People (STEP 6)

Exhibits 4.7 and 4.8 provide technical recommendations for primacy agencies for their review of desktop and demonstration study reports, respectively. Primacy agencies should refer to Chapter 2 for background on sources of lead and copper and impacts of water quality and physical system characteristics on lead and copper release. The information in Chapter 3 can also be used as a reference when evaluating the recommended OCCT option.

Upon its own initiative or in response to a request from a water system, a primacy agency may modify its OCCT determination or optimal water quality control parameters for the system (§141.82(h)). The primacy agency may modify its determination where it concludes that such a change is needed to ensure the water system will continue to provide optimized corrosion control treatment. Such modifications may be appropriate where water systems are contemplating changes to their source water, treatment, or other system components in a manner that could adversely impact their current treatment optimization.

Exhibit 4.7: Recommendations for Primacy Agency Review of Desktop Study

1) Make sure all components of a desktop study are included in the report.
   → If they are not, coordinate with system to complete study and check against recommended outline of required components for desktop studies.
   → If they are, continue.
2) Evaluate raw, entry point, and distribution system water quality information.
   → Evaluate key water quality parameters (pH, alkalinity, conductivity, hardness, other anions and cations) and their impact on lead and/or copper release to water (entry point and distribution system) and treatability (raw water).
   → Evaluate differences in entry point versus distribution system data for key water quality parameters, particularly variations in pH and DIC.
3) Review regulatory tap monitoring data for lead and copper and other supplemental lead and copper data (e.g., from special studies by universities).
   → Assess 90th percentile lead and copper levels and that sites selected for regulatory monitoring meet the criteria in the LCR.
   → Assess available supplemental lead and copper data, if available.
4) Review materials and customer complaint history.
   → Determine primary sources of lead and copper in drinking water (lead pipe, lead solder, brass, copper pipe).
   → Identify other materials in the system that may be impacted by CCT (unlined cast iron pipe, asbestos cement pipe, etc.).
5) Review analogous system information.
   → Ensure that systems described are similar in source, water quality, and materials profiles.
6) Evaluate causes of elevated lead and/or copper levels.
   → Use water quality and materials information along with corrosion theory to determine primary causes of elevated lead and/or copper levels.
7) Evaluate potential CCT alternatives identified in study.
   → Evaluate if alternatives have been compared with respect to their abilities to reduce lead and/or copper levels in the system (performance) and the effects that additional CCT will have on water quality parameters (WQPs) and on other water quality treatment processes.
8) Evaluate final recommended OCCT and approve installation if warranted.

Exhibit 4.8: Recommendations for Primacy Agency Review of Demonstration Study

1) Make sure all components of a demonstration study are included in the report.
   → If they are not, coordinate with system to complete study and check against recommended outline of required components for demonstration studies.
   → If they are, continue.
2) Evaluate raw, entry point, and distribution system water quality information.
   → Evaluate key water quality parameters (pH, alkalinity, conductivity, hardness, other anions and cations) and their impact on lead and/or copper release to water (entry point and distribution system) and treatability (raw water).
   → Evaluate differences in entry point versus distribution system data for key water quality parameters, particularly variations in pH and DIC.
3) Review regulatory tap monitoring data for lead and copper and other supplemental lead and copper data (e.g., from special studies by universities).
   → Assess 90th percentile lead and copper levels and that sites selected for regulatory monitoring meet the criteria in the LCR.
   → Assess available supplemental lead and copper data, if available.
4) Review materials and customer complaint history.
   → Determine primary sources of lead and copper in drinking water (lead pipe, lead solder, brass, copper pipe).
   → Identify other materials in the system that may be impacted by CCT (unlined cast iron pipe, asbestos cement pipe, etc.).
5) Review analogous system information.
   → Ensure that systems described are similar in source, water quality, and materials profiles.
6) Evaluate causes of elevated lead and/or copper levels.
   → **Bench scale/Pipe Rack:** Ensure that materials evaluated are similar to lead and copper source materials in system. Also ensure that water quality conditions are similar to system conditions. For pipe rack studies, ensure that study was conducted long enough for stable scales to form on the pipes.
   → **Scale Analyses:** Identify if representative pipe specimens were gathered in the field (representative of lead and/or copper source material that is contributing to elevated lead and copper levels in the water) and that scale analyses were completed using appropriate methods with proper quality assurance and quality control.
   → **Partial System Testing:** Testing area should be selected to represent sites with elevated lead and/or copper levels similar to those used for regulatory compliance sampling under the LCR. Study should continue long enough for CCT to be effective.
   → **Other:** Any additional sampling should be conducted at sites representative of sites used for LCR compliance sampling.
   → Results from special studies should be used to inform recommendations on causes of elevated lead and/or copper levels, performance of potential treatment alternatives, and constraints and secondary impacts that may occur with implementation of CCT.
7) Evaluate potential CCT alternatives identified in study.
   → Evaluate if alternatives have been compared with respect to their abilities to reduce lead and/or copper levels in the system (performance) and the effects that additional CCT will have on WQPs and on other water quality treatment processes.
8) Evaluate final recommended OCCT and approve installation if warranted.

4.2 Corrosion Control Steps for Systems Serving > 50,000 People

As noted earlier in this chapter, most systems serving more than 50,000 people were required to install OCCT by January 1, 1997. Systems that served 50,000 people or fewer at that time may have since experienced population growth, combined with other systems, and/or made other changes so that their new population served is more than 50,000 people. These systems then become subject to the requirements for large systems, including the specific CCT steps applicable to large systems unless they are deemed to have optimized CCT under §141.81(b)(2) or (b)(3).

Exhibit 4.9 summarizes the required actions and deadlines for CCT steps for these systems. It also shows the related section in this document where additional technical recommendations are provided for the system or primacy agency. Those systems serving more than 50,000 people with existing CCT – but that have subsequent lead or copper action level exceedances – can also follow these steps, where applicable, while also complying with the LCR's ALE-triggered source water, public education, and lead service line replacement requirements in §§141.83-85. Note that for these systems, the LCR does not prescribe a schedule for CCT adjustment; instead, one will likely be set by the primacy agency.

Exhibit 4.9: Summary of CCT Requirements and Deadlines for Systems Serving > 50,000 People (§141.81(e))

Requirement[1]	Timetable for Completing Corrosion Control Treatment Steps	Corresponding Section of this Document
STEP 1: System completes Corrosion Control Study.	Within 18 months after the end of the monitoring period which triggered a study[2]	Section 4.2.1
STEP 2: Primacy agency designates OCCT.	Within 6 months after study is completed	Section 4.2.2
STEP 3: System installs OCCT.[3]	Within 24 months after primacy agency's decision regarding type of treatment to be installed	Section 5.1
STEP 4: System conducts follow-up monitoring for 2 consecutive 6-month periods.	Within 36 months after primacy agency designates OCCT	Section 5.2
STEP 5: Primacy agency designates OWQPs.	Within 6 months of Step 4	Section 5.3
STEP 6: System conducts continued WQP and lead and copper tap monitoring.	The schedule for required monitoring is based on whether the system exceeds an AL and/or complies with OWQP ranges or minimums	Section 5.4

Notes:

[1] This schedule applies to systems newly serving > 50,000 people that are installing CCT. Because the regulatory deadlines for systems serving more than 50,000 people have passed, systems newly serving 50,000 people must follow the schedule for systems serving 3,301-50,000 people.

[2] In other words, the end of the monitoring period in which the system became a system serving > 50,000 people.

[3] For systems with existing CCT, this step would involve adjusting CCT.

4.2.1 Systems Serving >50,000 People Conduct a Corrosion Control Study (STEP 1)

Corrosion control study requirements (e.g., study tools, identification of constraints, reporting) were summarized previously in this Chapter in Exhibit 4.3.

In addition to the corrosion control study and OCCT recommendation, EPA recommends that systems provide their primacy agencies with the water quality and other system-specific information as identified in Appendix D. Primacy agencies may also require a system to collect this additional data/information as per §141.82(a) and (d)(2). The recommended data and information collection forms in Appendix D can be customized for individual systems. Data should be sufficient to characterize raw water, treated water quality (entry point), distribution system water quality, and lead and copper in tap samples. The frequency of data collection should be based on the complexity of the system and how water quality may vary over time and location. Systems should be encouraged to provide multiple years of data that represent different seasons (e.g., quarterly data). Water quality samples should be collected as close in time as possible to lead and copper tap samples. Primacy agencies may be able to verify information using the system's latest sanitary survey report. Recommendations for reviewing water quality data are provided in Section 3.2.1.

As noted in Exhibit 4.3, systems performing corrosion control studies must use either pipe rig/loop tests, metal coupon tests, partial-system tests, or analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration for their CCT study. Because there is less likelihood of truly analogous systems once the population served is more than 50,000 people, EPA recommends that these systems use one of the demonstration study tools (i.e., pipe rig/loop, metal coupon, or partial-system test) to meet CCT requirements. Additional desktop and demonstration study tools can be used to supplement the requirements – see Appendix F for a description of the required and additional CCT study tools. Systems may also find the recommended approach for selecting OCCT (provided in Chapter 3) helpful as a screening tool for identifying which treatments warrant further study.

The system must provide the primacy agency with its recommended OCCT option along with the rationale for its recommendation and supporting documentation as described §141.82(c)(1) – (6). The system must also identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment and document such constraints with at least one of the following (§141.82(c)(4) and (c)(6)):

- Data and documentation showing that a particular CCT has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or
- Data and documentation demonstrating that the water system has previously attempted to evaluate a particular CCT and has found that the treatment is ineffective or adversely affects other water quality treatment processes.

The system must also evaluate the effect of the chemicals used for CCT on other water quality treatment processes (§141.82(c)(5) and (c)(6)).

EPA recommends that the system submit to the primacy agency a report that includes the required information identified above and additional data and analyses as follows:

- Options for addressing identified constraints, so that the system would be able to achieve and maintain OCCT, meet other water quality goals, and remain in compliance with all applicable drinking water regulations.
- The corrosion control study's conclusion (i.e., the recommended treatment) and a target level for pH, alkalinity, and corrosion inhibitors (if used).
- Recommended operating ranges for key parameters (pH, alkalinity, and inhibitor (if used)) both at the entry point and in the distribution system.
- Treatment chemicals and dosages that will be used to maintain OCCT, recommendations for quality assurance testing of chemicals, and follow-up monitoring recommendations.
- The system's plan for treatment start-up (see Sections 3.3 and 5.1 for technical recommendations for start-up of pH/alkalinity/DIC adjustment and phosphate-based corrosion inhibitor treatment).

Exhibit 4.5 and Exhibit 4.6, presented earlier in this section, provide possible outlines for desktop and demonstration study reports, respectively.

4.2.2 Primacy Agency Reviews the Study and Designates OCCT for System Serving > 50,000 People (STEP 2)

Primacy agencies can use the checklist in Exhibit 4.8 in Section 4.1.5 to support their review of the study's design and findings. Primacy agencies should refer to Chapter 2 for background on sources of lead and copper and impacts of water quality and physical system characteristics on lead and copper release. The information in Chapter 3 can also be used as a reference when evaluating the recommended OCCT option.

Upon its own initiative or in response to a request from a water system, a primacy agency may modify its OCCT determination or optimal water quality control parameters for the system (§141.82(h)). The primacy agency may modify its determination where it concludes that such a change is needed to ensure the water system will continue to optimize corrosion control treatment. Such modifications may be appropriate where water systems are contemplating changes to their source water, treatment, or other system components in a manner that could adversely impact their current treatment optimization.

Chapter 5: Requirements and Technical Recommendations for OCCT Start-Up and Monitoring

This chapter picks up where Chapter 4 ended – after the primacy agency designates optimal corrosion control treatment (OCCT), the system will install OCCT and conduct follow-up monitoring. The primacy agency will then designate optimal water quality parameters (OWQPs). This chapter is organized as follows:

- Section 5.1 provides technical recommendations for systems on corrosion control treatment (CCT) start-up.
- Section 5.2 discusses required and recommended elements of follow-up monitoring during the first year of OCCT operation.
- Section 5.3 provides requirements and technical recommendations for primacy agencies on evaluating OCCT and setting OWQPs.
- Section 5.4 provides requirements and technical recommendations for comprehensive long-term monitoring for corrosion control.

Systems are encouraged to refer to the document *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (USEPA, 2010b) for direction on follow-up and continued lead and copper tap and water quality parameter (WQP) monitoring.[28]

5.1 CCT Start-up

In accordance with the Lead and Copper Rule (LCR), after the primacy agency designates OCCT, the system has 24 months to install it (§141.81(e)(5)).[29] During that time, systems may be adding a new chemical (i.e., a corrosion inhibitor) to the finished water and/or adjusting the finished water pH by adding a new chemical or increasing the dose of an existing chemical. These types of changes can have temporary adverse impacts on water quality in the distribution system (e.g., red water from sloughing of corrosion scale, microbial changes). Therefore, the Environmental Protection Agency (EPA) has provided recommendations in the next two sections for systems to consider when starting pH/alkalinity/dissolved inorganic carbon (DIC) adjustment (5.1.1) and when adding a corrosion inhibitor (5.1.2) to help minimize these potential adverse effects.[30] EPA recommends that systems discuss corrosion control treatment start-up procedures with their primacy agency when the agency is designating OCCT. Additional recommendations for CCT start-up can be found in Hill and Cantor (2011).

[28] This guidance is available at http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.pdf.
[29] The required time period for installing OCCT (24 months) applies to systems serving ≤ 50,000 people and systems newly serving > 50,000 people. The schedule for CCT adjustment for systems that already have CCT is not prescribed in the LCR. The primacy agency will likely set a schedule for systems serving > 50,000 people that previously installed CCT but have a subsequent action level exceedance.
[30] Silicate-based inhibitors are not included here because information on their use and effectiveness continues to be limited and more research is needed.

5.1.1 Start-up of pH/Alkalinity/DIC Adjustment

Changes in pH/alkalinity/DIC result in a new water quality equilibrium to be established in the distribution system. To minimize adverse impacts (e.g., sloughing of corrosion scale, aesthetic issues), systems should consider raising the pH in increments, e.g., by 0.2 or 0.3 pH units over a 12-month period, or increasing the pH incrementally every 3 months (USEPA, 2007b; MOE, 2009). The approach will be system specific, but consideration should be given to the amount of lead and/or copper reduction that is needed and the potential for secondary impacts as the distribution system equilibrates. The amount of time needed to see results from implementation of pH adjustment will also be system specific. Some systems have seen lead and/or copper reduction within a matter of days following pH adjustment (MOE, 2009); however, other systems have required up to a year to produce a new stable target pH in the distribution system (MWRA, 2010).

5.1.2 Start-up of Phosphate-Based Corrosion Inhibitors

When starting orthophosphate treatment, some systems have gradually increased their orthophosphate doses over time. For example, in a partial distribution system test, an initial orthophosphate dose of 1 mg/L as PO_4 (~0.3 mg/L as P) was gradually increased to 3 mg/L as PO_4 (~1 mg/L as P) over seven months. At three weeks, the orthophosphate concentration reached the target dose at the far ends of the system (MOE, 2009).

Some systems have started orthophosphate treatment with a higher passivation dose, then after a certain time period, switched to a lower maintenance dose for long-term corrosion control. For example, Hill and Cantor (2011) recommend starting inhibitors at 2 to 3 times the maintenance dose in order to more quickly establish a passivating layer. See Section 3.3.2 for technical recommendations related to passivation and maintenance doses.

5.2 Follow-up Monitoring during First Year of Operation

The LCR requires systems to conduct two types of follow-up monitoring during the two consecutive, 6-month periods directly following installation of OCCT (§141.81(d)(5) and (e)(6)):

- Lead and copper tap monitoring; and
- WQP monitoring.

The next two sections summarize follow-up monitoring requirements and recommendations. Systems can use the forms in Appendix G and the forms in the ***OCCT evaluation templates*** to document the results of follow-up monitoring.

As will be discussed in Section 5.3, the primacy agency will use the results of follow-up lead and copper tap monitoring and results from samples collected prior to the system's installation of CCT to determine if the system has properly installed and operated OCCT, and to set OWQPs.

5.2.1 Follow-up Lead and Copper Tap Monitoring

All systems, regardless of size, must conduct two consecutive six-month rounds of follow-up lead and copper tap monitoring at the same number of sites as required for routine monitoring under the LCR (§141.86(c) and (d)(2); see Exhibit 5.1).

Exhibit 5.1: Required Number of Sites for Follow-up Lead and Copper Tap Monitoring

Population Served	Required Number of Sites[1]
≤100	5
101 – 500	10
501 – 3,300	20
3,301 – 10,000	40
10,001 – 100,000	60
>100,000	100

Note:
[1] §141.86(c) and (d)(2). The number of sites is the same as the number of sites required for routine monitoring.

EPA recommends that systems with lead service lines (LSLs) and their primacy agencies consider collecting special tap samples during follow-up monitoring to evaluate the lead released directly from the LSLs. Systems can conduct premise plumbing profiles (see Appendix C for more information), or ask homeowners to collect samples that would capture water from within the LSL for lead analysis. Dissolved and particulate lead should be measured for these special samples. In addition, primacy agencies may wish to consider data from chronically low flow homes and homes with LSL disturbances when evaluating the effectiveness of the CCT.[31]

5.2.2 Follow-up WQP Monitoring

Requirements for WQP follow-up monitoring and recommendations for additional monitoring are summarized in Exhibits 5.2 and 5.3, respectively. Required WQP follow-up monitoring must be conducted at entry points to the distribution system and at tap monitoring locations. Entry point samples must be collected from locations that are representative of each source after treatment. Systems with multiple sources that are combined before distribution must sample at each entry point to the distribution system during periods of normal operating conditions to allow the sample to be representative of all sources being used (§141.87(a)(1)(ii); USEPA 2010b). Tap samples must be representative of water quality throughout the distribution system taking into account the number of persons served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. Tap monitoring

[31] All lead and copper tap sample results from the system's sampling pool collected within the monitoring period must be included in the 90th percentile calculation along with any samples where the system is able to determine that the site selection criteria in §141.86(a)(3)-(8) for the sampling pool are met. Other lead and copper tap data such as from customer requested sampling, investigative sampling, and special studies also must be submitted to the primacy agency (USEPA, 2004c; §141.90(g)).

locations can be the sites used for coliform monitoring or the sites used for lead and copper tap monitoring (§141.87(a)(1)(i)).

As summarized in Exhibit 5.2, the LCR requires:

- One sample from each entry point at least once every two weeks for:[32]
    - pH;
    - When alkalinity is adjusted, a reading of the dosage rate of the chemical used to adjust alkalinity and the concentration of alkalinity; and
    - When an inhibitor is used, a reading of the dosage rate of the inhibitor used and the concentration of orthophosphate or silicate (whichever is used).
- AND two sets of samples from a specified number of taps (see Exhibit 5.3) during both consecutive 6-month monitoring periods for:
    - pH;
    - Alkalinity;
    - Calcium, when calcium carbonate stabilization is used;
    - Orthophosphate, when a phosphate-based inhibitor is used; and
    - Silica, when a silicate-based inhibitor is used.

Note that the LCR requires systems serving 50,000 or fewer people to conduct follow-up WQP monitoring only during monitoring periods in which they have a lead and/or copper action level exceedance (§141.87(c)). Monitoring is not required if these systems no longer exceed the action level after installing OCCT. However, EPA recommends that primacy agencies consider requiring follow-up WQP monitoring during the first year after OCCT installation regardless of whether the system exceeds the action level in order to demonstrate that the treatment is operating properly.

[32] Except ground water systems that have primacy agency approval to limit this monitoring to representative sites.

Exhibit 5.2: Follow-up WQP Monitoring Requirements[1] and Recommendations

Type	Parameters	Required [1]		Recommended	
		Number of Sites	Frequency of Sampling	Number of Sites	Frequency of Sampling
Entry point	pH, alkalinity dosage rate and concentration,[2] inhibitor dosage rate and orthophosphate or silicate concentration (whichever is used)[3]	At each entry point[4]	At least once every two weeks	No Change	No Change
Tap (Distribution system samples)[5]	pH, alkalinity, orthophosphate or silica[3], calcium[6]	Number of sites based on system size, See Exhibit 5.3	At least twice per tap every six months (4 sample periods)	At ***more taps than required.*** See Exhibit 5.3.	All parameters: ***Monthly***

Notes:

[1] Required for all systems serving more than 50,000 people (§141.87(c)). Systems serving 50,000 or fewer people are required to conduct follow-up WQP monitoring during any monitoring period in which they exceed either action level or if required by the primacy agency (§141.81(b) and §141.87(c)). Follow-up monitoring occurs during the 12-month period following OCCT installation (§141.81(e)(6) and §141.87(c)).

[2] Required at entry point locations if alkalinity is adjusted as part of corrosion control (§141.87(c)(2)(ii)).

[3] Required if an inhibitor is used. Monitoring for orthophosphate is only required if a phosphate-containing inhibitor is used (§141.87(c)(1)(iii) and (c)(2)(iii)). Monitoring for silica is only required if a silicate-containing inhibitor is used (§141.87(c)(1)(iv) and (c)(2)(iii)).

[4] Ground water systems can limit entry point monitoring to representative sites with approval from their primacy agency (§141.87(c)(3)).

[5] WQP tap samples are collected at locations that are representative of the water quality throughout the distribution system. Systems may sample from sites used for coliform monitoring (§141.87(a)).

[6] Required if calcium carbonate stabilization is used (§141.87(c)(1)(v)).

Exhibit 5.3: Required and Recommended Number of Sites for Follow-up WQP Tap Monitoring

Population Served	Required Number of Sites[1]	Recommended Number Sites
≤100	1	2
101 – 500	1	5
501 - 3,300	2	10
3,301 - 10,000	3	15
10,001 - 50,000	10	20
50,001 - 75,000	10	25
75,001 - 100,000	10	30
100,001 - 500,000	25	40
500,001 - 1,000,000	25	50
>1,000,000	25	>50

Note:

[1] Required each six-month monitoring period for systems serving more than 50,000 people (§141.87(c)). Systems serving 50,000 or fewer people are required to conduct follow-up WQP monitoring during any monitoring period in which they exceed either action level or if required by the primacy agency (§141.81(b) and §141.87(c)).

For follow-up WQP tap monitoring, two samples must be collected from the required number of sites shown in Exhibit 5.3 during both six-month monitoring periods specified in §141.86(d)(2) (§141.87(c)(1)). As shown in Exhibit 5.2, EPA recommends that systems and primacy agencies consider increasing the frequency of WQP tap sampling to ***monthly.*** More frequent monitoring is recommended to capture seasonal variations and influences of temperature on treatment effectiveness.

EPA also recommends that systems and primacy agencies consider follow-up WQP tap monitoring at more locations than required by the LCR (See Exhibit 5.3). Collecting WQP samples at an increased number of tap monitoring locations is especially important for systems that experience fluctuations in distribution system water quality. In particular, pH variations can have a large impact on corrosion control treatment effectiveness. The pH can fluctuate widely in systems with low buffering capacity, high water age (e.g., in dead-end areas), high microbiological activity, and in systems that experience nitrification. It is important that distribution system monitoring represents all pressure and water quality zones to adequately assess treatment effectiveness in all parts of the system. Follow-up WQP samples from tap sites

should be collected as close in time as possible to when lead and copper tap samples are collected so that the system can evaluate the influence of water quality fluctuations on lead and copper tap monitoring results.

Primacy agencies and systems may want to consider additional monitoring for iron, manganese, chloride, sulfate, hardness, calcium, total dissolved solids (TDS), and/or oxidation-reduction potential (ORP) if they believe that these parameters may change or were not adequately characterized prior to CCT installation.[33] Primacy agencies can use the forms in Appendix G and electronic versions in the ***OCCT Evaluation Templates*** to document additional follow-up monitoring requirements for systems.

5.3 Evaluating OCCT and Setting Optimal Water Quality Parameters

Primacy agencies are required to evaluate results of follow-up tap and water quality monitoring and results collected prior to the installation of CCT to determine whether the system has properly installed and operated the OCCT and to designate (§141.82(f)):

- A minimum value or a range of values for pH measured at each entry point to the distribution system;
- A minimum pH value, measured in all tap samples, that is equal to or greater than 7.0, unless the primacy agency determines that meeting a pH level of 7.0 is not technologically feasible or is not necessary for the system to optimize corrosion control;
- If alkalinity is adjusted as part of OCCT, a minimum concentration or a range of concentrations for alkalinity, measured at each entry point to the distribution system and in all tap samples;
- If a corrosion inhibitor is used, a minimum concentration or a range of concentrations for the inhibitor, measured at each entry point to the distribution system and in all tap samples, that the primacy agency determines is necessary to form a passivating film on the interior walls of the pipes of the distribution system; and
- If calcium carbonate is used as part of corrosion control, a minimum concentration or a range of concentrations for calcium, measured in all tap samples.

Primacy agencies can designate values for additional water quality control parameters (e.g., free chlorine residual, conductivity, ORP) that reflect optimal corrosion control for the system (§141.82(f)).

[33] Under §141.82(f), the primacy agency may designate values for additional water quality control parameters determined by the primacy agency to reflect optimal corrosion control for the system. The primacy agency must notify the system in writing of these determinations and explain the basis for its decisions.

EPA recommends that primacy agencies also use results of follow-up monitoring to further evaluate the OCCT and recommend re-evaluation if the results of the treatment are not what were predicted.

Note that the LCR includes a provision (§141.82(h)) for primacy agencies to modify their determination of OCCT or OWQP designations where they conclude that such change is necessary to ensure that the system continues to optimize CCT. Such modifications may be appropriate where water systems are contemplating changes to their source water, treatment, or other system components that could adversely impact their current CCT optimization. A request for modification can also be in response to a written request with supporting documentation from a system or other interested party. The revised determination must be in writing, and include the new treatment requirements, the basis for the primacy agency's decision, and an implementation schedule for completing the treatment modifications.

Appendix G provides technical recommendations for primacy agencies to consider when designating OWQPs for pH/alkalinity/DIC adjustment, orthophosphate treatment, blended phosphate treatment, and use of a silicate inhibitor based on data gathered during the follow-up monitoring.

A recent publication by Cornwell et al. (2015) examined the use of control charts as a diagnostic tool for determining parameter variability and setting acceptable ranges. This approach may be useful to primacy agencies and systems for controlling WQPs and determining when treatment adjustment is needed to bring a parameter back within its goal range.

5.4 Required and Recommended Long-Term Corrosion Control Monitoring

This section describes WQP monitoring required by the LCR once the primacy agency has set OWQPs. It also provides technical recommendations for additional data collection and tracking that could be used to enhance a system's understanding of CCT effectiveness. For the purposes of this document, the combination of required WQP monitoring and additional recommended monitoring is referred to as "long-term corrosion control monitoring."

Generally, systems serving more than 50,000 people must conduct routine monitoring and determine compliance with OWQPs every six months, while systems serving 50,000 or fewer are required to conduct monitoring during periods in which they have a lead and/or copper action level exceedance (§141.87(d)).

Required WQP Monitoring

Systems are required to collect two sets of samples every six months (§141.87(c)(1) and (d)) at the number of WQP tap sampling sites specified for the system size in §141.87(a)(2) (see Exhibit 5.3) for:

- pH;
- Alkalinity;

- Calcium, when calcium carbonate stabilization is used;
- Orthophosphate, when a phosphate-based inhibitor is used; and
- Silica, when a silicate-based inhibitor is used.

They must also collect one set of samples at each entry point (except those ground water systems that can limit entry point monitoring to representative sites) at least once every two weeks for:

- pH;
- When alkalinity is adjusted as part of optimal corrosion control, a reading of the dosage rate of the chemical used to adjust alkalinity and the concentration of alkalinity; and
- When an inhibitor is used, a reading of the dosage rate of the inhibitor used and the concentration of orthophosphate or silicate (whichever is used).

Systems that meet their OWQPs for a specified period of time can qualify for reduced WQP monitoring that allows for fewer and less frequent monitoring at tap locations (§141.87(e)). The LCR does not allow reduced monitoring for WQP samples collected at entry points. Refer to Section III.H in the *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (USEPA, 2010b) for additional information.

Technical Recommendations for Additional Monitoring

Additional monitoring could include monitoring for additional WQPs, customer complaint tracking, and monitoring associated with lead source replacement programs.

In addition to required WQP monitoring, systems may want to consider analyzing other water quality parameters that can affect lead and copper release. These may include ORP, ammonia, chloride, sulfate, aluminum, iron, and manganese. See Section 2.3 for discussion of how these water quality parameters influence corrosion.

Customer complaints provide useful information on conditions occurring at customer's taps. Common complaints include red water (iron) and darker tint to the water (manganese), which can indicate an increase in source water levels of iron and manganese or sloughing of scale from cast iron pipe. Complaints of taste/odor issues (earthy or musty flavor) can indicate changes in natural organic matter (NOM) due to algae blooms. Systems can obtain important information from customer complaints of blue water or a metallic taste, which can indicate copper corrosion (customers can begin to notice the taste from copper at concentrations of 3 to 10 mg/L per Dietrich et al., 2008). It is important to note that while customer complaint records can provide information on copper corrosion, lead in drinking water has no taste or color.

Systems should consider additional monitoring to evaluate the effectiveness of lead source replacement programs. The monitoring, whether taken at the tap or directly from the service line, would occur before and after the lead source is removed. Both total and dissolved lead

should be analyzed to determine the percentages of particulate and dissolved lead. Replacement of lead sources, such as lead service lines, may increase lead levels (especially particulate lead levels) for a period of time due to the physical disturbance of the system (Sandvig et al., 2008; Muylwyk et al., 2009; Swertfeger et al., 2006; Del Toral et al., 2013). Some disturbances, along with other factors, may elevate lead levels for years (Del Toral et al., 2013). Particulate lead can also be released as part of normal (ongoing) corrosion processes in the system and is common when pipe scales contain substantial amounts of iron, manganese, and other coatings, or when corrosion of brass or solder is galvanically driven.

Recommendations for monitoring programs can be found in Kirmeyer et al. (2000, 2002, 2004); USEPA (2003, 2007d); and MOE (2009).

Chapter 6: Impacts of Source Water and Treatment Changes on Lead and Copper in Drinking Water

Research over the last several years has shed new light on the impacts of source water and treatment changes on lead and copper corrosion control. In particular, for systems with lead service lines, research has shown that lead release is dependent upon many water quality parameters (WQPs), and that treatment change once thought to be independent of corrosion control can have a significant impact on lead release.

Section 6.1 reviews the Lead and Copper Rule (LCR) requirements for maintaining optimal corrosion control treatment (OCCT) and explains when a system is required under the LCR to notify their primacy agency and obtain approval prior to a source or treatment change. Section 6.2 provides technical information on the effects of source water changes and Section 6.3 follows with technical information about the effects of treatment changes on lead and copper levels in drinking water.

6.1 Review of LCR Requirements Related to a Change in Source or Treatment

All systems optimizing corrosion control must continue to operate and maintain the treatment, including maintaining WQPs at or above minimum values or within ranges established by the primacy agency (§141.81(b) and §141.82(g)). Prior to the addition of a new source or any long-term change in water treatment, water systems are required to notify the primacy agency in writing of the change or addition. The primacy agency must review and approve the addition of a new source or long-term change in treatment before it is implemented by the water system. Primacy agencies also have the authority to modify OCCT determinations or OWQP designations upon their own initiative or in response to a request from a water system or other interested party (§141.82(h)). The primacy agency may modify these where it concludes the modifications are necessary to ensure the system will continue to provide optimized corrosion control treatment after changing the source water, treatment, or other system components in such a way that could adversely impact the current optimization.

Switching from purchased water to a new source is an example of source change (USEPA, 2015b). Examples of long-term treatment changes are provided in the LCR and discussed later in this section. The systems that are subject to this requirement are systems that are either: (1) deemed to have optimized corrosion control pursuant to §141.81(b)(3); (2) subject to reduced monitoring under §141.86(d)(4); or (3) subject to a monitoring waiver under §141.86(g). (§141.90(a)(3)).

As described in a November 3, 2015, memorandum from Dr. Peter Grevatt, Director of the Environmental Protection Agency (EPA) Office of Ground Water and Drinking Water (USEPA, 2015b):

1) The LCR requires that any large system (i.e., those serving > 50,000 people) that has met OCCT requirements through the installation of corrosion control treatment to continue

operating and maintaining the treatment and to continue meeting the OWQPs established by the primacy agency (§141.81(b) and §141.82(g)).

2) Systems deemed to have OCCT without the installation of corrosion control treatment are required to notify the primacy agency in writing of any upcoming changes in treatment or source and request that the primacy agency modify its determination of the OCCT and OWQPs applicable to the system. The primacy agency must then review and approve the change and designate OCCT and OWQPs prior to its implementation by the system (§141.81(b)(3)(iii)).

3) Systems subject to reduced monitoring under §141.86(d)(4) or monitoring waivers under §141.86(g) must notify the primacy agency of any upcoming changes in treatment or source and the primacy agency must subsequently review or approve it (§141.90(a)(3)).

EPA recommends that systems that are not subject to a notification requirement also notify the primacy agency prior to the addition of a new source or treatment and request the primacy agency to modify its determination of the OCCT and OWQPs applicable to the system (USEPA, 2015b).

Examples of long-term treatment changes include the addition of a new process or modification of an existing treatment process ((§141.90(a)(3)). Examples of modifications include switching secondary disinfectants, switching coagulants (e.g., alum to ferric chloride), and switching corrosion inhibitor products (e.g., orthophosphate to blended phosphate). Long-term changes can include dose changes to existing chemicals if the system is planning long-term changes to its finished water pH or residual inhibitor concentration. Long-term treatment changes would not include chemical dose fluctuations associated with daily raw water quality changes ((§141.90(a)(3)).

Due to the unique characteristics of each system (e.g., source water, existing treatment processes, distribution system materials) it is critical that public water systems, in conjunction with their primacy agencies and, if necessary, outside technical consultants, evaluate and address potential impacts resulting from treatment and/or source water changes prior to making the change. The evaluation may include a system-wide assessment of source water or treatment modifications to identify existing or anticipated water quality, treatment, or operational issues that may interfere with or limit the effectiveness of corrosion control treatment (CCT) optimization or re-optimization. In addition, systems should conduct ongoing monitoring to ensure compliance with OCCT prior to, during, and after a source or treatment change (USEPA 2015b).

6.2 Impacts of Source Water Changes

Changes in source water can have a significant impact on water quality, corrosion control treatment effectiveness, and lead and copper release. Examples of source changes include:

- Switching from a purchased treated water source to an untreated water source that requires treatment;
- Switching from a purchased treated water source to a different treated source;
- Changing from a ground to surface water source; and
- Adding a new source, such as a new ground water or purchased source, in the distribution system.

Not only can source water changes directly impact corrosion control treatment (e.g., pH, alkalinity, dissolved inorganic carbon (DIC), and corrosion inhibitor concentration), but they can also impact the effectiveness of corrosion control treatment through changes in water quality parameters such as natural organic matter (NOM), metals (e.g., iron and manganese), ions such as chloride and sulfate, oxidation-reduction potential (ORP), and buffer intensity. See Section 2.3 for information on how water quality can impact the release of lead and copper into drinking water.

The literature includes examples of how source water changes have impacted lead and copper release (Boyd et al., 2006; 2008). For example, changes in lead release associated with blending groundwater, treated surface water, and desalinated seawater sources were determined to be a function of temperature, alkalinity, pH, chloride and sulfate (Taylor et al., 2005; Tang et al., 2006). Total copper release has been attributed to changes in temperature, alkalinity, pH, sulfate, and silica (Imran et al., 2006; Xiao et al., 2007). In another study (Zhang et al., 2012), lead release from leaded solder increased with blending of desalinated seawater in pilot-scale pipe loops.

Source water changes can impact trace inorganic contaminant release from deposits or scales in the distribution system (Lytle et al., 2004; Schock, Hyland, and Welch, 2008; Friedman et al., 2010; Peng et al., 2012). As discussed in Section 2.3.9, dissolved lead can react with iron and manganese and form deposits on lead service lines and other pipe materials (Schock, Cantor, et al., 2014). Shifts in water chemistry (e.g., changes associated with blending disparate sources) can potentially affect release and remobilization of these contaminants in the distribution system (Schock, Lytle, et al., 2005; Hill et al., 2010; McFadden et al., 2011; Friedman et al., 2016), which can then impact the formation of passivating scales on lead- and copper-containing materials.

6.3 Impacts of Treatment Changes

Treatment changes that can potentially affect the corrosivity of treated water are identified in several references (USEPA, 2003; USEPA, 2007b; MOE, 2009; Schendel et al., 2009; Grigg, 2010), and discussed in more detail below.

6.3.1 Corrosion Control Treatment

Any proposed change to a system's CCT can have consequences for water quality in the distribution system and corrosion control effectiveness. Even small changes to pH/alkalinity/DIC adjustment processes and inhibitor doses can affect lead and copper levels. If a system proposes changes to any of these key parameters (e.g., lowers pH, lowers or shuts off corrosion inhibitor), there is the potential for increases in lead and/or copper in the water.

Changes in the inhibitor chemical used for treatment can also affect lead and copper release. For example, changing from an orthophosphate chemical to a blended phosphate chemical is significant because the mechanisms by which the two chemicals control lead release are different, and the effectiveness of blended phosphates depends on other constituents in the water (e.g., calcium). Changing to a different manufacturer of blended phosphates can impact lead and copper release, even if the percentage of orthophosphate in the blend is similar (see Chapter 3 for more information on blended phosphates). Systems may design for a specific corrosion control product, but obtain bids for different products with different formulations. Additional drivers for changing the inhibitor chemical include pricing, finished water quality, operational changes, and changes at the receiving wastewater treatment plant (Brown et al., 2013a).

6.3.2 Disinfection

Changing disinfectant from free chlorine to chloramine may destabilize Pb(IV) scales formed under highly oxidizing conditions (high free chlorine residual). This destabilization may cause higher lead levels to be observed (Boyd et al., 2008; Boyd et al., 2009). In order to prevent elevated lead levels, systems can maintain the current conditions where Pb(IV) was the predominant scale, can adjust the pH/alkalinity/DIC to convert scales to Pb(II) passivating films (i.e., pH greater than approximately 9.0 and DIC of 5 to 10 mg/L as C), or can use an orthophosphate inhibitor (optimally at pH in the 7.2 to 7.8 range) (Lytle et al., 2009). There may be a period of time during the conversion from Pb(IV)-based to Pb(II)-based scales where lead levels may increase. A real-world example occurred in the District of Columbia with the DC Water and Sewer Authority (currently known as DC Water) (Schock and Giani, 2004; USEPA, 2007b), in which conversion from free chlorine to chloramines for disinfection, along with pH variations in the distribution system and the presence of lead service lines, contributed to elevated lead levels over a sustained period of time.

Additional monitoring can help determine the typical range of ORP values (i.e., the baseline) in the distribution system prior to disinfectant changes. Special laboratory studies to determine the composition of the lead scales present in the system (e.g., Pb(II) or Pb(IV) scales) can be completed using pipe sections removed from the distribution system (Clement et al., 1998b; Sandvig et al., 2008). Primacy agencies can identify systems that may switch to chloramines or another disinfectant in the future by reviewing compliance with the Stage 2 Disinfection By-products Rule (DBPR).

For systems that use chloramines, nitrification may occur in the distribution system. In a corrosion control guidance manual developed for the Province of Ontario, a case study was presented in which nitrification reduced the pH from approximately 8.5 to 7.8, which resulted in increased lead release. In response, the system raised the finished water pH to 9.2 and observed reductions in lead levels at some sites (MOE, 2009). Nitrification can also be a problem for ground water systems that add chlorine and have high levels of ammonia in their source water.

Important Information about Pb(IV)

Do my lead service lines have Pb(IV) scales?

Pb(IV) (also known as Lead IV or Pb^{++++}) can occur on any lead surface. It forms under highly oxidative conditions. If you have lead service lines with a moderate pH (7 to 8), a consistent free chlorine residual throughout the system (typically 1 to 2 mg/L or higher), no corrosion inhibitor, and no lead problems, you might have predominantly Pb(IV) scales. To help determine if your systems is a candidate for Pb(IV) scales, you can measure ORP of the water. E_h values of 0.7 volts or higher are indicative of Pb(IV) scales. You can also evaluate the scale on exhumed lead service lines to find out for sure.

Can I promote formation of Pb(IV) scales to reduce lead levels?

Although some utilities are targeting the development of a Pb(IV) scale in their systems to control lead release (Brown et al., 2013a), questions remain as to how systems and primacy agencies can ensure that disinfectant residuals required for the formation and maintenance of Pb(IV) scales are maintained within lead service lines throughout the distribution system and to the customer's taps. This may be a particular challenge with homes that go unoccupied for an extended period of time. Therefore, EPA has not included formation of Pb(IV) scale as a corrosion control treatment technique in this document at this time.

What happens if I have Pb(IV) scales and I change treatment?

Changing disinfectant from free chlorine to chloramine for disinfection may destabilize Pb(IV) scales. Systems can use other corrosion control treatments such as pH/alkalinity/DIC adjustment or phosphate-based corrosion inhibitors, but lead levels may increase as the scale is converting from Pb(IV) to Pb(II)-based scale.

The type of chlorine used for disinfection may also have an impact on corrosion. Use of gaseous chlorine lowers the pH of the water resulting in potentially more corrosive water. For systems with low alkalinity water, this effect can be amplified (Schock, 1999). Sodium hypochlorite, a base, can increase the pH of the water.

6.3.3 Coagulation

Switching from a sulfate-based to a chloride-based coagulant may increase the chloride content of the water, increasing the chloride-to-sulfate mass ratio (CSMR). This may aggravate lead

release from galvanic connections such as lead solder on copper pipes or partial lead line replacements (Oliphant, 1983; Gregory, 1985; Reiber, 1991; Singley, 1994; Lauer, 2005; Nguyen et al., 2010; Triantafyllidou and Edwards, 2011; Clark et al., 2013; Wang et al., 2013). See Section 2.3.7 for additional discussion on the impacts of changes in chloride and sulfate on lead release.

Changes in pH to optimize the effectiveness of a new coagulant may impact the distribution system pH and cause changes in lead and copper release (USEPA, 2007d; Duranceau et al., 2004). Switching coagulants, or increased use of coagulants to achieve enhanced coagulation will also remove additional NOM. Changes in NOM can impact corrosion control in the distribution system; see Section 2.3.8 for more information.

6.3.4 Water Softening

Changing how softening is practiced at a treatment plant can affect corrosion control. Adding softening will raise the pH and change alkalinity, helping to control lead and copper release, whereas discontinuing softening will change these parameters, which may cause metal release (USEPA, 2007b).

6.3.5 Filtration

Nanofiltration and reverse osmosis remove alkalinity, hardness, and other dissolved compounds but do not remove carbon dioxide, resulting in a lower pH which can cause increases in lead and copper levels measured at the tap. They also remove NOM, which can impact corrosivity of the water (AwwaRF and DVGW-T, 1996; Mays, 1999; Kirmeyer et al., 2000; Duranceau et al., 2004; Schippers et al., 2004; USEPA, 2007b).

Chapter 7: References

APHA, AWWA, and WEF, 2005. *Standard Methods for the Examination of Water and Wastewater, 21st ed.* American Public Health Association. Washington, DC.

Appelo, C.A.J., and Postma, D. 2005. *Geochemistry, Groundwater and Pollution*. CRC Press. New York, NY.

ASTM D2688-11. 2005. *Standard Test Methods for the Corrosivity of Water in the Absence of Heat Transfer (Weight Loss Methods)*. ASTM International.

AWWA. 1993. *Initial Monitoring Experiences of Large Water Utilities under EPA's Lead and Copper Rule.* Water Industry Technical Action Fund (WITAF). AWWA. Denver, CO.

AWWA. 1999. *Water Quality and Treatment, a Handbook of Community Water Supplies*. 5th edition. Raymond Letterman, Editor. AWWA and McGraw-Hill. Denver, CO.

AWWA. 2004. Proceedings of Workshop - Getting the Lead Out: Analysis and Treatment of Elevated Lead Levels in DC's Drinking Water. Water Quality Technology Conference. San Antonio. AWWA. Denver, CO.

AWWA. 2005. *Managing Change and Unintended Consequences: Lead and Copper Rule Corrosion Control Treatment*. AWWA. Denver, CO.

AwwaRF. 1990. *Lead Control Strategies*. AwwaRF Report #90559. Project #406. AWWA Research Foundation (now Water Research Foundation) and AWWA. Denver, CO.

AwwaRF and DVGW-Technologiezentrum Wasser. 1996. *Internal Corrosion of Water Distribution Systems*. 2nd edition. AwwaRF Order 90508. Project #725. AWWA Research Foundation (now Water Research Foundation) and AWWA. Denver, CO.

Boyd G.R., Dewis, K.M., Sandvig, A.M., Kirmeyer, G.J., Reiber, S.H., and Korshin, G.V. 2006. What Effect Does Background Water Chemistry Have on Metals Release and Galvanic Coupling? Chapter 7 in *Effect of Changing Disinfectants on Distribution System Lead and Copper Release, Part 1 – Literature Review.* AwwaRF Order #91152. Project#3107a. AWWA Research Foundation. Denver, CO.

Boyd, G.R., Dewis, K.M., Korshin, G.V., Reiber, S.H., Schock, M.R., Sandvig, A.M., and Giani, R., 2008. Effects of Changing Disinfectants on Lead and Copper Release. *J. AWWA*, 100(11):75-87.

Boyd, G.R., McFadden, M.S., Reiber, S.H., Sandvig, A.M., Korshin, G.V., Giani, R., and Frenkel, A.I. 2009. *Effect of Changing Disinfectants on Distribution System Lead and Copper Release: Part 2 – Final Report*. WRF Order #3107. Water Research Foundation. Denver, CO.

Boyd, G.R., Tuccillo, M.E., Sandvig, A., Pelaez, M., Han, C., and Dionysiou, D.D. 2013. Nanomaterials: Removal Processes and Beneficial Applications in Treatment. *J. AWWA*, 105(12): E699-E708.

Britton, A., and Richards, W.N. 1981. Factors Influencing Plumbosolvency in Scotland. *J. Inst. Water Engrs. and Scientists*, 35(5):349-364.

Brown, R., McTigue, N., and Cornwell, D.A. 2013a. Strategies for Assessing Optimized Corrosion Control Treatment of Lead and Copper. *J. AWWA*, 105(5): 62-75.

Brown, R., McTigue, N., and Cornwell, D.A. 2013b. LSL Flushing and OCCT Case Studies. In *Proceedings of the AWWA Annual Conference*. AWWA. Denver, CO.

Brown, M.J., Raymond, J., Homa, D., Kennedy, C., and Sinks, T. 2011. Association Between Children's Blood Lead Levels, Lead Service Lines, and Water Disinfection, Washington, DC, 1998–2006. *Environ. Res.,* 111(1): 67-74.

Butler, J.N., and Cogley, D.R. 1998. *Ionic Equilibrium Solubility and pH Calculations*. John Wiley and Sons, New York, NY.

Cadmus Group. 2004. Investigation of Potential Environmental Impacts Due to the Use of Phosphate-Based Corrosion Inhibitors in the District of Columbia. Report Prepared for EPA Region 3.

Cantor, A.F., Denig-Chakoff, D., Vela, R.R., Oleinik, M.G., and Lynch, D.L. 2000. Use of Polyphosphate in Corrosion Control. *J. AWWA*, 92(2):95.

Carlson, K.H., Via, S., Bellamy, B., and Carlson, M. 2000. Secondary Effects of Enhanced Coagulation and Softening. *J. AWWA*. 92(6): 63-75.

Clark, B., Cartier, C., St. Clair, J., Triantafyllidou, S., Prévost, M., and Edwards, M. 2013. Effect of Connection Type on Galvanic Corrosion Between Lead and Copper Pipes. *J. AWWA,* 105: E576-E577.

Clement, J.A., Daly, W.J., Shorney, H.J., and Capuzzi, A.J. 1998a. An Innovative Approach to Understanding and Improving Distribution System Water Quality. *Proceedings of AWWA Water Quality Technology Conference, San Diego, CA*. AWWA. Denver, CO.

Clement, J., Sandvig, A., Snoeyink, V., Kriven, W., and Sarin, P. 1998b. *Analyses and Interpretation of the Physical, Chemical, and Biological Characteristics of Distribution System Pipe Scales*. Water Quality Technology Conference. AWWA. Denver, CO.

Clement, J. A., and Schock, M.R. 1998. *Buffer Intensity: What is It, and Why It's Critical for Controlling Distribution System Water Quality*. AWWA Water Quality Technology Conference, San Diego, CA. AWWA. Denver, CO.

Copeland, A., and Lytle, D.A. 2014. Measuring the Oxidation-Reduction Potential of Important Oxidants in Drinking Water. *J. AWWA*, 106(1): E10-E20.

Cook, J.B. 1992. Achieving Optimum Corrosion Control for Lead in Charleston, S.C.; A Case Study. *Jour. NEWWA*, 111(2):168.

Cornwell, D., Brown, R., and McTigue, N. 2015. Controlling Lead and Copper Rule Water Quality Parameters. *J. AWWA*, 107(2): E86-E96.

Del Toral, M.A., Porter, A., and Schock, M.R. 2013. Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study. *Environ. Sci. Tech*. 47(16): 9300-9307.

DeSantis, M.K., and Schock, M.R. 2014. Ground Truthing the 'Conventional Wisdom' of Lead Corrosion Control Using Mineralogical Analysis. AWWA Water Quality Technology Conference. November 19, 2014.

Dietrich A.M., Cuppett J.D., and Duncan S.E. 2008. How Much Copper Is Too Much? *OpFlow*, 34(9):8-30.

Dodrill, D.M., and Edwards, M. 1995. Corrosion Control on the Basis of Utility Experience. *J. AWWA*, 87(7):74.

Douglas, I., Guthmann, J., Muylwyk, Q. and Snoeyink, V. 2004. Corrosion Control in the City of Ottawa-Comparison of Alternatives and Case Study for Lead Reduction in Drinking Water. In: *11th Canadian National Drinking Water Conference and 2nd Policy Forum*, W. Robertson and T. Brooks (eds.). April 3-6, Calgary, AB. Canadian Water and Wastewater Association. Ottawa, ON.

Duranceau, S.J., Townley, D., and Bell, G.E.C. 2004. *Optimizing Corrosion Control in Distribution Systems*. AwwaRF Order #90983. Project #2648. AWWA Research Foundation. Denver, CO.

Edwards, M., and Dudi, A. 2004. Role of Chlorine and Chloramine in Corrosion of Lead-Bearing Plumbing Materials. *J. AWWA*, 96(10):69-81.

Edwards, M., Giani, R., Wujek, J., and Chung, C. 2004. *Use of Lead Profiles to Determine Source of Action Level Exceedances from Residential Homes in Washington, DC*, Sunday Workshop, AWWA Water Quality Technology Conference, San Antonio, TX.

Edwards, M., Jacobs, S., and Dodrill, D. 1999. Desktop Guidance for Mitigating Pb and Cu Corrosion By-Products. *J. AWWA*, 91(5):66-77.

Edwards, M., and McNeill, L.S. 2002. Effect of Phosphate Inhibitors on Lead Release from Pipes. *J. AWWA*, 94(1):79-90.

Edwards, M., Meyer, T.E., Rehring, J., Ferguson, J., Korshin, G., and Perry, S. 1996. *Role of Inorganic Anions, NOM, and Water Treatment Process in Copper Corrosion.* AwwaRF Order #90687. Project #831. AWWA Research Foundation. Denver, CO.

Estes-Smargiassi, S., and Cantor, A. 2006. Lead Service Line Contributions to Lead Levels at the Tap. AWWA Water Quality Technology Conference. Denver, CO. November 2006.

Freeze, R.A., and Cherry, J.A. 1979. *Groundwater*. Prentice Hall, NJ.

Friedman, M., Hill, A., Booth, S., Hallett, M., McNeil, L., McLean, J., Stevens, D., Sorenson, D., Hammer, T., Kent, W., De Hann, M., MacArthur, K., and Mitchell, K. 2016. *Metals Accumulation and Release within the Distribution System: Evaluation and Mitigation,* Project #4509. Water Research Foundation. Denver, CO.

Friedman, M.J., Hill, A.S., Reiber, S.H., Valentine, R.L., Larsen, G., Young, A., Korshin, G.V., and Peng, C.Y. 2010. Assessment of Inorganics Accumulation in Drinking Water System Scales and Sediments. WRF Project #3118. Water Research Foundation. Denver, CO

Gardels, M.C., and Sorg, T.J. 1989. A Laboratory Study of the Leaching of Lead from Water Faucets. *J. AWWA*, 81(7):101-113.

Giani, R., Edwards, M., Chung, C., and Wujek, J. 2004. *Lead Profiling Methodologies and Results*. Presented at Getting the Lead Out: Analysis and Treatment of Elevated Lead Levels in DC's Drinking Water at the AWWA Water Quality Technology Conference. Denver, CO.

Gregory, R. 1985. *Galvanic Corrosion of Lead and Copper Pipework: Phase I, Measurement of Galvanic Corrosion Potential in Selected Waters*. Water Research Centre Engineering, Swindon, England.

Grigg, N.S. 2010. *Secondary Impacts of Corrosion Control on Distribution System and Treatment Plant Equipment*. Project # 4029. Water Research Foundation. Denver, CO. www.waterrf.org/PublicReportLibrary/4029.pdf.

Hayes, C. R., Incledion, S., and Balch, M. 2008. Experience in Wales (UK) of the Optimization of Ortho-Phosphate Dosing for Controlling Lead in Drinking Water. *Journal of Water and Health***,** 6 (2), 177-185.

Hill, C.P., and Cantor, A.F. 2011. *Internal Corrosion Control in Water Distribution Systems. AWWA Manual M58, First Edition*. American Water Works Association. Denver, CO.

Hill, A.S., Friedman, M.J., Reiber, S.H., Korshin, G.V., and Valentine, R.L. 2010. Behavior of Trace Inorganic Contaminants in Drinking Water Distribution Systems. *J. AWWA,* 107(7): 107-118.

Holm, T.R., and Schock, M.R. 1991. Potential Effects of Polyphosphate Products on Lead Solubility in Plumbing Systems. *J. AWWA*, 83(7):76-82.

Hu, J., Gan, F., Triantafyllidou, S., Nguyen, C.K., and Edwards, M.A. 2012. Copper-Induced Metal Release from Lead Pipe into Drinking Water. *Corrosion,* 68(11): 1037-1048.

Imran, S.A., Dietz, J.D., Mutoti, G., Xiao, W., Taylor, J.S., and Desai, V. 2006. Optimizing Source Water Blends for Corrosion and Residual Control in Distribution Systems. *J. AWWA,* 98(5): 107-115.

James, C.N., Copeland, R.C., and Lytle, D.A. 2004. Relationships between Oxidation-Reduction Potential, Oxidant, and pH in Drinking Water. In *Proceedings of the AWWA Water Quality Technology Conference*. AWWA. Denver, CO.

Kimbrough, D.E. 2001. Brass Corrosion and the LCR Monitoring Program. *J. AWWA*, *93*(2):81-91.

Kimbrough, D.E. 2007. Brass Corrosion as a Source of Lead and Copper in Traditional and All-Plastic Distribution Systems. *J. AWWA*, *98*(8):70-76.

Kimbrough, D.E. 2009. Source Identification of Copper, Lead, Nickel, and Zinc Loading in Wastewater Reclamation Plant Influents from Corrosion of Brass in Plumbing Fixtures. *Environ. Pollut.,* 157(4):1310-6.

Kirmeyer, G.J., Clement, J. and Sandvig, A. 2000. *Distribution System Water Quality Changes Following Implementation of Corrosion Control Strategies*. AwwaRF Order #90764. Project #157. AWWA Research Foundation. Denver, CO.

Kirmeyer, G.J., Friedman, M., Martel, K., Thompson, G., Sandvig, A., Clement, J., and Frey, M. 2002. *Guidance Manual for Monitoring Distribution System Water Quality.* AwwaRF Order# 90882. Project #2522*.* AWWA Research Foundation. Denver, CO.

Kirmeyer, G.J., Murphy, B., Sandvig, A., Korshin, G., Shaha, B., Fabricino, M., and Burlingame, G. 2004. *Post-Optimization Lead and Copper Control Monitoring Strategies*. AwwaRF Order #90996F. Project #2679. AWWA Research Foundation. Denver, CO.

Kirmeyer, G.J., Sandvig, A.M., Pierson, G.L., and Neff, C.H. 1994. *Development of a Pipe Loop Protocol for Lead Control.* AwwaRF Order# 90650. Project #604. AWWA Research Foundation. Denver, CO.

Korshin, G.V., Perry, S.A.L., and Ferguson, J.F. 1996. Influence of NOM on Copper Corrosion. *J. AWWA*, 88(7): 36–47.

Korshin, G.V., Ferguson, J.F., Lancaster, A.N., and Wu, H. 1999. Corrosion and Metal Release for Lead-Containing Materials: Influence of NOM, AwwaRF Report No. 90759. Denver, CO: AWWA Research Foundation.

Korshin, G.V., Ferguson, J.F., and Lancaster. A.N. 2000. Influence of Natural Organic Matter on the Corrosion of Leaded Brass in Potable Water. *Corrosion Science*, 42: 53–66.

Korshin, G.V., Ferguson, J.F., and Lancaster, A.N. 2005. Influence of Natural Organic Matter on the Morphology of Corroding Lead Surfaces and Behavior of Lead-Containing Particles. *Water Research*, 39(5): 811–818.

Kvech, S., and Edwards, M. 2001. Role of Aluminosilicate Deposits in Lead and Copper Corrosion. *J. AWWA*, 93(11):104-112.

LaRosa-Thompson, J., Scheetz, B.E., Schock, M.R., Lytle, D.A., and Delaney, P.J. 1997. Sodium Silicate Corrosion Inhibitors: Issues of Effectiveness and Mechanism. Presented at AWWA Water Quality Technology Conference.

Lauer, W.C. 2005. *Water Quality in the Distribution System*. AWWA. Denver, CO.

Letterman, R.D. 1995. *Calcium Carbonate Dissolution Rate in Limestone Contactors, Research and Development Report*, EPA/600/SR-95/068, Risk Reduction Engineering Laboratory, Cincinnati, OH.

Letterman, R.D. Driscoll, C.T., Haddad, M., and Hsu, H.A. 1986. *Limestone Bed Contactors for Control of Corrosion at Small Water Utilities*. EPA 600/S2-86/099.

Letterman, R.D. Haddad, M. and Driscoll, C.T., Jr. 1991. Limestone Contactors: Steady State Design Relationships. *Jour. Envir. Engrg. Div.- ASCE,* 117(3):339-358.

Letterman, R.D., and Kathari, S. 1996. A Computer Program for the Design of Limestone Contactors. *Jour. NEWWA*, 110(1):42-47.

Lytle, D.A., and Schock, M.R. 1996. S*tagnation Time, Composition, pH and Orthophosphate Effects on Metal Leaching from Brass.* EPA/600/R-96/103. National Risk Management Research Laboratory, Office of Research and Development, USEPA. Cincinnati, OH.

Lytle, D.A., and Schock, M.R. 2005. The Formation of Pb (IV) Oxides in Chlorinated Water. *J. AWWA*, 97(11):102.

Lytle, D.A., Schock, M.R., Clement, J.A., and Spencer, C.M. 1998. Using Aeration for Corrosion Control*. J. AWWA*, 90(3):74-88.

Lytle, D.A., Schock, M.R., and Scheckel, K. 2009. The Inhibition of Pb (IV) Oxide Formation in Chlorinated Water by Orthophosphate. *Environ. Sci. Tech.*, 43(17), 6624-6631.

Lytle, D. A., Schock, M. R., and Sorg, T. J. 1995. Investigation on Techniques and Control of Building Lead and Copper Corrosion by Orthophosphate and Silicate, NACE Corrosion/95, Orlando, FL, 1995; pp 609/1-609/29.

Lytle, D.A., Sorg, T.J., and Frietch, C. 2004. Accumulation of Arsenic in Drinking Water Distribution Systems. *Environ Sci Technol.,* 38(20): 5365.

Mays, L.W. 1999. *Water Distribution Systems Handbook*. AWWA. Denver, CO.

McFadden, M., Giani, R., Kwan, P., and Reiber, S. 2011. Contributions to Drinking Water Lead from Galvanized Iron Corrosion Scales. *J. AWWA,* 103(4):76-89.

McNeill, L.S., and Edwards, M. 2004. Importance of Pb and Cu Particulate Species for Corrosion Control. *J. Environ. Eng.*, 130(2):136-144.

Miller, S.A. Investigation of Lead Solubility and Orthophosphate Addition in High pH Low DIC Water. Master of Science, Department of Biomedical, Chemical, and Environmental Engineering, College of Engineering and Applied Science, University of Cincinnati, Cincinnati, OH, 2014.

MOE. 2009. *Guidance Document for Preparing Corrosion Control Plans for Drinking Water Systems*. Ontario Ministry of Environment. https://ia802301.us.archive.org/18/items/guidancedocument00snsn21738/guidancedocument00snsn21738.pdf.

Montgomery, W.H. 2005. *Water Treatment Principles and Design*. 2nd Edition. John Wiley and Sons.

Muylwyk, Q., Gilks, J., Suffoletta, V., and Olesiuk, J. 2009. *Lead Occurrence and the Impact of LSL Replacement in a Well Buffered Groundwater*. Water Quality Technology Conference Proceedings. AWWA. Denver, CO.

MWRA. 2010. Massachusetts Water Resources Authority 90th Percentile Lead Levels in MWRA System of Fully-Supplied Communities, March 2010. www.mwra.com/watertesting/lead/webgraphs/2010/2010-march-640.jpg.

Nguyen, C., Stone, K., Clark, B., Edwards, M. Gagnon, G., and Knowles, A. 2010. Impact of Chloride:Sulfate Mass Ratio (CSMR) Changes on Lead Leaching in Potable Water. WRF Project #4088. Water Research Foundation. Denver, CO.

Nguyen, C.K., Stone, K.R., and Edwards, M.A. 2011. Chloride-to-Sulfate Mass Ratio: Practical Studies in Galvanic Corrosion of Lead Solder. *J. AWWA*, 103(1): 81-92.

NSF. 2010. *NSF/ANSI 61-2010. Drinking Water System Components – Health Effects*. NSF International. Ann Arbor, Michigan.

Oliphant, R.J. 1983. *Summary Report on the Contamination of Potable Water by Lead from Soldered Joints*. Water Research Center Engineering, Swindon, External Report 125-E.

Peng, C.-Y., Hill, A.S., Friedman, M.J., Valentine, R.L., Larson, G.S., Romero, A.M.Y., Reiber, S.H., and Korshin, G.V. 2012. Occurrence of Trace Inorganic Contaminants in Drinking Water Distribution Systems, *J. AWWA* 104:E181-E193.

Plummer, L.N., and Busenberg, E. 1982. Solubilities of Calcite Aragonite and Vaterite in CO_2-H_2O Solutions Between 0 and 90°C, and an Evaluation of the Aqueous Model for the System $CaCO_3$-CO_2-H_2O. *Geochimica et Cosmochimica Acta (The Journal of The Geochemical Society and The Meteoritical Society),* 46: 1011.

Rego, C.A., and Schock, M.R. 2007. Case Studies in the Integrated Use of Scale Analyses to Solve Lead Problems. Distribution System Research Symposium, AWWA. Denver, CO.

Reiber, S. 1991. Galvanic Stimulation of Corrosion on Lead-Tin Solder-Sweated Joints. *J. AWWA,* 83(7): 83-91.

Reiber, S., Poulsom, S., Perry, S.A.L., Edwards, M., Patel, S., and Dodrill, D.M. 1997. *A General Framework for Corrosion Control Based on Utility Experience*. AwwaRF Order #90712A. Project #910. AWWA Research Foundation, Denver, CO.

Rezania, L.W., and Anderl, W.H. 1996. Copper Corrosion and Iron Removal Plants. *National Conference on Integrating Corrosion Control and Other Water Quality Goals*, Cambridge, MA.

Rezania, L.W., and Anderl, W.H. 1997. Corrosion Control for High DIC Groundwater: Phosphate or Bust. AWWA Annual Conference, Atlanta, GA.

Rodgers, M. 2014. Impact of Corrosion Control on Publicly Owned Treatment Works. In *Proceedings of the Water Quality and Technology Conference*. AWWA. Denver, CO.

Safe Drinking Water Act Amendments of 1996. *Public Law 104-182.* 104th Congress. www.congress.gov/104/plaws/publ182/PLAW-104publ182.pdf.

Sandvig, A.M., Boyd, G., Kirmeyer, G., Edwards, M., Triantafyllidou, S., and Murphy, B. 2007. *Performance and Metal Release of Non-Leaded Brass Meters, Components, and Fittings*. AwwaRF Order # 91174. AWWA Research Foundation. Denver, CO.

Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R.R., Trussell, S., Cantor, A., and Prescott, A. 2008. *Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues*. AwwaRF Order # 91229. Project #3018. AWWA Research Foundation. Denver, CO.

Schendel, D.B., Chowdhury, Z.K., Hill, C.P., Summers, R.S., Towler, E., Balaji, R., Raucher, R.S., and Cromwell, J. 2009. *Simultaneous Compliance Tool: A Decision Tool to Help Utilities Develop Simultaneous Compliance Strategies*. WRF Order # 91263. Project #3115. Water Research Foundation. Denver, CO.

Schippers, J.C., Kruithof, J.C., Nederlof, M.M., Hofman, J.A.M.H. and Taylor, J. 2004. *Integrated Membrane Systems*. AwwaRF Order #90899. Project #264. AWWA Research Foundation. Denver, CO.

Schneider, O.D. Parks, J., Edwards, M., Atassi, A., and Kashyap, A. 2011. *Comparison of Zinc Versus Non-zinc Corrosion Control for Lead and Copper*. WRF Project #4103. Water Research Foundation. Denver, CO.

Schneider, O.D., Hughes, D.M., Bukhari, Z., LeChevallier, M., Schwartz, P., Sylvester, P., and Lee, J.J. 2010. Determining Vulnerability and Occurrence of Residential Backflow. *J. AWWA*, 102(8):52-63.

Schock, M.R. 1980. Response of Lead Solubility to Dissolved Carbonate in Drinking Water. *J. AWWA*, 72(12):695-704.

Schock, M.R. 1981. Erratum—Response of Lead Solubility to Dissolved Carbonate in Drinking Water. *J. AWWA,* 73(3):36.

Schock, M.R. 1989. Understanding Corrosion Control Strategies for Lead. *J. AWWA,* 81(7):88-101.

Schock, M. 1996. Corrosion Inhibitor Applications in Drinking Water Treatment: Conforming to the Lead and Copper Rule. Presented at NACE Corrosion 1996 Conference.

Schock, M.R. 1999. Internal Corrosion and Deposition Control. In *Water Quality and Treatment,* 5th Edition. R. Letterman (Ed.). McGraw-Hill Inc. New York, NY.

Schock, M.R. 2001. Tetravalent Lead: A Hitherto Unrecognized Control of Tap Water Lead Contamination. AWWA Water Quality Technology Conference. Denver, CO.

Schock, M.R. 2005. Lead Chemistry Basics, Scale Formation, and Corrosion Control Treatment. Simultaneous Compliance: The Lead/Chloramine Example. April 13, 2005, Virginia Section AWWA, Richmond, VA.

Schock, M.R. 2007a. Distribution System Considerations for Treatment. Workshop on Inorganic Contaminant Issues. August 22, 2007, Cincinnati, OH.

Schock, M.R. 2007b. New Insights Into Lead Corrosion Control and Treatment Change Impacts (with Some Considerations Towards Cu). Presented at Emerging Issues in Water Treatment MI Section, AWWA. May 15, 2007.

Schock, M.R., Cantor, A.F., Triantafyllidou, S., DeSantis, M.K., Scheckel, K.G. 2014. Importance of Pipe Deposits to Lead and Copper Rule Compliance. *J. AWWA.* 106(7): E336-E349.

Schock, M.R., Clement, J.A., Lytle, D.A., Sandvig, A.M., and Harmon, S.M. 1998. Replacing Polyphosphate with Silicate to Solve Problems with Lead, Copper and Source Water Iron. AWWA Water Quality Technology Conference, November 1-4, San Diego, CA.

Schock, M.R., DeSantis, M. K., Metz, D. H., Welch, M. M., Hyland, R.N., and Nadagouda, M.N. 2008. Revisiting the pH Effect on the Orthophosphate Control of Plumbosolvency, *Proceedings of the AWWA Annual Conference and Exposition*, Atlanta, GA.

Schock, M.R., and Fox, J.C. 2001. Solving Copper Corrosion Problems while Maintaining Lead Control in a High Alkalinity Water Using Orthophosphate. AWWA Annual Conference, June 3-7, Washington, DC.

Schock, M.R., and Giani, R. 2004. *Oxidant/Disinfectant Chemistry and Impacts on Lead Corrosion*. AWWA Water Quality Technology Conference. Denver, CO.

Schock, M.R., Holldber, J., Lovejoy, T.R., and Lowry, J. 2002. California's First Aeration Plants for Corrosion Control. *J. AWWA*, 94(3):88-100.

Schock, M.R., Hyland, R., and Welch, M. 2008. Occurrence of Contaminant Accumulation in Lead Pipe Scales from Domestic Drinking Water Distribution Systems. *Environ. Sci. Technol.,* 42(12): 4285-91.

Schock, M.R., and Lemieux, F.G. 2010. Challenges in addressing variability of lead in domestic plumbing. *Water Science & Technology: Water Supply***,** 10(5): 792-798.

Schock, M.R., and Lytle, D.A. 2011. Chapter 20: Internal Corrosion and Deposition Control. In *Water Quality and Treatment.* 6th Edition. AWWA and McGraw-Hill, Inc.

Schock, M.R., Lytle, D.A., Sandvig, A.M., Clement, J., and Harmon, S.M. 2005. Replacing Polyphosphate with Silicate To Solve Lead, Copper, and Source Water Iron Problems. *J. AWWA*, 97(11): 84-93.

Schock, M.R., and Rego, C. 2005. Lead and Copper Corrosion Control Theory Update. New England Water Works Association Conference Spring Exposition and Conference.

Schock, M.R., and Sandvig, A.M. 2006. Long-Term Impacts of Orthophosphate Treatment on Copper. In *Proceedings of the AWWA Annual Conference and Exposition, San Antonio, TX, June 11 - 15, 2006.* AWWA. Denver, CO.

Schock, M.R., Sandvig, A.M., Lemieux, F.G., and Desantis, M.K. 2012. Diagnostic Sampling to Reveal Hidden Lead and Copper Health Risks. 15th Canadian National Conference and 6th Policy Forum on Drinking Water, Kelowna, BC, October 21-24.

Schock, M.R., Scheckel, K.G., DeSantis, M., and Gerke, T.L. 2005. Mode of Occurrence, Treatment and Monitoring Significance of Tetravalent Lead. AWWA Water Quality Technology Conference. Denver, CO.

Schock, M.R., Triantafyllidou, S., and DeSantis, M.K. 2014. Peak Lead Levels and Diagnostics in Lead Service Lines Dominated by PbO_2. In *Proceedings of the AWWA Annual Conference*. AWWA. Denver, CO.

Schock, M.R., Wagner, I., and Oliphant, R. 1996. The Corrosion and Solubility of Lead in Drinking Water. In *Internal Corrosion of Water Distribution Systems*; 2nd edition. AwwaRF Order #90508. Project #725. AWWA Research Foundation/DVGW Forschungsstelle. Denver, CO. 131-230.

Sheiham, I., and Jackson, P.J. 1981. The Scientific Basis for Control of Lead in Drinking Water by Water Treatment. *J. Inst. Water Engrs. and Scientists*, 35(6):491.

Simon, G.P. 1991. Tables and Conversion Factors – Chemical Equivalent Weights and Conversion Factors. In: *Ion Exchange Training Manual*. Springer Science+Business Media. New York.

Singley, J.E. 1994. Electrochemical Nature of Lead Contamination. *J. AWWA*, 86(7): 91-96.

Smith, S.E., Colbourne, J.S., Holt, D.M., Lloyd, B.J., and Bisset, A. 1997. An Examination of the Nature and Occurrence of Deposits in a Distribution System and their Effect on Water Quality. AWWA Water Quality Technology Conference, November 17-21. Denver, CO.

Snoeyink, V., and Jenkins, D. 1980. *Water Chemistry*. John Wiley and Sons. New York, NY.

Snoeyink, V.L., Schock, M.R., Sarin, P., Wang, L., Chen, A.S., Harmon, C., and S.M. 2003. Aluminum-Containing Scales in Water Distribution Systems: Prevalence and Composition. *Journal of Water Supply: Research and Technology —Aqua***,** *52* (7): 455-474.

Spencer, C.M. 1998. Aeration and Limestone Contact for Radon Removal and Corrosion Control. *Jour. NEWWA*, 112(1):60-69.

Spencer, C.M., and Brown, W.E. 1997. pH Monitoring to Determine Aeration Effectiveness for Carbon Dioxide and Radon Removal. In *Proceedings of AWWA Water Quality Technology Conference*, November 9-13, Denver, CO.

Stone, K., Nguyen, C. and Edwards, M. 2009. Practical Identification and Resolution of Lead Corrosion Issues Due to Elevated Chloride to Sulfate Mass Ratio. AWWA Annual Conference, June 2009, San Diego, CA.

Stumm, W., and Morgan, J.J. 1981. *Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters*. 2nd Edition. John Wiley and Sons, New York.

Swertfeger, J., Hartman, D.J., Shrive, C., Metz, D., and DeMarco, J. 2006. Water Quality Effects of Partial Lead Replacement. In *Proceedings of the AWWA Annual Conference.* AWWA. Denver, CO.

Tang, Z., Hong, S., Xiao, W., and Taylor, J. 2006. Impacts of Blending Ground, Surface and Saline Waters on Lead Release in Drinking Water Distribution Systems. *Water Research*, 40: 943-950.

Taylor, J.S., Dietz, J.D., Randall, A.A., Hong, S.K., Norris, C.D., Mulford, L.A., Arevalo, J.M., Imran, S., Le Puil, M., Liu, S., Mutoti, I., Tang, J., Xiao, W., Cullen, C., Heaviside, R., Mehta, A., Patel, M., Vasquez, F., and Webb, D. 2005. *Effects of Blending on Distribution System Water Quality*. AwwaRF Order #91065F. Project #2702. AWWA Research Foundation. Denver, CO.

Taylor, J.S., Dietz, J.D., Randall, A.A., Norris, C.D., Alsheri, A., Arevalo, J., Guan, X., Lintereur, P., MacNevin, D., Stone, E., Vaidya, R., Zhao, B., Glatthorn, S., and Shekhar, A. 2008. *Control of Distribution System Water Quality Using Inhibitors*. AwwaRF Order #91241F. Project #2702. AWWA Research Foundation. Denver, CO.

Triantafyllidou, S., and Edwards, M. 2010. Contribution of Galvanic Corrosion to Lead in Water after Partial Lead Service Line Replacements. Order #4088b. Project #4088. Water Research Foundation. Denver, CO.

Triantafyllidou, S., and Edwards, M. 2011. Galvanic Corrosion after Simulated Small-Scale Partial Lead Service Line Replacements. *J. AWWA*, 103(9): 85-98.

Triantafyllidou, S., Schock, M., DeSantis, M., and White, C. 2015. Low Contribution of PbO_2-Coated Lead Service Lines to Water Lead Contamination at the Tap. *Environmental Science and Technology*, 49(6): 3746−3754.

Uchida, M., and Okuwaki, A. 1999. Dissolution Behavior of Lead Plates in Aqueous Nitrate Solutions. *Corros. Sci.*, 41(10): 1977-1986.

USEPA. 1982. *EPA Method 150.1, pH (Electrometric).* www.nemi.gov/methods/method_summary/4685/.

USEPA. 1987. Amendments to the Safe Drinking Water Act. *52 FR 20674*, June 2, 1987.

USEPA. 1991a. National Primary Drinking Water Regulations – Synthetic Organic Chemicals and Inorganic Chemicals; Monitoring for Unregulated Contaminants; National Primary Drinking Water Regulations Implementation; National Secondary Drinking Water Regulations. *Federal Register,* 56(20): 3573. January 30, 1991.

USEPA. 1991b. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. *Federal Register,* 56(110): 26505. June 7, 1991.

USEPA. 1991c. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. Technical Correction. *Federal Register,* 56(135): 32112. July 15, 1991.

USEPA. 1992a. *Lead and Copper Rule Guidance Manual, Vol. II: Corrosion Control Treatment*. Report No. EPA/811-B-92/002. US Environmental Protection Agency. Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/91019DM4.PDF?Dockey=91019DM4.PDF

USEPA. 1992b. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. Technical Correction. *Federal Register,* 57(125): 28785. June 29, 1992.

USEPA. 1994. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. Technical Correction. *Federal Register,* 59(125): 33860. June 30, 1994.

USEPA. 1997. Interpretation of New Drinking Water Requirements Relating to Lead Free Plumbing Fittings and Fixtures. *Federal Register,* 62(63): 44684. Aug. 22, 1997.

USEPA. 2000. National Primary Drinking Water Regulations for Lead and Copper. *Federal Register*, 65(8): 1950-2015. January 12, 2000. www.gpo.gov/fdsys/pkg/FR-2000-01-12/pdf/00-3.pdf.

USEPA. 2001. *How to Determine Compliance with Optimal Water Quality Parameters as Revised by the Lead and Copper Rule Minor Revisions.* United States Environmental Protection Agency. Office of Water 4606. EPA 815-R-99-019. February 2001. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=901U0100.pdf.

USEPA. 2003. *Final Revised Guidance Manual for Selecting Lead and Copper Control Strategies.* Report No. EPA-816-R-03-001. US Environmental Protection Agency, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100999U.pdf.

USEPA. 2004a. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. *Federal Register,* 69(124): 38850. June 29, 2004.

USEPA. 2004b. USEPA *Local Limits Development Guidance*. Office of Wastewater Management 1203. EPA 833-R-04-002A. July 2004. https://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi/300062Q1.PDF?Dockey=300062Q1.PDF.

USEPA. 2004c. *Lead and Copper Rule – Clarification of Requirements for Collecting Samples and Calculating Compliance.* Office of Water (4606). November 23, 2004. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100NEFJ.PDF?Dockey=P100NEFJ.PDF.

USEPA. 2006a. *Inorganic Contaminant Accumulation in Potable Water Distribution Systems.* Office of Water (4601M). December 2006.

USEPA. 2006b. *Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems*, EPA 815-R-06-10. April 2006. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1009UBF.PDF?Dockey=P1009UBF.PDF.

USEPA. 2007a. National Primary Drinking Water Regulations for Lead and Copper: Short-Term Regulatory Revisions and Clarifications. *Federal Register*, 72 (195) :57782-57820. October 10, 2007. www.federalregister.gov/articles/2007/10/10/E7-19432/national-primary-drinking-water-regulations-for-lead-and-copper-short-term-regulatory-revisions-and.

USEPA. 2007b. *Simultaneous Compliance Guidance Manual for Long Term 2 and Stage 2 DBP Rules*. Office of Water (4601). EPA 815-R-07-017. March 2007. http://nepis.epa.gov/Exe/ZyPDF.cgi/60000E2Q.PDF?Dockey=60000E2Q.PDF.

USEPA. 2007c. *Elevated Lead in D.C. Drinking Water – A Study of Potential Causative Events, Final Summary Report*. Office of Water (4607M). EPA 815-R-07-021. August 2007. http://nepis.epa.gov/Exe/ZyPDF.cgi/P1007ZEI.PDF?Dockey=P1007ZEI.PDF.

USEPA. 2007d. *Lead and Copper Rule 2007 Short Term Revisions and Clarifications State Implementation Guidance*. Office of Water (4606M). EPA 816-D-07-003. December 2007. http://nepis.epa.gov/Exe/ZyPDF.cgi/P100A2A8.PDF?Dockey=P100A2A8.PDF.

USEPA. 2008a. *Implementing the Lead Public Education Provisions of the Lead and Copper Rule: A Guide for Community Water Systems*. Office of Water (4606M). EPA 816-R-08-007. June 2008. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=60001I4N.pdf.

USEPA. 2008b. *Implementing the Lead Public Education Provisions of the Lead and Copper Rule: A Guide for Non-Transient Non-Community Water Systems*. Office of Water (4606M). EPA 816-R-08-008. June 2008. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=60001I2F.pdf.

USEPA. 2008c. *Lead and Copper Rule: A Quick Reference Guide*. Office of Water (4606). EPA 816-F-08-018. http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=60001N8P.pdf.

USEPA. 2010a. *Nutrient Control Design Manual*. Office of Research and Development. EPA 600/R-10/100. August 2010. http://nepis.epa.gov/Exe/ZyPDF.cgi/P1008KTD.PDF?Dockey=P1008KTD.PDF.

USEPA. 2010b. *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems*. Office of Water (4606M). EPA 816-R-10-004. March 2010. http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.pdf.

USEPA. 2013. *Summary of the Reduction of Lead in Drinking Water Act and Frequently Asked Questions*. Office of Water (4707M) EPA 815-S-13-003. December 19, 2013. http://nepis.epa.gov/Exe/ZyPDF.cgi/P100M5DB.PDF?Dockey=P100M5DB.PDF.

USEPA. 2015a. *How to Identify Lead-Free Certification Marks for Drinking Water System & Plumbing Materials*. EPA/600/F-13/153c. Revised March 2015. http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.pdf.

USEPA. 2015b. Memorandum from Peter C. Grevatt, Director, Office of Ground Water and Drinking Water, to EPA Regional Water Division Directors, Regions I-X. Lead and Copper Rule Requirements for Optimal Corrosion Control Treatment for Large Drinking Water Systems. November 3, 2015. www.epa.gov/sites/production/files/2015-11/documents/occt_req_memo_signed_pg_2015-11-03-155158_508.pdf.

Vaidya, R.D. 2010. The Impact of Corrosion Inhibitors on Iron, Copper, and Lead Surface Scales in Drinking Water. In *Proceedings of the AWWA Annual Conference*. AWWA. Denver, CO.

Wang, Y., Mehta, V., Welter, G.J., and Giammar, D.E. 2013. Effect of Connection Methods on Lead Release from Galvanic Corrosion. *J. AWWA*, 105(7): E337-E351.

Wachinski, A.M. 2016. Tables and Conversion Factors – Common Water Treatment Chemicals. In: *Environmental Ion Exchange: Principles and Design*. 2nd edition. CRC Press. Boca Raton, FL.

Wasserstrom, L., Miller, S., Triantafyllidou, S., DeSantis, M., and Schock, M. 2017. Scale Formation under Blended Phosphate Treatment for a Utility with Lead Pipes. *J. AWWA*, 109(11): E464-E478.

Wilczak, A.J., Hokanson, D.R., Rhodes Trussel, R., Boozarpour, M., and Degraca, A. 2010. Water Conditioning For LCR Compliance and Control Of Metals Release In San Francisco's Water System. *J. AWWA*, 102(3):52-64.

Xiao, W., Hong, S., Tang, Z., and Taylor, J.S. 2007. Effects of Blending on Total Copper Release in Distribution Systems, *J. AWWA,* 99(1): 78-88.

Zhang, Y., Tseng, T.J., Andrews-Tate, C., Cheng, R.C., and Wattier, K.L. 2012. Pilot-Scale Evaluation of Blending Desalinated Seawater into a Distribution System, *J. AWWA,* 104: E416-E429.

Appendix A – Glossary

Term	Definition
90th Percentile	The concentration of lead or copper in tap water that is exceeded by 10 percent of the sites sampled during a monitoring period. For systems collecting five samples, the 90th percentile is the average of the fourth and fifth highest lead or copper result. For systems that are allowed by their primacy agencies to collect fewer than five samples, this value is the highest lead or copper result. The 90th percentile level is compared to the lead or copper action level (AL) to determine whether an AL has been exceeded.
Action Level (AL)	The concentration of lead or copper in tap water which determines whether a system may be required to install corrosion control treatment (CCT), collect water quality parameter (WQP) samples, collect lead and copper source water samples, replace lead service lines (LSLs), and/or deliver public education materials to consumers about lead. The action level for lead is 0.015 mg/L. The action level for copper is 1.3 mg/L.
Action Level Exceedance	Occurs when the 90th percentile lead or copper sample result is above its respective AL.
Aeration	A non-chemical method used for oxidation or adjusting pH where air is introduced into the water. This removes carbon dioxide, which results in an increase in pH.
Alkalinity	The capacity of water to neutralize acid. It is the sum of carbonate (CO_3^{2-}), bicarbonate (HCO_3^-), and hydroxide (OH^-) anions in the water.
Aluminum Carryover	This may occur when a system uses aluminum-containing compounds in their treatment and the aluminum passes through the treatment plant processes into the distribution system. It may affect hydraulic capacity or tie up orthophosphate needed for effective corrosion control treatment.
Analogous Systems	Water systems with similar water quality, treatment, and distribution systems.
Anion	A negative ion; an atom or group of atoms that has gained one or more electrons.
Anode	The component of an electrochemical cell where oxidation occurs and electrons are generated.
Anodic Inhibitor	A substance which can be used to reduce oxidation reactions at the anode.
Buffer Index	The ability of water to provide buffering against a pH increase or decrease caused by a corrosion process or water treatment chemical addition.
Buffer Intensity	Also called buffer capacity, this is a measure of the resistance of water to changes in pH, either up or down. It is related to alkalinity (sum of bicarbonate, carbonate, and hydroxyl ions) but varies with pH.
Cation	A positive ion; an atom or group of atoms that has lost one or more electrons.

Term	Definition
Chloride-to-Sulfate Mass Ratio (CSMR)	The relative ratio of chloride ions (Cl^-) to sulfate ions (SO_4^{2-}) in the water.
Community Water System (CWS)	A public water system (PWS) that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Corrosion	The physicochemical interaction between a metal and its environment which results in changes in the properties of the metal.
Corrosion Control Treatment (CCT)	A treatment designed to reduce the corrosivity of water toward metal plumbing materials, particularly lead and/or copper.
Corrosion Rate	The rate at which a metal or alloy will deteriorate over time as a result of electrochemical oxidation. The rate will vary according to the specific properties of the metal or alloy and its environmental conditions.
Corrosivity	The ability of a substance to break down (corrode) materials.
Coupon Study	Study that uses metal pieces (i.e., coupons) of lead, copper, iron, or steel to help determine how specific water treatments may help prevent release of metals from these materials.
Cu	The chemical symbol for copper.
Demonstration Study	A study to evaluate alternative treatment approaches for reducing lead and/or copper levels which includes development and implementation of testing protocols. Demonstration testing can incorporate pipe loops, coupon tests, scale analysis, or partial system testing.
Desktop Study	A study to determine appropriate corrosion control treatment for reducing lead and/or copper levels which includes evaluations of literature, historical data and information, theory, and similar system information.
Dissolved Inorganic Carbon (DIC)	An estimate of the amount of total carbonates in the form of carbon dioxide gas (CO_2 or H_2CO_3), bicarbonate ion (HCO_3^-), and carbonate ion (CO_3^{2-}).
E_h Value	The electrical potential as measured by an oxidation-reduction potential (ORP) probe. The higher the E_h value the more oxidizing the conditions.
Electromotive Force (EMF)	Energy supplied by a source divided by the electric charge transported through the source. For a galvanic cell it is equal to the electric potential difference for zero current through the cell.
Entry Point	Refers to points of entry into the drinking water distribution system from which samples will be representative of each source after treatment.
Finished Water	Water that has been treated and is ready to be delivered to customers.
Flushed Sample	A water sample collected after the water has been allowed to run for a specified period of time.
Galvanic Corrosion	Occurs when two different types of metals or alloys physically contact each other. One of the metals serves as the anode, with its corrosion rate accelerated, while the other serves as the cathode, with its corrosion rate reduced.

Term	Definition
Hardness	A measure of the amount of calcium and magnesium in the water. Hardness is typically reported as "mg/L as $CaCO_3$" (calcium carbonate). Hardness must be taken into consideration when corrosion control is selected and implemented because too much hardness can cause unintended side effects such as increased scaling, either within the pump station/treatment plant or out in the service area.
Ionic Strength	A measure of the concentration of ions in solution.
Langelier Saturation Index (LSI)	The comparison between the measured pH of water with the pH that water would have at saturation with $CaCO_3$. The LSI should only be used to predict scaling potential as an adverse secondary impact of pH or alkalinity adjustment and has no value as a corrosivity indicator for lead and copper.
Large Water System	System serving more than 50,000 people.
LCR	An acronym used to describe the Lead and Copper Rule, which was originally published on June 7, 1991 and also includes subsequent revisions to the rule.
Lead-free	The Reduction of Lead in Drinking Water Act was enacted on January 4, 2011 to amend the Safe Drinking Water Act (SDWA) to redefine the definition of “lead-free.” The bill specifies a maximum weighted average of 0.25 percent for wetted surfaces of pipes, fittings, and fixtures and retains the maximum lead content of 0.2 percent for solder and flux. This revised definition became effective on January 4, 2014.
Lead Service Line (LSL)	A service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck, or other fitting which is connected to such lead line (§141.2).
Limestone Contactor	A method for increasing pH, alkalinity, and calcium level by having water flow through a bed of crushed limestone.
Maximum Contaminant Level Goal (MCLG)	The level of a contaminant in drinking water below which there is no known or expected risk to health. It is set at zero for lead and 1.3 mg/L for copper.
Medium Water System	A water system that serves 3,301 to 50,000 people.
Microbial and Disinfection Byproducts Rules (MDBPR)	A series of rules from the Environmental Protection Agency (EPA) designed to protect drinking water supplies from microbial contamination while minimizing health risks from the formation of disinfection byproducts.
Natural Organic Matter (NOM)	Organic material derived from plants and animals in the environment.
Nitrification	Nitrification occurs when nitrifying bacteria convert ammonia (NH_3) into nitrite (NO_2^-) and nitrate (NO_3^-), which may lower the pH and alkalinity of the water, potentially accelerating brass corrosion and causing problems with lead release.

Term	Definition
Non-transient, Non-Community Water System (NTNCWS)	A public water system that is not a community water system and regularly serves at least 25 of the same persons during a minimum of 6 months of each year.
Optimal Corrosion Control Treatment (OCCT)	The corrosion control treatment that minimizes the lead and copper concentrations at users' taps while ensuring that the treatment does not cause the water system to violate any National Primary Drinking Water Regulations (NPDWRs) (§141.2).
Optimal Water Quality Parameters (OWQPs)	Specific ranges or minimums that are determined by the primacy agency for each relevant WQP. OWQPs represent the conditions under which systems must operate their corrosion control treatment to most effectively minimize the lead and copper concentrations at their users' taps while not violating any NPDWRs.
Orthophosphate	The active agent for phosphate-based inhibitor chemicals that, when added to the water, can combine with lead and copper to form several different compounds that have a strong tendency to form a passivating scale, inhibiting lead and copper release into drinking water).
Oxidant	A chemical compound that readily transfers oxygen atoms, or a substance that gains electrons in a redox chemical reaction.
Oxidation-Reduction Potential (ORP)	Also termed redox potential. An electrical measurement that describes the ability of water to oxidize or reduce substances. It affects how the water interacts with solid substances, such as pipe materials in a distribution system, and it affects the thermodynamic stability of minerals.
Partial System Testing	A type of demonstration study in which CCT is evaluated full-scale by applying the treatment to a hydraulically isolated portion of the distribution system.
Passivating Scale	A protective layer comprised of insoluble forms of metals that forms on the pipe surface and helps to prevent the release of lead or copper into drinking water.
Pb	The chemical symbol for lead.
pH	The pH of water is a measure of its acidity, otherwise known as hydrogen ion concentration (H^+ or H_3O^+).
Phosphate Inhibitors	Chemicals used to control lead by forming passivating phosphate-based compounds that help prevent (or inhibit) lead and copper from going into solution. Orthophosphate is the active agent for phosphate-based inhibition.
Pipe Loop Testing	Pipe loops consist of pipes or pipe sections made of a variety of materials, including lead pipe (new or excavated); copper pipe; copper pipe with lead soldered joints; or brass components (faucets or meters). Pipe loop testing is used to evaluate the ability of corrosion control treatments to reduce the presence of metals in drinking water.
Point-of-Use (POU) Treatment Unit	Treatment unit applied to a single tap to reduce contaminants in the drinking water at that tap.

Term	Definition
Polyphosphates	Polymers comprised of linked units of orthophosphate that are used to sequester (or bind) iron, manganese, and other constituents in the water to keep them in solution.
Pourbaix Diagram	Also known as a potential-pH diagram, predicts what aqueous species or corrosion by-product solid phases are thermodynamically stable under different conditions of electrochemical potential and pH.
Premise Plumbing	Premise plumbing includes that portion of the potable water distribution system associated with schools, hospitals, public and private housing, and other buildings.
Profile Testing	A type of demonstration study in which several sequential stagnation samples are collected at the tap and analyzed for lead and/or copper. This protocol for sampling can be used to evaluate lead and/or copper release from specific portions of the service line and premise piping system in a residence, and can help identify both the sources of lead and copper and the impact of replacing plumbing materials containing lead and copper.
Public Water System (PWS)	A system that provides piped water for human consumption, which has at least 15 service connections or regularly serves an average of at least 25 individuals daily for at least 60 days of the year. It includes: 1) the collection, treatment, storage, and distribution facilities operated and used by the system, and 2) any collection or pretreatment storage facilities not under the control of the system, but which it primarily uses.
Redox (Lead) Chart	A chart which shows lead speciation as a function of pH and the oxidizing or reducing environment; can be used to identify the potential for changes in ORP to influence lead or copper levels.
Secondary Standards	Non-enforceable federal guidelines regulating contaminants that may cause cosmetic, aesthetic effects (such as taste, odor, or color), or technical effects (corrosion, staining, scaling, and sedimentation) in drinking water. Iron (Fe) and manganese (Mn) are two contaminants with secondary standards (of 0.3 mg/L and 0.05 mg/L, respectively) based on their aesthetic and technical effects.
Sequestering Agents	Chemicals used to absorb metals such as iron and manganese that may interfere with treatment and/or cause customer complaints such as staining or taste problems. Examples include polyphosphates, sodium hexametaphosphate, and silicates.
Silicate Inhibitors	A mixture of soda ash and silicon dioxide that can form metal silicate compounds that serve as anodic inhibitors (i.e., they inhibit the oxidation and dissolution of the metal). They can passivate the surface of lead and copper based materials and help to reduce lead and copper levels. They can also sequester iron and manganese.
Small Water System	A water system that serves ≤ 3,300 people.
Solder	A metallic compound used to seal joints in plumbing. Until the lead ban took effect in 1988, most solder contained about 50 percent lead.

Term	Definition
Solubility (Lead or Copper) Chart	Used to predict the theoretical amount of lead or copper that may be released into water under specific water quality conditions (pH and DIC levels). They can be used as a general indication of the impact that changing water quality conditions may have on lead and copper release and its control.
Soluble/Insoluble	A substance which dissolves in a liquid is termed soluble. A substance that does not dissolve or has very low solubility is termed insoluble.
Standard 61, Section 9	A standard developed by NSF International for American National Standards Institute (ANSI) that limits the amount of lead that can be leached from endpoint devices for water intended for human consumption.
Water Distribution System	Refers to the piping, devices, and related fittings that are used to carry a system's drinking water to its users.
Water Quality Parameters (WQPs)	Used to help systems and primacy agencies determine what levels of CCT work best for the system and whether this treatment is being properly operated and maintained over time. WQPs include: pH, temperature, conductivity, alkalinity, calcium, orthophosphate, and silica.

Appendix B – Estimated Dissolved Inorganic Carbon (mg/L as C) based on Alkalinity and pH (with water temperature of 25 degrees C and TDS of 200)[1, 2, 3]

Total Alkalinity	pH																				
	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4
0	0																				
2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0					
4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0			
6	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	0	0		
8	4	3	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	0		
10	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	1	1	0	
12	5	4	4	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	1	1	
14	6	5	4	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	1	1	0
16	7	6	5	5	4	4	4	4	4	4	4	4	4	4	3	3	3	2	2	1	0
18	8	7	6	5	5	5	5	4	4	4	4	4	4	4	4	4	3	3	2	2	1
20	9	7	6	6	5	5	5	5	5	5	5	5	5	4	4	4	4	3	3	2	1
22	10	8	7	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	3	2	1
24	11	9	8	7	7	6	6	6	6	6	6	6	5	5	5	5	4	4	3	2	2
26	11	10	8	8	7	7	7	6	6	6	6	6	6	6	6	5	5	4	4	3	2
28	12	10	9	8	8	7	7	7	7	7	7	7	6	6	6	6	5	5	4	3	2
30	13	11	10	9	8	8	8	7	7	7	7	7	7	7	6	6	6	5	4	3	2
35	15	13	11	10	9	9	9	9	9	8	8	8	8	8	8	7	7	6	5	4	3
40	18	15	13	12	11	10	10	10	10	10	10	9	9	9	9	8	8	7	6	5	4
45	20	16	14	13	12	12	11	11	11	11	11	11	10	10	10	9	9	8	7	6	5
50	22	18	16	14	14	13	13	12	12	12	12	12	12	11	11	10	10	9	8	7	5
55	24	20	18	16	15	14	14	14	13	13	13	13	13	12	12	11	11	10	9	8	6
60	26	22	19	17	16	16	15	15	15	14	14	14	14	14	13	12	12	11	10	8	7
65	29	24	21	19	18	17	16	16	16	16	15	15	15	15	14	14	13	12	10	9	8

Total Alkalinity	pH																				
	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4
70	31	26	22	20	19	18	18	17	17	17	17	16	16	16	15	15	14	13	11	10	8
75	33	27	24	22	20	19	19	19	18	18	18	18	17	17	16	16	15	14	12	11	9
80	35	29	26	23	22	21	20	20	19	19	19	19	19	18	18	17	16	14	13	12	10
85	37	31	27	25	23	22	21	21	21	20	20	20	20	19	19	18	17	15	14	12	11
90	40	33	29	26	24	23	23	22	22	22	21	21	21	20	20	19	18	16	15	13	11
95	42	35	30	28	26	25	24	23	23	23	23	22	22	22	21	20	19	17	16	14	12
100	44	37	32	29	27	26	25	25	24	24	24	24	23	23	22	21	20	18	17	15	13
125	55	46	40	36	34	32	31	31	30	30	30	29	29	28	27	26	25	23	21	19	17
150	66	55	48	43	41	39	38	37	37	36	36	35	35	34	33	32	30	28	25	23	20
175	77	64	56	51	47	45	44	43	43	42	42	41	41	40	39	37	35	32	30	27	24
200	88	73	64	58	54	52	50	49	49	48	48	47	46	45	44	42	40	37	34	31	28
225	99	82	72	65	61	58	57	56	55	54	54	53	52	51	50	48	45	42	38	35	32
250	110	91	80	72	68	65	63	62	61	60	60	59	58	57	55	53	50	47	43	39	36
275	121	100	88	80	75	71	69	68	67	66	66	65	64	63	61	58	55	51	47	43	39
300	132	110	96	87	81	78	76	74	73	72	72	71	70	68	66	64	60	56	52	47	43
325	143	119	104	94	88	84	82	80	79	78	77	77	75	74	72	69	65	61	56	51	47
350	154	128	112	101	95	91	88	86	85	84	83	82	81	80	77	74	70	65	60	55	51
375	165	137	120	109	102	97	94	93	91	90	89	88	87	85	83	79	75	70	65	59	54
400	176	146	128	116	108	104	101	99	97	96	95	94	93	91	88	85	80	75	69	63	58

Notes:

[1] This table is meant to help primacy agencies and water systems identify potential carbonate precipitation constraints when evaluating CCT alternatives in Section 3.2. DIC values may be up to 20% higher at temperatures as low as 10 degrees C, and may vary slightly at higher and lower TDS.

[2] Shaded cells indicate chemically impossible conditions. May indicate analytical quality or total dissolved solids (TDS) assumption error.

[3] See USEPA (2003) for information on the formula used to calculate the DIC values provided above. Equilibrium constants are referenced from Butler and Cogley (1998); Plummer and Busenberg (1982); Schock (1980); and USEPA (2003).

Appendix C – Investigative Sampling to Determine the Source of Lead and Copper

Investigative sampling can be used to help identify the sources of lead and copper in tap water samples for a specific building. This type of information can help water systems and building owners determine the most effective lead source replacement strategy.

Systems can take two consecutive, first draw, 125-mL standing samples to identify whether the faucet, the brass underneath the faucet, or both components are contributing to lead in a tap water sample. Another method identified in the literature is collecting samples to develop premise plumbing profiles. This method may be used to determine where metals are being released within the premise plumbing and service line and can provide information on the stability and solubility of pipe scales within lead service lines (LSLs). A typical procedure is as follows:

- The water utility first collects pipe material data and estimates the length and diameter of plumbing in the home from the sample tap to the water main.
- After at least 6 hours of stagnation, water utility staff collect sequential 1-liter bottles of water without turning off the tap, typically from a kitchen sink, until all of the estimated volume in the pipe and service line has been collected (up to the water main, typically 10 to 15 bottles). Smaller volumes (e.g., 125 mL) can be collected for the first several samples to isolate potential sources of lead in the faucet from the underlying plumbing materials (connectors, valves).
- As an option, the utility can filter a small volume of water from specific samples (e.g., approximately 200 mL) on-site using a 0.45 micron filter to determine the particulate vs. dissolved portion of lead. A 'water hammer' sample can also be taken by rapidly opening and closing the tap several times to provide an indication of the amount of 'loose' particulate on the pipe walls.
- Analyzing samples for lead, copper, zinc, and iron can provide useful co-occurrence information that can be used to identify potential sources of lead in the plumbing network (Del Toral et al., 2013).

Exhibit C.1 provides an example of a lead profile at a residential home with a LSL, and identifies which portions of the premise plumbing are contributing to elevated lead levels. The home had 8 ft of copper pipe from the kitchen tap to the meter/LSL and 89 ft of LSL following that (Del Toral et al., 2013).

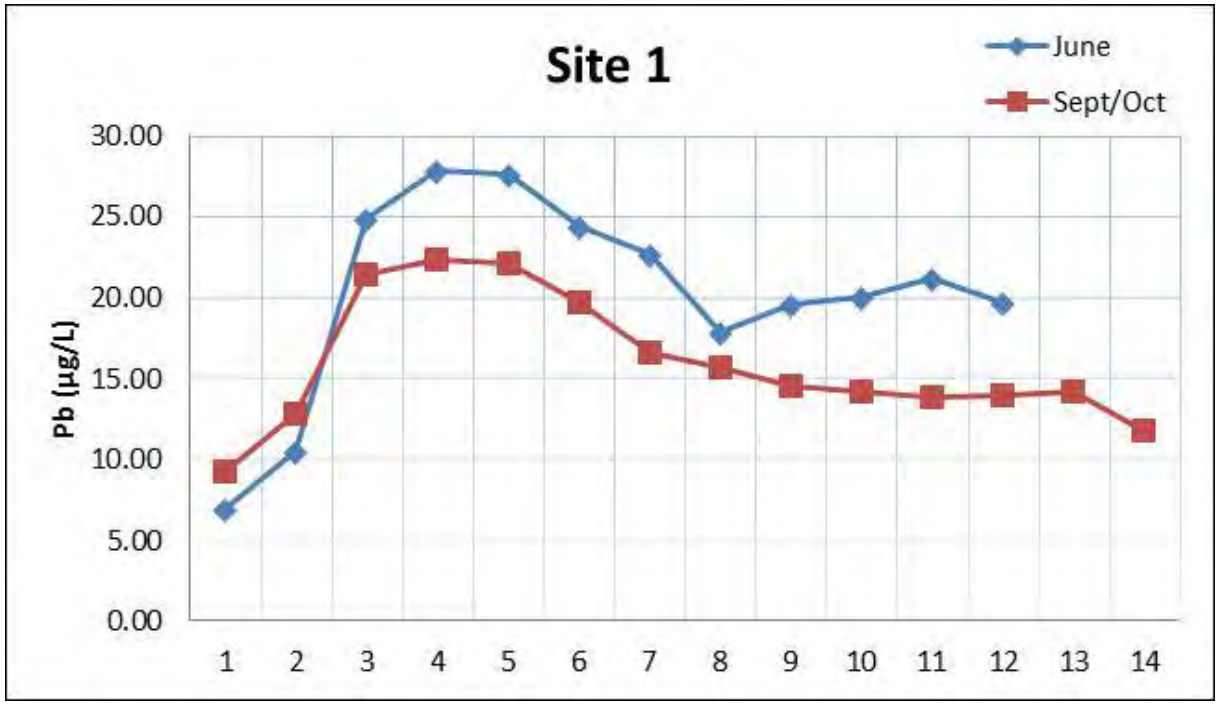


Exhibit C.1: Example of a Lead Profile (Del Toral et al., 2013)

Note: the x-axis represents sequential samples (typically liters)

Appendix D – Water Quality Data and Information Collection Forms

This appendix contains the following forms:

D.1 Water Quality Data – Raw Water
D.2 Water Quality Data – Entry Point
D.3 Water Quality Data – Distribution System
D.4 LCR Data Summary
D.5 Treatment Process Information
D.6 Lead Service Line (LSL) Information
D.7 Distribution System Materials and Operation

These forms and recommended procedures are also available electronically in the ***OCCT Evaluation Templates***.

Important notes about these forms are below.

1) These are technical recommendations only, and can be changed by the primacy agency to reflect system-specific conditions and/or primacy agency needs.

2) These tables can be included in the system's corrosion control treatment (CCT) study report or submitted separately to the primacy agency.

3) Environmental Protection Agency (EPA)-approved analytical methods must be used for regulatory sample analyses (§141.89(a)). Primacy agency approved analytical methods may be used for analysis of additional samples. In some cases, this may include use of field test kits.

Exhibit D.1: Water Quality Data – Raw Water

Exhibit D.1 Water Quality Data - Raw Water [1]													
Source Name (if more than one source, copy this section and complete for each source)													
Source ID													
Source Type													
Parameter	**Required Monitoring**			**Recommended Monitoring**			**System Data**						
	No. of Samples	**Frequency**	**Duration of Sampling**	**No. of Samples**	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
									Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
Lead (mg/L)				2	2x/year	1 year							
Copper (mg/L)				2	2x/year	1 year							
pH				6	every other month	1 year							
Alkalinity (mg/L as $CaCO_3$)				4	quarterly	1 year							
Hardness (mg/L as $CaCO_3$)				4	quarterly	1 year							
Temperature (°C)				6	every other month	1 year							
Calcium (mg/L as Ca)				4	quarterly	1 year							
Total Dissolved Solids (mg/L)[2]				4	quarterly	1 year							
Conductivity (as µmho/cm @ 25 °C)[2]				6	every other month	1 year							
Total Chlorine (mg/L as Cl_2)				NA	NA	NA							
Free Chlorine (mg/L as Cl_2)				NA	NA	NA							
Chloride (mg/L)				2	2x/year	1 year							
Sulfate (mg/L)				2	2x/year	1 year							
Iron (mg/L)				4	quarterly	1 year							
Manganese (mg/L)				4	quarterly	1 year							
Silica (mg/L as SiO_2)				4	quarterly	1 year							

[1] Under the Lead and Copper Rule, no raw water monitoring is required. However, if raw water monitoring data are available, this may assist the system in selecting the corrosion control treatment that will work best with the system's water quality.

[2] Either total dissolved solids or conductivity can be measured.

NA = not applicable

Exhibit D.2: Water Quality Data – Entry Point

Exhibit D.2 Water Quality Data - Entry Point[1]													
Source Name (If more than one source, copy this section and complete for each source)													
Source ID													
Source Type													
Parameters	**Entry Point[4]**												
	Required Monitoring under LCR			**Recommended Monitoring**			**System Data**						
	No. of Samples	**Frequency**	**Duration of Sampling**	**No. of Samples**	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
									Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
Lead (mg/L)[1]				1	1x/year	1 year							
Copper (mg/L)[1]				1	1x/year	1 year							
pH				12[5]	monthly	1 year							
Alkalinity (mg/L as $CaCO_3$)				12[5]	monthly	1 year							
Orthophosphate (mg/L as P)				12	monthly	1 year							
Hardness (mg/L as $CaCO_3$)				12	monthly	1 year							
Temperature (°C)				12	monthly	1 year							
Calcium (mg/L as Ca)				12	monthly	1 year							
Total Dissolved Solids (mg/L)[2]				6	every other month	1 year							
Conductivity (as µmho/cm @ 25 °C)[2]				12	monthly	1 year							
Disinfectant Residual[3]													
Total Chlorine (mg/L as Cl_2)				12[5]	monthly	2 year							
Free Chlorine (mg/L as Cl_2)				12[5]	monthly	3 year							
Chloride (mg/L)				6	every other month	1 year							
Sulfate (mg/L)				6	every other month	1 year							
Iron (mg/L)				4	quarterly	1 year							
Manganese (mg/L)				4	quarterly	1 year							
Silica (mg/L as SiO_2)				4	quarterly	1 year							

[1] Enter data for each entry point. Copy sheet for multiple entry points.
[2] Either total dissolved solids or conductivity can be measured.
[3] Both total and free chlorine should be measured.
[4] If there is no treatment, then system is only required to sample at the entry point, unless water is piped a significant distance, or stored, between the raw water point and the entry point.
[5] Additional data may be available from the system depending on process control data collection schedules.

Exhibit D.3: Water Quality Data – Distribution System

Exhibit D.3 Water Quality Data - Distribution System													
Source Name (if more than one source, copy this section and complete for each source)													
Source ID													
Source Type													
Parameter	**Required Monitoring under LCR**			**Recommended Data Collection**			**System Data**						
	No. of Samples	**Frequency**	**Duration of Sampling**	**No. of Sites**	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
									Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
pH				12[3]	monthly	1 year							
Alkalinity (mg/L as $CaCO_3$)				6	monthly	1 year							
Orthophosphate (mg/L as P)				12[3]	monthly	1 year							
Hardness (mg/L as $CaCO_3$)				6	monthly	1 year							
Temperature (°C)				12[3]	monthly	1 year							
Calcium (mg/L as Ca)				6	monthly	1 year							
Total Dissolved Solids (mg/L)[1]				6	monthly	1 year							
Conductivity (as µmho/cm @ 25 °C)[1]				12	monthly	1 year							
Disinfectant Residual[2]													
Total Chlorine (mg/L as Cl_2)				12[3]	monthly	1 year							
Free Chlorine (mg/L as Cl_2)				12[3]	monthly	1 year							
Chloride (mg/L)				4	quarterly	1 year							
Sulfate (mg/L)				4	quarterly	1 year							
Iron (mg/L)				4	quarterly	1 year							
Manganese (mg/L)				4	quarterly	1 year							
Silica (mg/L as SiO_2)				4	quarterly	1 year							

[1] Either total dissolved solids or conductivity can be measured.
[2] Both total and free chlorine should be measured.
[3] Select a combination of sites at various distances from the entry point.

Exhibit D.4: LCR Data Summary

Exhibit D.4 Lead and Copper Rule (LCR) Data Summary								
Parameters	**First Round of Regulated Tap Samples**							
	No. of Samples	**Minimum Value**	**Maximum Value**	**Average**	**90th Percentile**	**# Samples > 0.015 mg/L for lead or > 1.3 mg/L for copper**	**Sample Period Start Date (dd/mm/yyyy)**	**Sample Period End Date (dd/mm/yyyy)**
Lead (mg/L)								
Copper (mg/L)								

Parameters	**Second Round of Regulated Tap Samples**							
	No. of Samples	**Minimum Value**	**Maximum Value**	**Average**	**90th Percentile**	**# Samples > 0.015 mg/L for lead or > 1.3 mg/L for copper**	**Sample Period Start Date (dd/mm/yyyy)**	**Sample Period End Date (dd/mm/yyyy)**
Lead (mg/L)								
Copper (mg/L)								

In the Last 10 Years	**How Many Times Has the 90th Percentile of Sampling Results Exceeded the Action Level[1] (indicate the year in which these occurred in parentheses)**
Lead (mg/L)	
Copper (mg/L)	

1. Action Levels are 0.015 mg/L for lead and 1.3 mg/L for copper.

Exhibit D.5: Treatment Process Information

Exhibit D.5 Treatment Process Information *Note: Indicate current and planned, future drinking water treatment processes.*							
Source Name (if more than one source, copy this section and complete for each source)							
Source ID							
Source Type							
Treatment Process	Current Treatment			Planned Future Treatment			
	Mark an 'X' if applicable	Chemical Used and Dosage (if applicable)	Notes/Comments	Mark an 'X' if applicable	Chemical Planned and Dosage (if applicable)	Estimated Implementation Date (mm/yyyy)	Notes/Comments
Primary Disinfection							
Secondary Disinfection							
Conventional Filtration							
Membrane Filtration							
Ion Exchange							
Aeration							
Lime Softening							
Fluoride Addition							
Orthophosphate (concentration mg/L as P)							
Blended Phosphate[1]							
Silicate							
Other Processes							
Other Processes							
Other Chemical Addition							
Chemical Name #1							
Chemical Name #2							
Chemical Name #3							
Chemical Name #4							
Chemical Name #5							
[1] Include percentage of the blend that is orthophosphate in Notes/Comments field.							

Exhibit D.6: Lead Service Line Information

Exhibit D.6. Lead Service Line Information	
Question	**Response**
Does your system have **ANY** full[1] or partial[2] lead service lines (YES or NO)?	
If **YES**, approximately how many <u>full</u> lead service lines are in place?	
If **YES**, approximately how many <u>partial</u> lead service lines are in place?	
What was the approximate range of years the lead service lines were installed (YYYY to YYYY)?	

[1] A <u>full</u> lead service line refers to the pipe from the water main to the residence being lead pipe, see illustration below (Source: Sandvig et al., 2008).

[2] A <u>partial</u> lead service line refers to only a portion of the pipe from the main to the residence being lead pipe. This could be the portion of the pipe that is under the control of the utility or the portion of the pipe that is under the control of the property owner, see illustration below (Source: Sandvig et al., 2008).

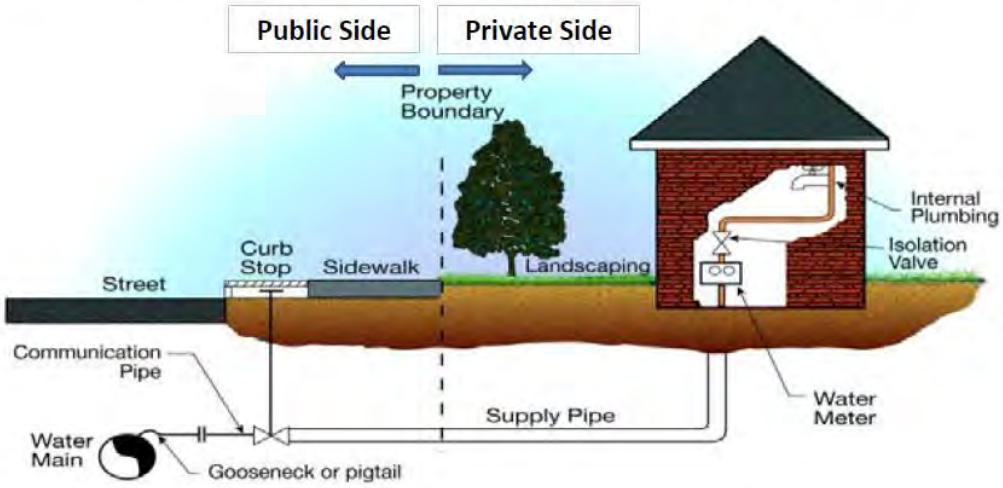


Exhibit D.7: Distribution System Materials and Operation

Exhibit D.7 Distribution System Materials and Operation		
Question	**Response**	
When was your last material survey completed (40 CFR §141.86(a))?		
What percentage of water mains are unlined cast iron? What is the approximate total length of unlined cast iron mains (feet)?		
Provide any additional comments on distribution system materials (e.g., list all types).		
Do you flush your system (YES or NO)?		
If **YES**, how often do you flush your system?		
Do you have dead-ends in your system that have experienced water quality problems (YES or NO)?		
If you chloraminate, do you use free chlorine periodically during the year (YES or NO)?		
If **YES**, approximately how often do you use free chlorine and at what dose?		
If **YES**, approximately how long is free chlorine used? (i.e. one week, one month, etc...)		
Do you have red water complaints?		
If **YES**, how often do they occur? Rarely (a few times a year), Sometimes (monthly), Regularly (weekly)		
Does your system purchase any water (YES or NO)?		
If **YES**, how much? If it varies by month please list an average per month.		
What is the source of the purchased water?		
Do you have plans to change your source water or purchase water from another system (YES or NO)?		
If **YES**, please describe.		
If applicable, do you have plans to change your coagulant in the near future (i.e. in the next 1-3 years) (YES or NO)?		
	Current Coagulant	Future Coagulant
If **YES**, please list your current coagulant and the coagulant you plan to use. Please include the planned implementation date.		

Appendix E – OCCT Recommendation Forms for Systems Serving ≤ 50,000 People

Appendix E supports Chapter 4 by providing forms systems can use to identify corrosion control treatment options, evaluate secondary impacts, and document conclusions and rationale for the optimal corrosion control treatment (OCCT) recommendation.

This appendix contains the following forms:

E.1 Identification of Potential Corrosion Control Treatment Options
E.2 Evaluation of Secondary Impacts
E.3 Documentation of OCCT Recommendation

These forms and recommended procedures are also available electronically in the ***OCCT Evaluation Templates***.

Important notes about these forms are below.

1) The procedures in Exhibits E.1 through E.3 are technical recommendations only, and can be changed by the primacy agency to reflect system-specific considerations and/or primacy agency needs.

2) These tables can be included in the system's corrosion control treatment (CCT) study report or submitted separately to the primacy agency.

Exhibit E.1: Identification of Potential Corrosion Control Treatment Options

Exhibit E.1: Identification of Potential Corrosion Control Treatment Options		
CCT Options	**Put an X next to all that apply**	**Identify possible treatment chemicals or processes for the options identified (chemical formula or common name)**
Raise pH		
Raise DIC (alkalinity)		
Add orthophosphate[1]		
Add silicate		
Add blended phosphate[1]		
[1] For orthophosphate and blended phosphate, provide in mg/L as P. For blended phosphate, include the percent of the blend that is orthophosphate.		

Exhibit E.2: Evaluation of Secondary Impacts

Exhibit E.2: Evaluation of Secondary Impacts[1]					
Source Name (if more than one source, copy this section and complete for each source)					
Source ID					
Source Type					
Questions	**Adjust pH**	**Adjust DIC (Alkalinity)**	**Add Orthophosphate**	**Add Silicate**	**Add Blended Phosphate**
Is the chemical available (YES or NO)?					
Do you feel your current operators will have difficulty using this chemical and operating the treatment?					
What are the relative costs for each treatment option? (High, Medium, Low) (Provide your best estimate, which should include cost for the chemical, any equipment that needs to be purchased, increased operator time, etc...) (Indicate what dosage cost comparisons are based on.)					
Will this treatment change potentially cause excessive scaling (See OCCT Manual Exhibit 3-2)?					
Additional Notes/Comments					

[1] Complete for each corrosion control treatment option identified in Exhibit E.1.

Exhibit E.3: Documentation of OCCT Recommendation

Exhibit E.3: Documentation of OCCT Recommendation					
Source Name (if more than one source, copy this section and complete for each source)					
Source ID					
Source Type					
Identify Recommended Treatment Approach	**Adjust pH**	**Adjust DIC (Alkalinity)**	**Add Orthophosphate**	**Add Silicate**	**Add Blended Phosphate**
Recommended Chemical or Process					
Recommended Dosage					
Recommended Levels at the Entry Point	**pH**	**Alkalinity (mg/L as $CaCO_3$)**	**Inhibitor[1]**		
Minimum					
Maximum					
Average					
Recommended Levels in the Distribution System	**pH**	**Alkalinity (mg/L as $CaCO_3$)**	**Inhibitor[1]**		
Minimum					
Maximum					
Average					
[1] For orthophosphate and blended phosphate, provide in mg/L as P.					

PRINTED NAME and Signature of Responsible Party from Public Water System

Date

Appendix F – Tools for Conducting Corrosion Control Studies

This appendix provides a description of tools that can be used to conduct desktop or demonstration-type corrosion control studies. Note that the Lead and Copper Rule (LCR) requires the use of specific types of studies - see Chapter 4 for regulatory requirements. This appendix describes both the required types of studies and additional study tools that can be used to help identify the best corrosion control treatment.

F.1 Desktop Study Tools

Desktop study tools use analogous systems, charts and other information related to corrosion control theory, and models to select appropriate corrosion control treatment strategies. These tools are described below.

Analogous Systems[34]

Drinking water systems can evaluate and compare data from other systems with similar water quality, treatment, and distribution systems (analogous systems) to help identify corrosion control treatment options. A description of the raw source water, water treatment processes, distribution system, source water usage, and the performance of their corrosion control strategy should be included in the corrosion control study report. Systems may want to start with neighboring water systems using the same aquifer or surface source. Systems can also conduct a survey of similar systems to obtain this information; seek technical assistance from engineering consultants or industry associations; or review literature sources, such as the report by The American Water Works Association's (AWWA's) Water Industry Technical Action Fund which provides information on lead, copper, and other water quality information for 400 US water systems (AWWA, 1993). An additional resource is the Distribution System Optimization Program developed by the Partnership for Safe Water and the Water Research Foundation. Participating systems can benchmark their performance against utilities with similar water quality issues.

Corrosion Control Treatment Theory

Chapter 3 contains significant background information on corrosion control treatment. This information can help systems conduct their study and evaluate different treatment strategies.

Models

Modeling software can be used to evaluate corrosion characteristics of water and to predict changes in those characteristics with changes in treatment. However, systems and primacy

[34] Systems conducting a desktop study (with no demonstration testing) must conduct analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration to meet the requirements of the LCR.

agencies should consider any relevant limitations that may be inherent to the modeled data. Many models are not valid for scaling potential in the presence of phosphates, silicates, or natural organic matter (NOM), and some trace metals that inhibit nucleation and growth of $CaCO_3$. Also, calcite may not be the proper solid phase in some systems. Utilities with corrosion inhibitors or naturally occurring scale-inhibiting factors should consider marble testing or field studies to predict scale potential.

F.2 Demonstration Study Tools

This section describes coupon tests, pipe loop studies, solid and scale analysis, and partial system tests. Several documents can be referenced for more detailed information on the usefulness and relative costs of these tools (USEPA, 2007d; AWWA, 2005; Kirmeyer et al., 2004; USEPA, 1992a; AwwaRF, 1990). A guidance document prepared by the Ontario Ministry of Environment (MOE, 2009) provides a summary of these different tools and recommendations on which to use given a system's size and complexity. This document can be found at https://ia802301.us.archive.org/18/items/guidancedocument00snsn21738/guidancedocument00snsn21738.pdf.

Coupon Studies

Coupon studies use flat metal pieces (i.e., coupons) of lead, copper, iron, or steel to help determine how specific corrosion control treatments (CCTs) may help prevent release of metals from these materials. These coupons can be evaluated using a variety of different protocols (static dump and fill, mounted in a flow-through pipe rig, or mounted in the distribution system) after which they can be taken out and weighed to determine total weight loss. Coupons can also be used to measure the instantaneous corrosion rate of the metal using a variety of electrochemical techniques (ASTM, 2005; AwwaRF, 1990; Schock, 1996; USEPA, 2007d). It is important to note that coupon studies can be useful in determining the corrosion rate, but may have limited use in predicting the concentrations of lead or copper in the water (Schock, 1996).

Pipe Loop Testing

Pipe loops consist of pipes or pipe sections made of a variety of materials, including lead pipe (new or excavated), copper pipe, copper pipe with lead soldered joints, or brass components (faucets or meters). Pipe loop studies can be designed as either flow-through systems (where water flows through the apparatus once and is discharged to waste) or as recirculating systems (where a batch of water is continuously recirculated through the loops for a set period of time). There are several references that provide detailed information on the design and operation of pipe loop systems (Schock and Lytle, 2011; AwwaRF, 1990; and Kirmeyer et al., 1994). Pipe loops may need to be operated for several months or years to develop scales that are similar to what would be found on premise piping in the system, and to measure stable metal levels. One limitation of pipe loops is that they do not provide indication of contribution of lead release

from physical disturbances that occur as part of routine system operations, maintenance and repairs.

Scale and Solids Analysis

The analysis of actual pipe scale, and solids released from pipe scales, can provide an understanding of their composition and role in release of lead and/or copper to the water. These types of analyses may be particularly valuable to larger systems with lead service lines (LSLs) that are contemplating a water quality and/or treatment change (particularly a switch from free chlorine to chloramines for disinfection). Many techniques are available to examine the scale: visual inspection, X-ray emission spectroscopy, X-ray diffraction, X-ray fluorescence, Raman spectroscopy, inductively coupled plasma mass spectroscopy (ICP-MS), and scanning electron microscopy with energy dispersive spectroscopy (EDS). There is currently no standardized approach for evaluating pipe scales and solids, but there are references that provide information on the application of these techniques and typical results (Smith et al., 1997; Sandvig et al., 2008; Rego and Schock, 2007).

Partial System Testing

CCTs can be evaluated full-scale by applying the treatment to a hydraulically isolated portion of the distribution system. Systems can collect samples from residential taps for lead and copper analysis and additional water quality parameters in the distribution system. Partial system testing can be relatively expensive, but it does provide a direct means for examining the potential secondary impacts of implementing a particular CCT and for monitoring the implementation timeframes for installation of CCT (i.e., length of time needed for an inhibitor to be effective).

Appendix G – Forms for Follow-up Monitoring and Setting OWQPs

Appendix G supports Chapter 5 by providing data collection forms for follow-up monitoring and technical recommendations for primacy agencies to consider when designating Optimal Water Quality Parameters (OWQPs) for pH/alkalinity/dissolved inorganic carbon (DIC) adjustment, orthophosphate treatment, blended phosphate treatment, and use of a silicate inhibitor.

This appendix contains the following forms:

G.1 Results of Follow-up Lead and Copper Tap Monitoring
G.2 Results of Follow-up WQP Monitoring – Entry Point
G.3 Results of Follow-up WQP Monitoring – Taps
G.4 Setting OWQPs for pH/Alkalinity/DIC Adjustment
G.5 Setting OWQPs for Orthophosphate Inhibitor Addition
G.6 Setting OWQPs for Blended Phosphate Inhibitor Addition
G.7 Setting OWQPs for Silicate Inhibitor Addition
G.8 OWQPs Designated for the System

These forms and recommended procedures are also available electronically in the ***OCCT Evaluation Templates*****.**

Important notes about these forms are below.

1) Environmental Protection Agency (EPA)-approved analytical methods must be used for regulatory sample analyses (§141.89(a)). Primacy agency approved analytical methods may be used for analysis of additional samples. In some cases, this may include use of field test kits.

2) The procedures in Exhibits G.4 through G.7 are technical recommendations only; see Chapter 5 for requirements for primacy agencies in setting OWQPs. Note that the water quality ranges in these exhibits are intended as general guidelines included for the reader's reference. As discussed in Section 3.3, these values may not apply to every situation; therefore, they should not be interpreted or universally prescribed as default minimums and/or maximums.

Exhibit G.1: Results of Follow-up Lead and Copper Tap Monitoring

Exhibit G.1 Results of Follow-up Lead and Copper Tap Monitoring										
Parameter	First Round of Follow-Up Monitoring									
	Required by the Primacy Agency			PWS Data						
	No. of Tap Sites	Frequency	Duration of Sampling	No. of Sites	No. of Samples	Date Range When Samples Were Collected		Minimum Value	Maximum Value	Average Value
						Start (dd/mm/yyyy)	End (dd/mm/yyyy)			
Lead (mg/L)								mg/L	mg/L	mg/L
Copper (mg/L)								mg/L	mg/L	mg/L

Parameter	Second Round of Follow-Up Monitoring									
	Required by the Primacy Agency			PWS Data						
	No. of Tap Sites	Frequency	Duration of Sampling	No. of Sites	No. of Samples	Date Range When Samples Were Collected		Minimum Value	Maximum Value	Average Value
						Start (dd/mm/yyyy)	End (dd/mm/yyyy)			
Lead (mg/L)								mg/L	mg/L	mg/L
Copper (mg/L)								mg/L	mg/L	mg/L

Exhibit G.2: Results of Follow-up WQP Monitoring – Entry Point

Exhibit G.2 Results of Follow-up WQP Monitoring - Entry Point[1]								
Source Name (if more than one source or multiple entry points/source, copy this section and complete for each source/entry point combination)								
Source ID								
Source Type								
Parameter	**Required by the Primacy Agency**		**PWS Data**					
	Frequency	**Duration of Sampling**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
				Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
pH								
Alkalinity (mg/L as $CaCO_3$)								
Inhibitor Concentration (phosphate inhibitor in mg/L as P (not as orthophosphate); silicate inhibitor in mg/L as SiO_2)								
Hardness (mg/L as $CaCO_3$)								
Temperature (°C)								
Calcium (mg/L as Ca)								
Total Dissolved Solids (mg/L)[2]								
Disinfectant Residual Total Chlorine (mg/L as Cl_2)								
Free Chlorine (mg/L as Cl_2)								
Chloride (mg/L)								
Sulfate (mg/L)								
Iron (mg/L)								
Manganese (mg/L)								

[1] Enter data for each entry point. Copy sheet for multiple entry points.
[2] Either Total Dissolved Solids or Conductivity (as µmhos/cm @ 25C or µS/cm)

Exhibit G.3: Results of Follow-up WQP Monitoring – Taps

Exhibit G.3 Results of Follow-up WQP Monitoring - Tap Samples[1]										
Source Name Associated with tap samples (if there are additional tap samples associated with a different source, copy this section and complete for each source/tap sample set. If multiple sources are associated with the tap samples listed below, list all sources here)										
Source ID(s)										
Source Type										
Parameter	**Required by the Primacy Agency**			**PWS Data**						
	No. of Tap Sites	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
						Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
pH										
Alkalinity (mg/L as $CaCO_3$)										
Inhibitor Concentration (phosphate inhibitor in mg/L as P (not as orthophosphate); silicate inhibitor in mg/L as SiO_2)										
Hardness (mg/L as $CaCO_3$)										
Temperature (°C)										
Calcium (mg/L as Ca)										
Total Dissolved Solids (mg/L)[2]										
Disinfectant Residual										
Total Chlorine (mg/L as Cl_2)										
Free Chlorine (mg/L as Cl_2)										
Chloride (mg/L)										
Sulfate (mg/L)										
Iron (mg/L)										
Manganese (mg/L)										

[1] Tap should be flushed prior to collecting samples for all parameters except lead and copper which are standing samples.

[2] Either Total Dissolved Solids or Conductivity (as µmhos/cm @ 25 C or µS/cm)

Exhibit G.4: Setting OWQPs for pH/Alkalinity/DIC Adjustment

Exhibit G.4 Setting OWQPs for pH/Alkalinity/DIC Adjustment		
Step 1: Are the recommended minimums or ranges for pH and/or alkalinity met at the Entry Point and in the Distribution System? [1]	YES	Go to Step 2.
	NO	Work with system to re-evaluate pH and/or alkalinity adjustment process.
Step 2: Is the range of pH values measured at the Entry Point < 0.4 pH units (Range = Max entry point pH - Min entry point pH)?[1]	YES	Go to Step 3.
	NO	The pH range may be too wide for effective control of lead and/or copper levels at the tap. Work with system to re-evaluate pH adjustment process. Review process control charts for pH chemical dosages and resultant pH levels. Evaluate seasonal changes in raw source water quality and impacts on maintenance of pH at the entry point. Also go to Step 3.
Step 3: Is the range of pH values measured in the Distribution System < 0.6 pH units (Range = Max distribution pH - Min distribution pH)?[1]	YES	Identify WQP minimums and ranges based on existing system information (both regulatory WQP monitoring data and additional diagnostic monitoring data if available).
	NO	The pH may be too variable for effective corrosion control. Re-evaluate pH adjustment process and reasons for variability in pH in the distribution system (evaluate buffer intensity, distribution system materials, distribution system operations). If low alkalinity water (< 20 mg $CaCO_3$/L), may need to increase DIC.
[1] The standard deviation is another tool that can be used to evaluate variability of pH measurements, in addition to the minimum, maximum, and range.		

Exhibit G.5: Setting OWQPs for Orthophosphate Inhibitor Addition

Exhibit G.5 Setting OWQPs for Orthophosphate Inhibitor Addition		
Step 1: Is the residual orthophosphate level in the distribution system ≥ 1.0 mg P/L (> 3.0 mg/L PO_4)?	YES	Go to Step 2.
	NO	If system has recommended an orthophosphate residual in the distribution system that is < 1.0 mg P/L, then determine if inhibitor chemical dosage needs to be increased to provide optimal reduction in lead and/or copper levels. If system has recommended an orthophosphate residual in the distribution system that is ≥ 1.0 mg P/L, then evaluate orthophosphate demand in the system (difference between entry point orthophosphate versus residual orthophosphate in the distribution system) and potential for adjusting required dosage to meet recommended residual in the distribution system. Go to Step 2.
Step 2: Are the minimum pH values measured at the Entry Point > 7.2 pH units?	YES	Go to Step 3.
	NO	Minimum pH should be higher for orthophosphate use. Have system re-evaluate pH adjustment process, or raise pH if 7.2 or below.
Step 3: Is the distribution system pH between 7.2 and 7.8 pH units?	YES	Go to Step 4.
	NO	The pH is not in the optimal range for use of orthophosphate inhibitors. Have system re-evaluate the pH control treatment process, pH variability in the distribution system, and adequacy of recommended orthophosphate dosage and residual in the distribution system.
Step 4: Is the range of pH values measured at the entry point < 0.4 pH units (Range = max entry point pH - min entry point pH)?	YES	Go to Step 5.
	NO	The pH may be too variable for effective corrosion control. System should re-evaluate the pH adjustment process (i.e., review process control charts and operations).
Step 5: Is the range of pH values measured in the distribution system < 0.6 pH units (Range = Max distribution pH - Min distribution pH)?	YES	Identify OWQP minimums and ranges based on existing information (both regulatory WQP monitoring data and additional diagnostic monitoring data if available).
	NO	Evaluate causes for pH variability in the system. Evaluate buffer intensity, distribution system materials, and distribution system operations, and adjust treatment and operations to achieve a narrower range of pH and alkalinity.

Exhibit G.6: Setting OWQPs for Blended Phosphate Inhibitor Addition

Exhibit G.6 Setting OWQPs for Blended Phosphate Inhibitor Addition		
Step 1: Is the residual orthophosphate level in the distribution system ≥ 0.5 mg P/L?	YES	Go to Step 2.
	NO	If system has recommended a blended phosphate product dose that results in an orthophosphate residual of < 0.5 mg P/L in the distribution system, then determine if inhibitor chemical dosage needs to be increased to provide optimal reduction in lead and/or copper levels. If system has recommended an orthophosphate residual in the distribution system that is ≥ 0.5 mg P/L, then evaluate orthophosphate demand in the system (difference between entry point orthophosphate versus residual orthophosphate in the distribution system) and potential for adjusting required dosage to meet recommended residual in the distribution system. Go to Step 2.
Step 2: Are the minimum pH values measured at the entry point > 7.2 pH units?	YES	Go to Step 3.
	NO	Minimum pH should be higher for orthophosphate use. Have system re-evaluate pH adjustment process, or raise pH if 7.2 or below.
Step 3: Is the distribution system pH between 7.2 and 7.8 pH units?	YES	Go to Step 4.
	NO	The pH may not be in the optimal range when using blended phosphate inhibitors, check with the chemical supplier for optimal pH range. Have system re-evaluate the pH control treatment process, pH variability in the distribution system, and adequacy of recommended orthophosphate dosage and residual in the distribution system.
Step 4: Is the range of pH values measured at the entry point < 0.4 pH units (Range = max entry point pH - min entry point pH)?	YES	Go to Step 5.
	NO	The pH may be too variable for effective corrosion control, check with the chemical supplier to verify quality of the product used to adjust pH. System should re-evaluate its pH adjustment process (process control charts and operations).
Step 5: Is the range of pH values measured in the distribution system < 0.6 pH units (Range = max distribution pH - min distribution pH)?	YES	Identify OWQP minimums and ranges based on existing information (both WQP monitoring data and additional diagnostic monitoring data if available).
	NO	Evaluate causes for pH variability in the system. Evaluate buffer intensity, distribution system materials, distribution system operations and adjust treatment and operations accordingly.

Exhibit G.7: Setting OWQPs for Silicate Inhibitor Addition

Exhibit G.7 Setting Optimal WQPs for Silicate Inhibitor Addition		
Step 1: Is the silicate level at the entry point approximately 20 mg/L as SiO_2?	YES	Go to Step 2.
	NO	Silicate addition process should be re-evaluated. Relatively high dosages may be required (in excess of 20 mg/L as SiO_2, depending on the system) for adequate corrosion control.
Step 2: Is the pH at the entry point less than the pH measured in the distribution system?	YES	Go to Step 3.
	NO	Silicate addition process should be re-evaluated. Silicate addition should increase pH in the distribution system, so recommended dosage may not be high enough for adequate corrosion control.
Step 3: Is the range of silicate levels measured in the distribution system from 10 to 20 mg/L as SiO_2?	YES	Identify OWQP minimums and ranges based on existing information (both regulatory WQP monitoring data and additional diagnostic monitoring data if available).
	NO	Re-evaluation of silicate treatment should be completed. Relatively higher dosages may be required (in excess of 20 mg/L) in order to maintain adequate levels in the distribution system for effective corrosion control.

Exhibit G.8: OWQPs Designated for the System

Exhibit G.8 OWQPs Designated for the System				
Parameter[1]	Entry Point		Distribution System	
	Minimum	Maximum	Minimum	Maximum
pH[2]				
Alkalinity[3] (mg/L as $CaCO_3$)				
Inhibitor Concentration (mg/L as P or SiO_2)[4]				

Notes:

[1] In addition to pH, alkalinity, or corrosion inhibitor concentrations, primacy agencies have the authority to designate values for other additional water quality parameters determined by the primacy agency to reflect optimal corrosion control treatment for the system.

[2] Under the Lead and Copper Rule, the minimum pH value measured in all tap samples must be equal to or greater than 7.0, unless the primacy agency determines that meeting a pH of 7.0 is not technologically feasible or is not necessary for the system to optimize corrosion control.

[3] Under the Lead and Copper Rule, primacy agencies must designate a minimum or a range of alkalinity concentrations if it is adjusted as part of the system's optimal corrosion control treatment.

[4] For systems using a corrosion inhibitor as part of the optimal corrosion control treatment.

Region 5 Suggested Reading for 2020 Workshop:

1. USEPA (US Environmental Protection Agency). (2016). Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems. EPA 816-B-16-003. USEPA Office of Water (4606M). https://www.epa.gov/sites/production/files/2019-07/documents/occtmarch2016updated.pdf
2. Tully J, DeSantis MK, Schock MR. Water quality–pipe deposit relationships in Midwestern lead pipes. AWWA Wat Sci. 2019;e1127. https://doi.org/10.1002/aws2.1127
3. Del Toral, M. A., Porter, A., & Schock, M. R. (2013). Detection and evaluation of elevated lead release from service lines: a field study. *Environmental science & technology*, *47*(16), 9300-9307. https://www.epa.gov/sites/production/files/2015-10/documents/lead-service-lines-study-20130723.pdf
5. Schock, Michael. (1996). Corrosion Inhibitor Applications in Drinking Water Treatment: Conforming to the Lead and Copper Rule. https://www.researchgate.net/publication/254547727_Corrosion_Inhibitor_Applications_in_Drinking_Water_Treatment_Conforming_to_the_Lead_and_Copper_Rule
6. Lytle, D. A., Schock, M. R., Wait, K., Cahalan, K., Bosscher, V., Porter, A., & Del Toral, M. (2019). Sequential drinking water sampling as a tool for evaluating lead in flint, Michigan. *Water Research*, *157*, 40-54. https://www.sciencedirect.com/science/article/abs/pii/S0043135419302647
7. Williams, Daniel & Parrett, Christopher & Schock, Michael & Muhlen, Christy & Donnelly, Peg & Lytle, Darren. (2018). Peer Reviewed Design and Testing of USEPA'S Flint Pipe Rig for Corrosion Control Evaluation. Journal - American Water Works Association. 109. 1. https://www.researchgate.net/publication/327605254_Peer_Reviewed_Design_and_Testing_of_USEPA'S_Flint_Pipe_Rig_for_Corrosion_Control_Evaluation
8. Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R. R., ... & Prescott, A. (2009). *Contribution of service line and plumbing fixtures to lead and copper rule compliance issues*. Water Environment Research Foundation. https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf
9. EPA. Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems (2010). Link: https://nepis.epa.gov/Exe/ZyNET.exe/P100DP2P.TXT

From: Sarkipato, Ernest (EGLE)
To: Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc: Sylvester, Matthew (EGLE)
Subject: FW: BH Corrosion Study
Date: Wednesday, March 3, 2021 4:29:00 PM
Attachments: image001.png
image002.png
image003.png
image004.png
2021-03-03 BH Corrosion RFP.docx
Optimal Corrosion Control Treatment Evaluation Technical Recommendations.pdf
Reading List (EPA).docx

Attached is the near-final RFP for BH corrosion study. Abonmarche has two questions, here's my proposed reply.

1. I don't think the EPA's OCCT technical rec document is appropriate to reference in this effort. I could send abonmarche the attached list of reading from EPA, which was provided in relationship to the August 2020 OCCT study workshop w/ Arcadis?
2. I think Abonmarche is feeling this open-ended type of RFP will result in an influx of miss-the-mark proposals. He may be right, though I think it would be easy to sort through those efficiently if that's the case.

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 3, 2021 3:47 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,

Please find attached, a draft version of the Corrosion Study RFP. I had a few additional comments listed below.

1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment

that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 25, 2021 10:36 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

Jason,

Our approach would probably be to allow the qualified consultant to propose the timeline, as it will depend on what methodologies they are proposing. If we give a bookend of 12 months, that will likely constrain their options. Can we extend that out to at least 18 months, but also indicate periodic check-ins?

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, February 24, 2021 1:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: BH Corrosion Study

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,

What would be a realistic timeframe to expect this type of corrosion study to be completed? Does it tie into any requirements from EGLE to the city in terms of hard deadlines? We had mentioned 12

months on the EPA application (expected to be completed by March 2022), which was on our EPA application from the fall.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager

D 269.926.4565
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ABONMARCHE

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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT
City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be fully completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in the previous October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, without further study it is not certain to be the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items shall be described and addressed in the Corrosion Study report to be provided to the City upon completion.

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (i.e. look at subsequent samples from the same sample sites)
3. Analysis of distribution system pipe scales on various materials
4. Target water quality parameters (WQPs) for controlling copper corrosion
    a. Focus on Phosphate (PO_4) dose and distribution concentration variability
    b. Focus on Chlorine (Cl) dose and residual variability
    c. Focus on pH
5. Solubility tests
6. Pipe loop testing and the effectiveness of corrosion treatment.
7. Comparison of nearby water system water quality
8. Evaluate single family home water use trends

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200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – March TBD
Consultant Award – April 2021
Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Terms and Conditions of this RFP:

1. Proposals must be submitted by 10:00 am on March TBD. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

3. The City Reserves the Right to accept or reject any or all proposals and award the contract in the best interest of the City.

4. Proposals, once opened, become public documents and may be subject to disclosure under the Freedom of Information Act.

5. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, "Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

6. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems

Office of Water (4606M)
EPA 816-B-16-003
March 2016 (Updated)

Disclaimer

This document provides technical recommendations to primacy agencies and public water systems (PWSs) in determining the most appropriate treatment for controlling lead and copper and complying with the corrosion control treatment (CCT) requirements of the Lead and Copper Rule (LCR) that are in place at the time of document publication.

The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does it change or substitute for those provisions and regulations. Thus, it does not impose legally binding requirements on EPA, states or the regulated community. This document does not confer legal rights or impose legal obligations upon any member of the public.

While EPA has made every effort to ensure the accuracy of the discussion in this document, the obligations of the regulated community are determined by statutes, regulations or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling.

The general descriptions provided here may not apply to a particular situation based upon the circumstances. Interested parties are free to raise questions and objections about the substance of these technical recommendations and the appropriateness of the application of these technical recommendations to a particular situation. EPA and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those described in this document, where appropriate.

Mention of trade names or commercial products does not constitute endorsement or recommendation for their use.

This is a living document and may be revised periodically without public notice. EPA welcomes public input on this document at any time.

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Table of Contents

Chapter 1 : Introduction 1

1.1 Purpose and Audience 1

1.2 Document Organization 2

1.3 How to Use this Document 3

Chapter 2 : Background Information 4

2.1 Regulatory Actions to Control Lead and Copper in Drinking Water 4

2.1.1 Lead and Copper Regulation 4

2.1.2 Control of Lead Content in Plumbing Components 6

2.2 Sources of Lead and Copper 8

2.2.1 Corrosion and Metals Release 8

2.2.2 Lead and Copper-Containing Material 10

2.3 Water Quality Factors Affecting Release of Lead and Copper 11

2.3.1 pH, Alkalinity and DIC 12

2.3.2 Corrosion Inhibitors 13

2.3.3 Hardness (Calcium and Magnesium) 14

2.3.4 Buffer Intensity 14

2.3.5 Dissolved Oxygen 15

2.3.6 Oxidation-Reduction Potential 16

2.3.7 Ammonia, Chloride, and Sulfate 17

2.3.8 Natural Organic Matter 18

2.3.9 Iron, Manganese, and Aluminum 19

2.4 Physical and Hydraulic Factors Affecting Release of Lead and Copper 20

2.4.1 Physical Disturbances 20

2.4.2 Hydraulic Factors 20

2.4.3 Water Use 21

2.4.4 Water Temperature 21

Chapter 3 : Corrosion Control Treatment for Lead and Copper 22

3.1 Available Corrosion Control Treatment Methods 22

3.1.1 pH/Alkalinity/DIC Adjustment 23

3.1.2 Phosphate-Based Inhibitors 25

3.1.3 Silicate Inhibitors 26
3.2 Technical Recommendations for Selecting Treatment Alternatives 26
3.2.1 Technical Recommendations for Reviewing Water Quality Data and Other Information (STEP 1) 28
3.2.2 Technical Recommendations for Evaluating the Potential for Scaling (STEP 2) 30
3.2.3 Technical Recommendations for Selecting One or More Treatment Option(s) (STEP 3) 31
3.2.4 Technical Recommendations for Identifying Possible Limitations for Treatment Options (STEP 4) 42
3.2.5 Technical Recommendations for Evaluating Feasibility and Cost (STEP 5) 45
3.3 Setting the Target Dose and Water Quality 45
3.3.1 pH/Alkalinity/DIC Adjustment 46
3.3.2 Phosphate-Based Inhibitors 47
3.3.3 Silicate Inhibitors 49
Chapter 4 : Review of Corrosion Control Treatment Steps under the LCR 50
4.1 Corrosion Control Treatment Steps for Systems Serving ≤ 50,000 People 51
4.1.1 System Serving ≤ 50,000 People Makes OCCT Recommendation (STEP 2) 53
4.1.2 Primacy Agency Determines Whether a Study Is Required for System Serving ≤ 50,000 People (STEP 3) 53
4.1.3 Primacy Agency Designates OCCT for System Serving ≤ 50,000 People (STEP 4) 54
4.1.4 System Serving ≤ 50,000 People Conducts Corrosion Control Study (STEP 5) 55
4.1.5 Primacy Agency Designates OCCT for Systems Serving ≤ 50,000 People (STEP 6) 61
4.2 Corrosion Control Steps for Systems Serving > 50,000 People 64
4.2.1 Systems Serving >50,000 People Conduct a Corrosion Control Study (STEP 1) 65
4.2.2 Primacy Agency Reviews the Study and Designates OCCT for System Serving > 50,000 People (STEP 2) 66
Chapter 5 : Requirements and Technical Recommendations for OCCT Start-Up and Monitoring 67
5.1 CCT Start-up 67
5.1.1 Start-up of pH/Alkalinity/DIC Adjustment 68
5.1.2 Start-up of Phosphate-Based Corrosion Inhibitors 68
5.2 Follow-up Monitoring during First Year of Operation 68
5.2.1 Follow-up Lead and Copper Tap Monitoring 69

5.2.2 Follow-up WQP Monitoring 69
5.3 Evaluating OCCT and Setting Optimal Water Quality Parameters 73
5.4 Required and Recommended Long-Term Corrosion Control Monitoring 74
Chapter 6 : Impacts of Source Water and Treatment Changes on Lead and Copper in Drinking Water 77
6.1 Review of LCR Requirements Related to a Change in Source or Treatment 77
6.2 Impacts of Source Water Changes 79
6.3 Impacts of Treatment Changes 79
6.3.1 Corrosion Control Treatment 80
6.3.2 Disinfection 80
6.3.3 Coagulation 81
6.3.4 Water Softening 82
6.3.5 Filtration 82
Chapter 7 : References 83

Appendix A: Glossary
Appendix B: Estimated Dissolved Inorganic Carbon (mg/L as C) based on Alkalinity and pH (with water temperature of 25 degrees C and TDS of 200)
Appendix C: Investigative Sampling to Determine the Source of Lead and Copper
Appendix D: Water Quality Data and Information Collection Forms
Appendix E: OCCT Recommendation Forms for Systems Serving ≤ 50,000 People
Appendix F: Tools for Conducting Corrosion Control Studies
Appendix G: Forms for Follow-up Monitoring and Setting OWQPs

Exhibits

Exhibit 2.1: Timeline of Regulatory Actions Related to Lead and Copper 5
Exhibit 2.2: Typical Water Service Connection that May Provide Sources of Lead (Sandvig et al., 2008) 11
Exhibit 2.3: Buffer Intensity as a Function of pH at Different DIC Values (Clement and Schock, 1998, Figure 1) 15
Exhibit 2.4: E_h-pH Diagram for a Lead-Water-Carbonate System. DS oxidant demand in upper box is 'distribution system oxidant demand' (Schock, 2007a; provided by author) 17
Exhibit 3.1: Typical Chemical Processes for pH/Alkalinity/DIC Adjustment 24
Exhibit 3.2: Theoretical Saturation pH for Calcium Carbonate Precipitation (USEPA, 2003) 31
Exhibit 3.3: Identifying the Appropriate Flowchart for Preliminary CCT Selection 32
Exhibit 4.1: Review of CCT Requirements and Deadlines for Systems Serving ≤ 50,000 People (§141.81(e)) 52
Exhibit 4.2: Recommended Checklist to Support Determination of the Need for a CCT Study for Systems Serving ≤ 50,000 People 54
Exhibit 4.3: Corrosion Control Study Requirements[1] 56
Exhibit 4.4: Recommended Checklist to Support Primacy Agency Determination of When to Require a Demonstration Study for Systems Serving ≤ 50,000 People 57
Exhibit 4.5: Possible Outline for a Desktop Study Report 59
Exhibit 4.6: Possible Outline for a Demonstration Study Report 60
Exhibit 4.7: Recommendations for Primacy Agency Review of Desktop Study 62
Exhibit 4.8: Recommendations for Primacy Agency Review of Demonstration Study 63
Exhibit 4.9: Summary of CCT Requirements and Deadlines for Systems Serving > 50,000 People (§141.81(e)) 64
Exhibit 5.1: Required Number of Sites for Follow-up Lead and Copper Tap Monitoring 69
Exhibit 5.2: Follow-up WQP Monitoring Requirements[1] and Recommendations 71
Exhibit 5.3: Required and Recommended Number of Sites for Follow-up WQP Tap Monitoring 72

Flowcharts

Flowchart 1a: Selecting Treatment for Lead only or Lead and Copper with pH < 7.2 33
Flowchart 1b: Selecting Treatment for Lead only or Lead and Copper with pH from 7.2 to 7.8 . 34
Flowchart 1c: Selecting Treatment for Lead only or Lead and Copper with pH > 7.8 to 9.5 35
Flowchart 1d: Selecting Treatment for Lead only or Lead and Copper with pH > 9.5 36
Flowchart 2a: Selecting Treatment for Copper Only with pH < 7.2..... 37
Flowchart 2b: Selecting Treatment for Copper Only with pH from 7.2 to 7.8 38
Flowchart 2c: Selecting Treatment for Copper Only with pH > 7.8..... 39
Flowchart 3a: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH < 7.2..... 40
Flowchart 3b: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH ≥ 7.2..... 41

Acronyms

AL	Action Level
ANSI	American National Standards Institute
AWWA	American Water Works Association
CCPP	Calcium Carbonate Precipitation Potential
CCT	Corrosion Control Treatment
COC	Chain of Custody
CSMR	Chloride-to-Sulfate Mass Ratio
CWS	Community Water System
DBP	Disinfection Byproduct
DBPR	Disinfection Byproducts Rule
DIC	Dissolved Inorganic Carbon
DO	Dissolved Oxygen
EDS	Energy Dispersive Spectroscopy
EMF	Electromotive Force
EPA	Environmental Protection Agency
HAA5	Haloacetic Acids
ICP-MS	Inductively Coupled Plasma Mass Spectroscopy
LCR	Lead and Copper Rule
LSI	Langelier Saturation Index
LSL	Lead Service Line
LT2ESWTR	Long Term 2 Enhanced Surface Water Treatment Rule
MCLG	Maximum Contaminant Level Goal
MDBPR	Microbial and Disinfection Byproducts Rules
NDWAC	National Drinking Water Advisory Council
NOM	Natural Organic Matter

NPDWR	National Primary Drinking Water Regulations
NSF	NSF International
NTNCWS	Non-transient, Non-Community Water System
OCCT	Optimal Corrosion Control Treatment
ORP	Oxidation-Reduction Potential
OWQP	Optimal Water Quality Parameter
POU	Point-of-use
PWS	Public Water System
RLDWA	The Reduction of Lead in Drinking Water Act of 2011
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
TDS	Total Dissolved Solids
TTHM	Total Trihalomethanes
VOC	Volatile Organic Compound
WQP	Water Quality Parameter
WRF	Water Research Foundation
WWTP	Wastewater Treatment Plant

Chapter 1: Introduction

1.1 Purpose and Audience

The purpose of this document is to provide technical recommendations to help primacy agencies and systems comply with corrosion control treatment (CCT) requirements of the Lead and Copper Rule (LCR), including designation of optimal corrosion control treatment (OCCT).[1] This document summarizes the regulatory requirements, and provides technical recommendations that can assist systems in complying with CCT steps and assist primacy agencies with evaluation of technical information from systems. It also includes background information on corrosion and CCT techniques. This document provides Excel-based ***OCCT Evaluation Templates*** that can be used to organize data and document decisions.

The technical recommendations provided in this document are consistent with previously published corrosion control guidance (USEPA, 1992a; USEPA, 1997; and USEPA, 2003). It is not intended to supersede prior guidance; those resources continue to provide technical information that may be relevant to, and further inform, decision-making. Instead, this document is intended to serve as an added resource, offering supplemental information gleaned from recent developments in the drinking water industry's understanding of lead and copper release and control. This includes:

- Influence of oxidation-reduction potential (ORP) on lead and copper release, and importance of Pb(IV) compounds for systems with lead service lines (LSLs).
- Importance of aluminum, manganese, and other metals on formation of lead scales and lead release.
- Impact of physical disturbances on lead release.
- Mechanisms and limitations of using blended phosphates for corrosion control.
- Target water quality parameters (WQPs) for controlling copper corrosion.
- Impacts of treatment changes, particularly disinfectant changes, on corrosion and corrosion control.

EPA recognizes that research is ongoing, and that the water industry's understanding of corrosion, metals release, and treatment strategies will continue to evolve. EPA will update this document periodically as new information becomes available and as time and resources allow.

[1] Note that for the purposes of this document, "optimal corrosion control treatment" or "OCCT" is only used when referring to the requirement in section 141.80(d) of the existing LCR for primacy agencies to designate optimal corrosion control treatment. Section 141.2 defines optimal corrosion control treatment as "the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations." The terms "optimal" or "optimized" may also be used in the manual to indicate the best conditions for preventing lead and copper from leaching into water.

1.2 Document Organization

The remainder of this document is organized as follows:

Chapter 2: Background Information provides a history of regulatory actions to reduce lead and copper exposure from drinking water, including efforts since the 1986 Safe Drinking Water Act (SDWA) Amendments to limit the amount of lead in plumbing materials. It also describes the sources of lead in water, including an overview of lead and copper corrosion and release mechanisms, and relative contribution of lead- and copper-containing materials. Lastly, this chapter provides an updated description of water quality and physical factors that influence lead and copper levels in drinking water.

Chapter 3: Corrosion Control Treatment for Lead and Copper describes the available CCT methods and provides approaches that can be used to identify CCT alternatives. The chapter also provides technical recommendations on setting treatment dose and water quality conditions.

Chapter 4: Corrosion Control Treatment Steps under the LCR reviews the CCT requirements under the LCR and provides additional technical recommendations for primacy agencies and systems to consider when meeting these requirements.

Chapter 5: OCCT Start-Up and Monitoring provides technical recommendations on CCT start-up, reviews requirements under the LCR and technical recommendations for follow-up monitoring during the first year of CCT implementation, reviews requirements for establishing optimal water quality parameters (OWQPs) under the LCR, and reviews LCR-required WQP and technical recommendations for additional corrosion control monitoring.

Chapter 6: Impacts of Source Water and Treatment Changes on Lead and Copper in Drinking Water reviews the requirements in the LCR for notification and approval of a source or treatment change. The chapter also provides technical information on how source and treatment changes can affect lead and copper release.

Chapter 7: References provides a full list of references that were used in the development of this document.

These chapters are supported by several appendices:

Appendix A provides a glossary of corrosion terms.

Appendix B provides a lookup table for systems to determine dissolved inorganic carbon (DIC) based on pH and alkalinity.

Appendix C provides technical recommendations on how to conduct investigative sampling and construct lead profiles to help identify the sources of lead and copper in a building water system.

Appendix D provides blank forms for data collection to support a system's OCCT recommendation and/or the corrosion control study.

Appendix E provides blank forms for systems to support OCCT recommendations to their primacy agencies.

Appendix F summarizes desktop and demonstration tools that can be used by systems when conducting a corrosion control study.

Appendix G provides blank forms for systems and technical recommendations for primacy agencies when reviewing system data and designating OWQPs.

1.3 How to Use this Document

Primacy agencies and systems can use the material in Chapters 2 and 3 as a technical reference to help understand corrosion and CCT and to evaluate CCT alternatives. Tools such as the flowcharts in Chapter 3 are intended for screening and are not meant to serve as substitutes for pilot studies and other site-specific investigations. Chapters 4 and 5 provide a review of the LCR regulatory requirements and provide additional technical recommendations to support primacy agencies and systems when a system serving 50,000 or fewer people exceeds the lead or copper action level (AL), or if a system increases its population to more than 50,000 and is subject to the CCT requirements of the LCR for the first time. Chapters 4 and 5 can also be useful for systems serving more than 50,000 people that previously installed CCT but have subsequent AL exceedances. Primacy agencies and systems can use the information in Chapter 6 to review the regulatory requirements related to notification and approval of a source or treatment change. They can also use the technical information in this chapter to determine how treatment changes could impact lead and copper release.

The Excel-based ***OCCT evaluation templates*** mirror the steps and tables in Chapters 4 and 5 and Appendices D through G. Primacy agencies can use the templates to document circumstances around an AL exceedance and review compliance deadlines for individual systems. They can also use the templates to support determinations of whether or not to require a CCT study, what kind of study to require, and to document their decisions. The templates provide electronic versions of the forms in Appendices D through G. Systems can use the forms to organize their data and information electronically and prepare submittals to their primacy agencies.

Chapter 2: Background Information

This chapter provides information on:

- Regulations to control lead and copper in drinking water;
- Sources of lead and copper;
- Water quality characteristics that impact corrosion of lead and copper and release of these metals into the water; and
- Physical and hydraulic characteristics of water systems that impact lead and copper release.

2.1 Regulatory Actions to Control Lead and Copper in Drinking Water

2.1.1 Lead and Copper Regulation

The national primary drinking water regulation that controls lead and copper in drinking water is the 1991 Lead and Copper Rule (LCR) (USEPA, 1991b), as amended. In the 1991 rulemaking, the Environmental Protection Agency (EPA) established maximum contaminant level goals (MCLGs) (zero for lead and 1.3 milligrams per liter (mg/L) for copper) and action levels (0.015 mg/L for lead and 1.3 mg/L for copper) in public water systems (PWSs). (See Exhibit 2.1 for a timeline of lead and copper regulations and related regulatory activities.) The lead or copper action level is exceeded if the concentration in more than 10 percent of water samples (i.e., the 90th percentile level) collected after a minimum stagnation period of 6 hours is greater than the respective action level. Samples from residences must be collected from cold water kitchen or bath taps and those collected from non-residential areas must be collected from interior taps (§141.86(b)(2)).[2] The number of samples to be collected depends on the size of the water system, as specified in the regulation. The 1991 LCR also established requirements that are triggered, in some instances, by exceedances of the action levels. These additional requirements include the installation and maintenance of corrosion control treatment (CCT) and source water monitoring/treatment, lead public education, and lead service line (LSL) replacement.

[2] Unless otherwise stated, all citations are in Title 40 of the Code of Federal Regulations (CFR).

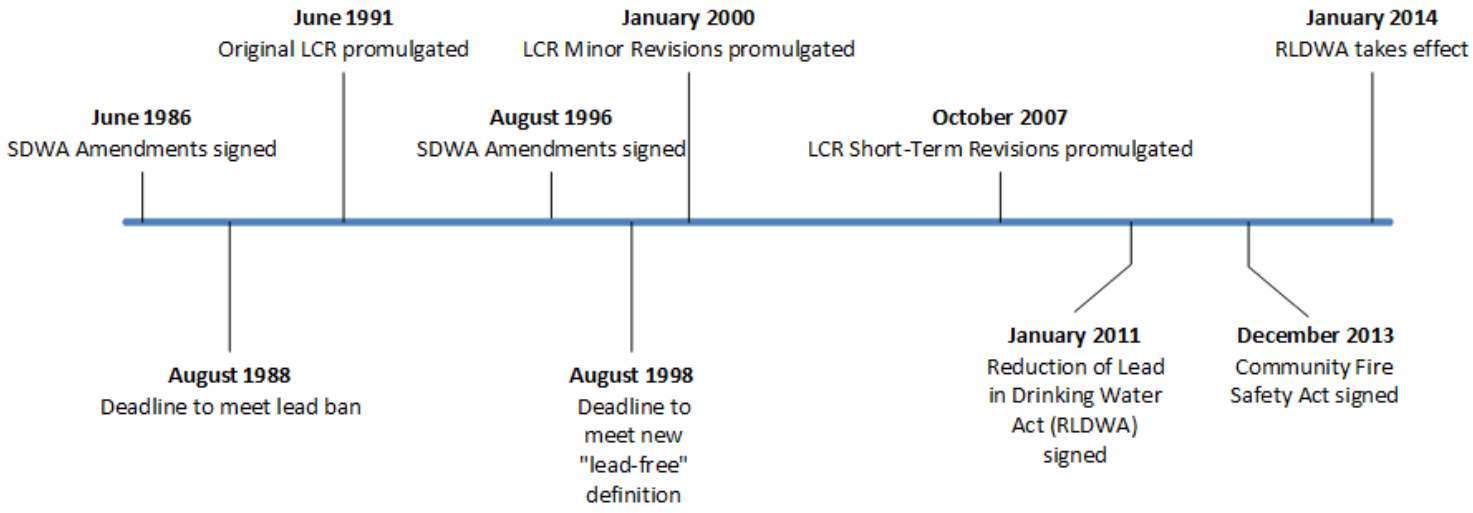


Exhibit 2.1: Timeline of Regulatory Actions Related to Lead and Copper

After the June 1991 LCR, EPA promulgated several technical amendments (USEPA, 1991c; USEPA, 1992b; USEPA, 1994; USEPA, 2004a) as well as more extensive revisions in January 2000 and October 2007 (USEPA, 2000; USEPA, 2007a). The goal of the January 2000 LCR Minor Revisions was to streamline requirements, promote consistent national implementation, and, in many cases, reduce monitoring and reporting requirements (USEPA, 2000). The goal of the 2007 LCR Short-Term Revisions was to enhance the implementation of the LCR in the areas of monitoring, treatment, consumer awareness, and LSL replacement, as well as to improve compliance with the public education requirements of the LCR (USEPA, 2007a).

2.1.2 Control of Lead Content in Plumbing Components

While the LCR regulates the amount of lead and copper in drinking water, the Safe Drinking Water Act (SDWA) also includes provisions aimed at reducing the amount of lead in plumbing components, which could result in lower lead levels in tap samples in the future. This section discusses key changes in SDWA to reduce lead in plumbing components. For additional information, see the references and web links provided herein.

The 1986 SDWA Amendments established requirements to minimize the lead content in source materials that are used in the conveyance and treatment of drinking water. Section 1417 of the 1986 SDWA Amendments banned the use of lead pipe and required the use of "*lead-free"* solders, fluxes, pipes and pipe fittings in the installation or repair of PWSs (also referred to as the "lead ban") (USEPA, 1987). Lead-free materials were defined as:

- Solders and fluxes with a lead content of ≤ 0.2 percent.
- Pipes and pipe fittings with a lead content of ≤ 8.0 percent.

The 1996 SDWA Amendments made it unlawful for anyone to introduce into commerce pipes, pipe or plumbing fittings or fixtures that are not lead free. The 1996 Amendments also required certain plumbing fittings and fixtures (endpoint devices) to be in compliance with a performance standard for lead release for plumbing fittings and fixtures.[3] This standard was satisfied by NSF International/American National Standards Institute (NSF/ANSI) Standard 61, Section 9,[4] which limited the amount of lead that can be leached from endpoint devices used for water intended for human consumption. After August 6, 1998, only those plumbing fittings and fixtures with a lead content of ≤ 8.0 percent that were in compliance with NSF/ANSI Standard 61, Section 9 by an ANSI-accredited certifier could be defined as *"lead-free"* (NSF, 2010).[5]

[3] For a summary of the 1996 Amendments revisions to the lead ban, refer to Section 118. www.congress.gov/bill/104th-congress/senate-bill/1316.

[4] Devices specifically listed in NSF Standard 61, Section 9 include kitchen and bar faucets, lavatory faucets, water dispensers, drinking fountains, water coolers, glass fillers, residential refrigerator ice makers, supply stops and endpoint control valves. Devices that were not covered by section 9 of NSF 61 were not subject to the NSF performance-based standard, but if they were covered by Section 1417, they were subject to the 8.0 percent lead limit.

[5] This commerce restriction does not apply to pipes used for manufacturing and industrial processing.

Plumbing materials meeting the lead-free definition of ≤ 8.0 percent lead were still found to contribute to lead levels measured at the tap (Sandvig et al., 2008). Thus, efforts to reduce the lead content of materials continued, notably in the States of California, Maryland, Massachusetts, and Vermont. In response, manufacturers developed non-leaded alloys containing very low levels of lead (less than 0.25 percent lead) that can be used in the manufacture of brass faucets, meters, and fittings. Many utilities have also developed their own specifications for non-leaded components (Sandvig et al., 2007).

In 2011, The Reduction of Lead in Drinking Water Act of 2011 (RLDWA) revised Section 1417 to:

(1) Redefine "*lead-free*" in SDWA Section 1417(d) to:
   - Lower the maximum lead content of the wetted surfaces of plumbing products such as pipes, pipe fittings, plumbing fittings and fixtures from 8.0% to a weighted average of 0.25%;
   - Establish a statutory method for the calculation of lead content; and
   - Eliminate the requirement that lead-free products be in compliance with voluntary standards established in accordance with SDWA 1417(e) for leaching of lead from new plumbing fittings and fixtures.

(2) Create exemptions in SDWA Section 1417(a)(4) from the prohibitions on the use or introduction into commerce for:
   - Pipes, fittings and fixtures that are used exclusively for non-potable services where the water is not anticipated to be used for human consumption (SDWA 1417(a)(4)(A)); and
   - "toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves that are 2 inches in diameter or larger." (SDWA 1417(a)(4)(B)).

A subsequent Act, The Community Fire Safety Act of 2013, signed on December 20, 2013, exempted fire hydrants from the new lead-free standard, and required EPA to consult with the National Drinking Water Advisory Council (NDWAC) on lead-free issues. Both The RLDWA and Community Fire Safety Act became effective on January 4, 2014. EPA has published a "Summary of The Reduction of Lead in Drinking Water Act and Frequently Asked Questions" that describes both of these Acts in more detail (USEPA, 2013).[6] On January 17, 2017, EPA issued a proposed rule to amend EPA's current regulations and reflect the changes to Section 1417 of SDWA as a result of the RLDWA.

Although the SDWA no longer requires third-party certification, some state or local laws require third-party certification. In addition, third-party certification bodies or agencies may be used by manufacturers to inform consumers which products meet a voluntary standard. One such standard, NSF/ANSI 372 is consistent with the requirements of the RLDWA. A third-party

[6] This document is available at http://nepis.epa.gov/Exe/ZyPDF.cgi/P100M5DB.PDF?Dockey=P100M5DB.PDF.

certification against this standard could be a useful way to identify a product as meeting the requirements of Section 1417. Products will bear the mark of the laboratory that has independently certified the product as meeting the standard. EPA published a brochure to help the public identify the various marks that indicate a product has been certified as lead-free to satisfy the new requirement of the Act: "How to Identify Lead-Free Certification Marks for Drinking Water System & Plumbing Materials" (USEPA, 2015a).[7] EPA also recommends that PWSs incorporate this NSF/ANSI standard into their contract specifications for materials installed in their treatment and distribution systems, and to encourage their consumers to purchase certified products.

2.2 Sources of Lead and Copper

Lead and copper are rarely present in raw water sources. They are primarily present at the customer's tap due to corrosion of lead and copper-based material. This section:

- Provides an overview of chemical and physical reactions that result in lead and copper release into drinking water (Section 2.2.1); and
- Discusses the relative contribution from supply lines and premise plumbing components (Section 2.2.2).

2.2.1 Corrosion and Metals Release

Corrosion in water systems is defined as the electrochemical interaction between a metal surface such as pipe wall or solder and water. During this interaction, metal is oxidized and transferred to the water or to another location on the surface as a metal ion. Depending on the material there are many forms of corrosion, but usually the most important for drinking water are: (1) uniform corrosion, where the electrochemical interaction occurs along the pipe wall, resulting in a relatively uniform loss of metal across the entire surface; (2) non-uniform corrosion, where metal is lost from a localized point, causing pitting and mounding in some cases; and (3) galvanic corrosion which comes from a coupling of dissimilar metals or internally in metallic alloys. While it is important to understand and control corrosion, the LCR is specifically concerned with controlling ***metals release*** (i.e., release of lead and copper) into the water. Metals release is a function of the reactions that occur between the metal ions released due to corrosion, and the physical, chemical, and biological characteristics of the water and the metal surface.

The form of lead and copper released into the water can be dissolved, colloidal, or particulate (i.e., bound up with other compounds such as iron and aluminum). Of great importance is the ***scale*** that builds up naturally on the metal surface. Pipe scales can be complex and can include two types of compounds: (1) passivating films that form when pipe material and water react directly with each other; and (2) deposited scale material that forms when substances in the water (e.g., iron, manganese, aluminum, calcium) precipitate out or sorb to, and then build up

[7] This document is available at http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.pdf.

on the pipe surface. Scales can have layers and are influenced by treatment history. The structure and compounds in the existing corrosion scale can influence the effectiveness of CCT.

Researchers have identified many different compounds on lead pipe scales depending on water quality and treatment history:

- In the absence of corrosion inhibitors, lead pipe scales are frequently dominated by compounds that result from the reaction of carbonate and divalent lead compounds (Pb^{++} or Pb(II)),[8] such as hydrocerussite [$(Pb_3(CO_3)_2(OH)_2$] and cerussite ($PbCO_3$) (Schock and Lytle, 2011). Plumbonacrite ($Pb_{10}(CO_3)_6(OH)_6O$) has been found to co-occur with Pb(II) carbonate compounds in scales and can be a predominant form in systems with high pH (>10) (DeSantis and Schock, 2014). Lead pipe scales may also include massicot and litharge (which are both forms of PbO) under higher alkalinity conditions (McNeill and Edwards, 2004). Carbonate containing scales are often off-white and slightly chalky when dry (Schock and Lytle, 2011).

- Newer research has confirmed that Pb(IV) compounds, i.e., lead oxide (PbO_2),[9] can be the predominant compounds in lead pipe scales under highly oxidative conditions[10] and under low organic matter conditions (Schock, 2007b; Schock, 2001; Schock and Giani, 2004; DeSantis and Schock, 2014).

- When orthophosphate is used, lead pipe scales are often dominated by crystalline Pb(II) orthophosphate compounds such as hydroxypyromorphite, $Pb_9(PO_4)_6$, or $Pb_3(PO_4)_2$. Scales in systems with blended phosphates do not follow the same trends as orthophosphate and seem to be influenced by calcium concentrations and phosphorus speciation (DeSantis and Schock, 2014).

Copper-based scales usually include cuprite (Cu_2O), cupric hydroxide ($Cu(OH)_2$), tenorite (CuO), and malachite ($Cu_2(OH)_2CO_3$). When orthophosphate is used, various copper phosphate scales may develop (Schock and Sandvig, 2006; Schock and Lytle, 2011)).

The characteristics of the scale and its structure dictate the amount of lead or copper that is released into the water. If conditions favor the formation of insoluble, adherent scale (i.e., scale that adheres well to the pipe wall), the rate of metals release will be low. However, if scales do not adhere well to the pipe wall or they are very soluble, the release of metals may be greater. Other compounds in the water including aluminum, iron, manganese, and calcium can significantly influence scale formation and properties. The type of scale will also dictate how

[8] Pb^{++}, Pb(II), or divalent lead is the ionic form of lead that is transferred from the material to the water during the corrosion process.

[9] Pb^{++++}, Pb(IV), or tetravalent lead is an ionic form of lead that forms lead oxide (PbO_2), the only Pb(IV) compound that has been identified in lead pipe scales. Throughout this manual, Pb(IV) and PbO_2 are used interchangeably.

[10] For example, systems that have a free chlorine residual of 2 mg/L or greater. See Section 2.3 for more information on how disinfection affects ORP of the water and how this affects the types of lead compounds in the scale.

susceptible it is to releasing particulate lead following physical disturbances (e.g., infrastructure work).

2.2.2 Lead and Copper-Containing Material

The main sources of lead and copper in drinking water are the materials used for supply pipes from the water main to the building (also called "service lines") and premise plumbing. These include lead and copper pipe, lead-based solder, and brass materials used in faucets and fittings.[11] Exhibit 2.2 shows plumbing components that may be potential sources of lead.[12]

Researchers have performed various studies to identify the relative contribution of these materials to lead and/or copper levels measured at the tap in standing samples (Gardels and Sorg, 1989; Lytle and Schock, 1996; Kimbrough, 2001; Kimbrough, 2007; Sandvig et al., 2008; Kimbrough, 2009). They have found that LSLs contribute a significant percentage of the lead in samples collected at the tap (under normal household usage conditions), and that brass may also be a significant source of lead and copper depending on the quality of the drinking water and the composition of and manufacturing process for the brass faucet or fitting. There are, however, many different types of alloys used in brass faucets and fittings. Each may react differently under different water qualities and chemistries, as well as water use patterns, which makes it difficult to identify specific brass components that might cause problems with respect to lead and/or copper release in any given PWS. Appendix C provides methods for diagnostic monitoring that can help pinpoint the source of lead for a specific building.

[11] Prior to the 1986 SDWA Amendments, 50:50 lead:tin solder could be used for potable applications. Brass alloys comprised of various amounts of copper and lead are used to manufacture pipes, pipe fittings, plumbing fittings, and fixtures (e.g., faucets and meters). As discussed in Section 2.1.2, the RLDWA of 2011 further limits the allowable lead content of these materials.
[12] Although the water utility often owns the portion of the supply pipe from the water main to the property boundary, the homeowner generally owns the portion from the property boundary or meter to the home and is responsible for premise plumbing. This makes lead and copper unique contaminants in that their source is under the control of the individual customer (except in the case of the portion of a LSL owned by the water utility).

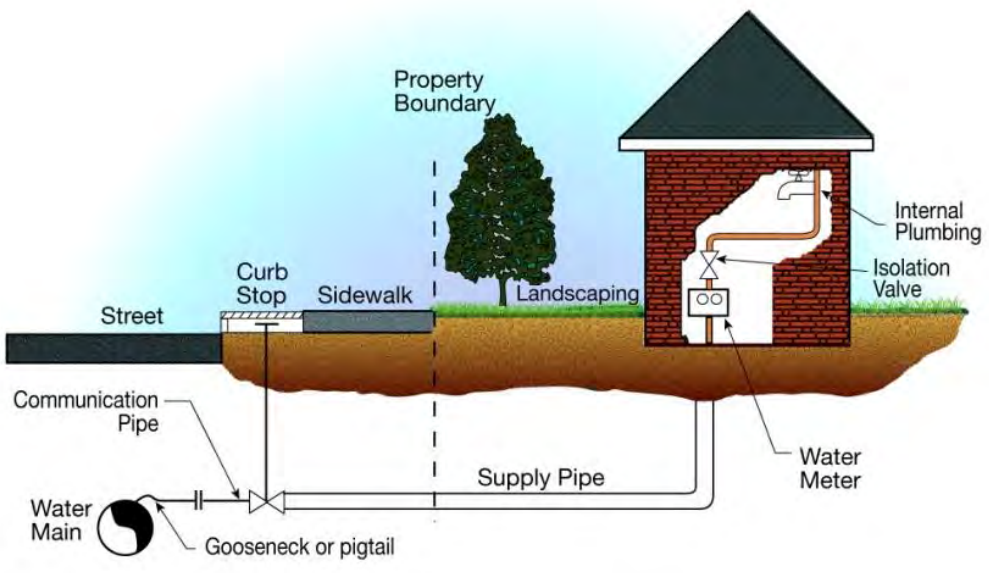


Exhibit 2.2: Typical Water Service Connection that May Provide Sources of Lead (Sandvig et al., 2008)

Copper pipe may be used for both the supply pipe (service line) and the interior piping. Brass fixtures typically are 60 – 90 % copper by weight. Copper release depends on water quality conditions (particularly pH, dissolved inorganic carbon (DIC), and oxidation-reduction potential (ORP)), the age of the copper pipe, and how long the water has been in contact with the pipe. Copper release is typically higher in newer copper plumbing (Cantor et al., 2000; Kimbrough, 2007; Schock and Lytle, 2011). The amount of time required for copper pipes to passivate (i.e., no longer release copper into the water) is highly dependent on water quality, particularly pH, alkalinity, and DIC.

New research has shown that iron and manganese can adsorb other metals such as lead. McFadden et al. (2011) showed that lead released from LSLs was adsorbed onto galvanized iron pipe in homes. Another study showed that iron- and manganese- rich scale provided a source of lead for more than four years after LSLs were fully removed (Schock, Cantor, et al., 2014). Thus, lead released "upstream" (e.g., from an LSL) can accumulate in these scales, providing a long-term source of lead even after LSLs and other lead-containing materials are removed. Residual aluminum in the finished water from the coagulation treatment step can also affect the type and stability of scales formed within LSLs (Schock, 2007b).

2.3 Water Quality Factors Affecting Release of Lead and Copper

New research conducted in recent years has continued to show the influence and importance of water quality on lead and copper levels in drinking water. Water quality can affect the rate of corrosion of lead and copper materials, the formation and characteristics of scales that form on lead and copper based materials, and ultimately, the release of metals into the water. New

findings have shed light on the effects on lead and copper levels of natural organic matter (NOM) and metals including iron, aluminum, and manganese. Alkalinity, pH, DIC, and corrosion inhibitors remain critical parameters that directly impact lead release. In addition, new research has shown the importance of ORP in certain types of waters.

Understanding the water quality conditions that impact the release of lead and copper in drinking water provides a foundation for making effective treatment decisions. This section describes the following parameters, how they can be measured or approximated, and how they can affect lead and copper release in drinking water:

- Alkalinity, pH, and DIC.
- Corrosion inhibitors.
- Hardness (calcium and magnesium).
- Buffer Intensity.
- Dissolved oxygen (DO).
- Oxidation reduction potential (ORP).
- Ammonia, chloride, and sulfate.
- Natural organic matter (NOM).
- Iron, aluminum, and manganese.

2.3.1 pH, Alkalinity and DIC

The pH of water is a measure of its acidity, otherwise known as its hydrogen ion concentration (H^+ or H_3O^+). Alkalinity is the capacity of water to neutralize acid. It is primarily the sum of carbonate, bicarbonate, and hydroxide anions in the water as shown in Equation 1 (Stumm and Morgan, 1981).

$$\text{Alkalinity} = 2CO_3^{2-} + HCO_3^- + OH^- - H^+ \qquad \textit{Equation 1}$$

DIC is an estimate of the total amount of inorganic carbon as shown in Equation 2 (Stumm and Morgan, 1981).

$$\text{DIC} = CO_2 + H_2CO_3 + CO_3^{2-} + HCO_3^- \qquad \textit{Equation 2}$$

Alkalinity and DIC are closely related. Most alkalinity comes from bicarbonate and carbonate ions in the water. Although water operators are more familiar with alkalinity, DIC is the parameter more closely related to corrosion because it directly measures the available carbonate species in the water that can react with lead and copper to form the passivating scales. The water's pH influences many other corrosion-related parameters (i.e., buffer capacity, alkalinity, ORP) and has a large influence on corrosion inhibitor effectiveness.

It is best to measure pH in the field at the time of sample collection using a calibrated instrument. EPA Method 150.1 emphasizes the importance of proper sampling technique - the pH of highly purified waters and the pH of waters that are not in equilibrium with the atmosphere are subject to changes as dissolved gases are either absorbed or desorbed. To

minimize these impacts, EPA recommends filling sampling containers completely and keeping them sealed prior to analysis (USEPA, 1982). Alkalinity is commonly measured by a certified laboratory and reported as mg/L as calcium carbonate ($CaCO_3$). DIC cannot be measured but can be predicted based on the pH, alkalinity, ionic strength, and temperature of the water, using the table in Appendix B. DIC is usually reported in mg/L as carbon (mg/L as C).There are optimal ranges of pH and DIC that result in the greatest formation of insoluble compounds in the scale, and in this way prevent the release of lead and copper. See Chapter 3 for technical recommendations on adjusting pH/alkalinity/DIC to prevent lead and copper release.

The pH, alkalinity, and DIC of water can be highly variable within the distribution system. The pH can fluctuate due to interactions between water and pipe material, microbiological activity, and changes in disinfectant residual. The water's ability to resist changes in pH is called its buffering capacity (also called buffer intensity). The carbonate and bicarbonate ions in the water provide this buffering; see Section 2.3.4 for additional information.

Regardless of the specific treatment used, understanding the pH and DIC range throughout a distribution system is an important part of maintaining corrosion control and minimizing the release of lead and copper.

2.3.2 Corrosion Inhibitors

Corrosion inhibitors are used not only to control lead and copper release, but also to prevent corrosion of iron pipe and other metals in the distribution system. The most common corrosion inhibitors used by water systems are phosphate-based, which means they have orthophosphate (PO_4^{3-}) in their formulation. Silicate-based corrosion inhibitors, which are mixtures of soda ash and silicon dioxide, have been used in a few cases.

Orthophosphate is commonly used for lead and copper control. Polyphosphates, which are polymers containing linked orthophosphate ions in various structures are used mainly for sequestering iron and manganese. They work by binding or coordinating the metals into their structures so they cannot precipitate on sinks or clothes. Polyphosphates can also sequester lead and copper, keeping them in the water and actually increasing the risk of exposure. Polyphosphates can revert to orthophosphate in the distribution system, but it is difficult to predict if and when this occurs. Research has confirmed that polyphosphates are generally ***not*** effective on their own for controlling the release of lead and copper (Holm and Schock, 1991; Cook, 1992; Dodrill and Edwards, 1995; Cantor et al., 2000). Blended phosphates, which contain a mixture of orthophosphate and polyphosphate, have been used for corrosion control and to sequester iron and manganese. Silicate-based inhibitors have been shown to successfully reduce lead and copper levels in first draw-samples at the tap (Schock, Lytle, et al., 2005), but their full-scale use has been limited.

See Chapter 3 for additional technical recommendations on using orthophosphate, blended phosphates, and silicate-based corrosion inhibitors for controlling lead and copper release.

2.3.3 Hardness (Calcium and Magnesium)

Hardness is primarily the sum of calcium and magnesium in water. It is a common water quality parameter measured in the laboratory and is typically reported as mg/L as $CaCO_3$ (calcium carbonate).

If finished water has high hardness, increasing the pH to control lead release can cause calcium carbonate precipitation, or scaling, in the distribution system. The Langelier Saturation Index (LSI), and other calcium carbonate-related indices such as the Ryznar Index and calcium carbonate precipitation potential (CCPP), can be used as indicators of scaling conditions (Schock and Lytle, 2011).[13] It is critical to note that, while these indices can be used to predict scaling potential as an adverse secondary impact of pH or alkalinity adjustment, they have no value as corrosivity indictors and should ***not*** be used to evaluate lead or copper control. The LSI is only important insofar as it provides information regarding the amount of pH adjustment that can be employed without causing precipitation.

In addition to contributing to scaling, calcium may be a particularly important component of scales laid down by blended phosphate corrosion inhibitors. See Chapter 3 for more information.

2.3.4 Buffer Intensity

Buffer intensity (also called buffer capacity) is a measure of the water's resistance to changes in pH, either up or down. It is defined as the concentration of base required to raise the pH one unit and has units of moles/L/unit pH. Buffer intensity depends on the alkalinity, DIC, and pH of the water. Exhibit 2.3 shows the relationship of pH and buffer intensity at different DIC values, with the highest buffer intensity at a pH of approximately 6.3 and minimum intensity at pH values between 8.0 and 8.5. Thus, waters with pH between 8 and 8.5 and low DIC (less than about 10 mg/L as C) have low buffer intensity and may have more variable pH within the distribution system, whereas waters outside this pH range will have higher buffer intensity and may exhibit less variability in pH levels in the distribution system. Increasing DIC in waters with pH values in the 8 – 8.5 range will not result in appreciable increases in buffer intensity. Additional buffer intensity may result when phosphate or silicate chemicals are dosed at a high concentration relative to DIC.

[13]The LSI is defined as the comparison between the measured pH of the water with the pH the water would have at saturation with $CaCO_3$.

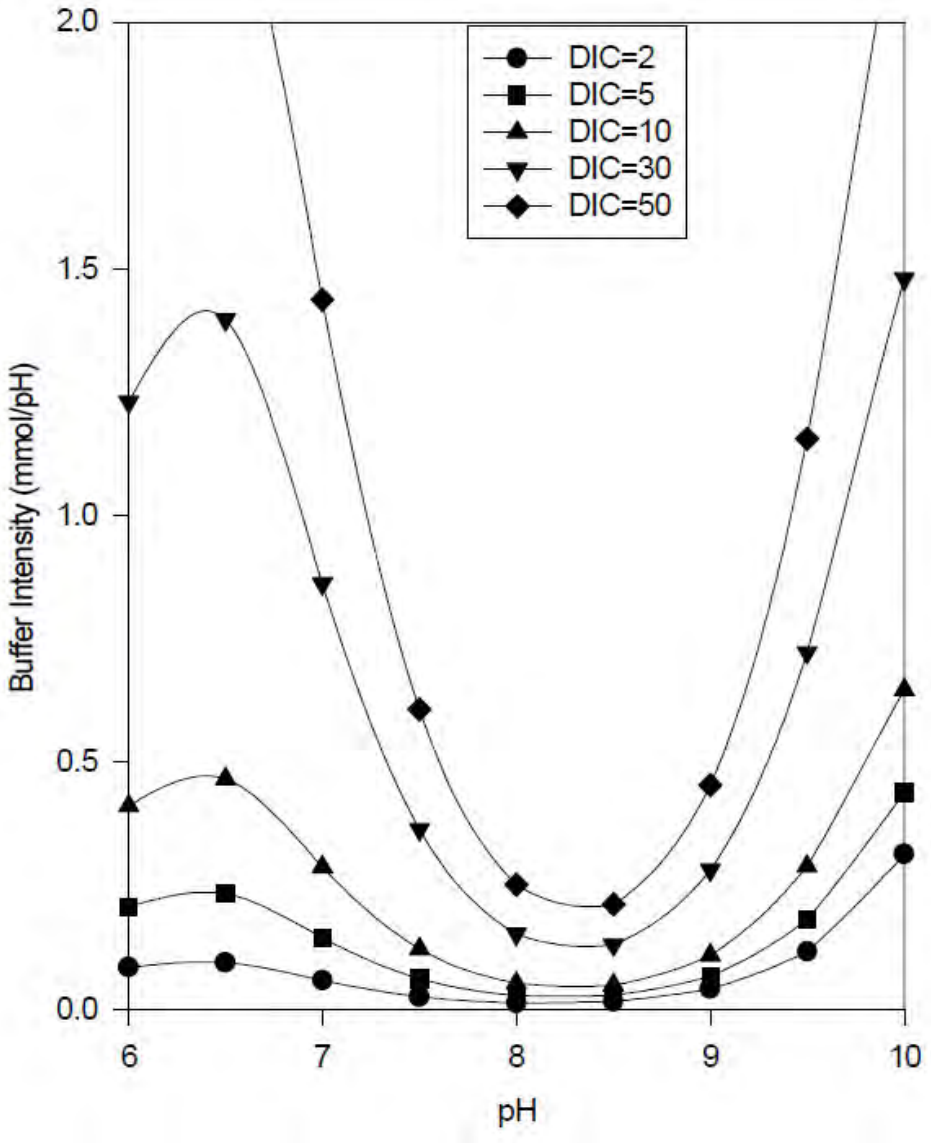


Exhibit 2.3: Buffer Intensity as a Function of pH at Different DIC Values (Clement and Schock, 1998, Figure 1)

2.3.5 Dissolved Oxygen

Oxygen is slightly soluble in water, seldom reaching dissolved concentrations above 15 mg/L. In ground water, DO can vary depending on the geochemistry and hydrogeology of the aquifer. Deep ground water or shallow ground water in areas where the recharge area has silty or clayey soils may have no DO. Shallow ground water in areas with fractured rock or sandy soils may contain higher concentrations of DO. Surface waters are generally more oxygenated, especially flowing sources (i.e., rivers). Stagnant water and waters with low DO content, however, can create oxygen-deficient conditions in some cases. The DO concentration depends

on water temperature, but typical well-aerated water will have a DO concentration of about 8 or 9 mg/L. DO concentrations can be measured in the field using a calibrated DO meter.

DO concentration affects the solubility of iron, manganese, lead, and copper. Some ground water systems add dissolved oxygen through aeration processes to oxidize iron and manganese so that they can be removed through precipitation. Increasing DO in the water can increase copper corrosion, converting Cu(I) to Cu(II). However, water with high DO levels may provide corrosion benefits under some circumstances, by facilitating the production of different and more protective lead oxide scales than would have been formed under low DO conditions (see Section 2.3.6 on Oxidation-Reduction Potential for more information).

2.3.6 Oxidation-Reduction Potential

Oxidation-reduction potential, also called redox potential or ORP, is the electric potential required to transfer electrons from one compound (the oxidant) to another compound (the reductant). It is considered a quantitative measure of the state of oxidation in water treatment and distribution systems. Like pH, ORP is a fundamental characteristic of aqueous systems and affects how water interacts with solid substances such as metal pipe material. It is commonly measured using a platinum reference electrode and reported in units of volts (V) or millivolts (mV). Measured ORP values are often normalized with respect to the standard hydrogen electrode and reported as electric potential (E_h) by taking into account a material-specific conversion factor, generally provided by the electrode manufacturer or found in reference textbooks (Copeland and Lytle, 2014).

ORP varies with pH, temperature, and DIC, but is fundamentally driven by the type and concentration of disinfectant in the water (e.g., chlorine or chloramines) and the DO concentration. Laboratory studies by James et al. (2004) and Copeland and Lytle (2014) showed that ORP values are highest for free chlorine and chlorine dioxide, and that ORP decreases with increasing pH from 7 to 9, regardless of the oxidant used. Copeland and Lytle (2014) found an E_h range of 0.51 V (no disinfectant and pH of 9) to 1.02 V (chlorine disinfection and a pH of 7). In general, the influence of free chlorine on ORP is much greater than that of DO. As a result, for systems using a free chlorine residual in the distribution system, DO's influences on ORP are minor.

Under certain conditions, ORP can have a dramatic impact on lead release. Exhibit 2.4 shows the theoretical E_h and pH conditions that favor different dissolved and solid forms of lead. The hatched areas represent lead solids, and the un-hatched areas are lead complexes that are in solution. It is important to note that E_h-pH diagrams are based on theory, and the positions of the boundaries can vary depending upon the data used to construct them. Thus, these diagrams should be used to understand relationships and interpret field data, and not for predicting lead release.

Exhibit 2.4 shows that Pb(II) solids exist theoretically at low E_h values at typical pH levels in drinking water. At higher E_h values (> 0.7 V) and in the absence of corrosion inhibitors or other

interfering surface deposits, PbO_2 (a Pb(IV) solid) could form on lead pipe surfaces. PbO_2 is insoluble and would prevent lead from being released to the water. Water quality changes that cause a reduction in pH or ORP from a change in disinfection practices (e.g., switching from chlorine to chloramines in the distribution system), however, can cause PbO_2 to convert to Pb(II) compounds and release lead into the water.

The high E_h values needed for PbO_2 formation may be found in systems that have a high chlorine residual (i.e., > 2 mg/L as free chlorine) for extended periods of time. PbO_2 has been observed to form between pH 7 and 9.5, with formation occurring more quickly at higher pH values. Field testing has shown that the amount of lead released from PbO_2 scales is very low and close to lead levels for non-lead pipes (Schock, Triantafyllidou, et al., 2014; Triantafyllidou et al., 2015).

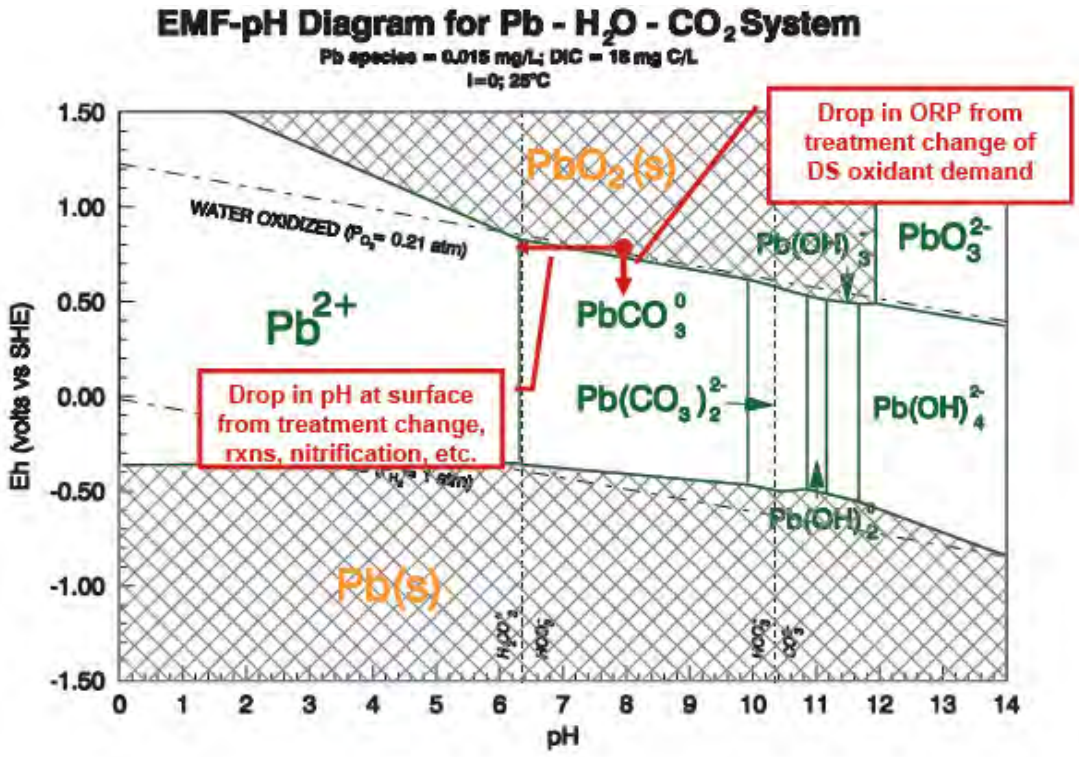


Exhibit 2.4: E_h-pH Diagram for a Lead-Water-Carbonate System. DS oxidant demand in upper box is 'distribution system oxidant demand' (Schock, 2007a; provided by author)

2.3.7 Ammonia, Chloride, and Sulfate

Excess ammonia (NH_3) may occur in the distribution system due to elevated source water ammonia levels and/or if the system uses chloramines for disinfection. The presence of excess ammonia can lead to nitrification in the distribution system. Nitrification occurs when nitrifying bacteria convert ammonia into nitrite and nitrate, which may lower the pH and alkalinity of the water. This can accelerate brass corrosion and cause problems with lead release (Uchida and

Okuwaki, 1999; Douglas et al., 2004). Ammonia may also form compounds with lead and copper, which can interfere with the effectiveness of CCT.

Research has shown that the ratio of chloride (Cl^-) to sulfate (SO_4^{2-}) in the water can be an indicator of potential lead release. An evaluation of LCR tap sampling data from 12 drinking water utilities collected as part of a Water Research Foundation (WRF) project found that all of the water systems with chloride-to-sulfate ratios less than 0.58 met the 90th percentile action level for lead, whereas only 40 percent of the systems with chloride/sulfate ratios greater than 0.58 met the lead action level (Reiber et al., 1997). More recent research has shown that that lead leaching increased when the chloride-to-sulfate mass ratio approached 0.4 to 0.6 (Nguyen et al., 2010; Nguyen et al., 2011); however, further increasing the chloride-to-sulfate mass ratio above 0.7 may not necessarily be an indicator of increased lead release (Wang et al., 2013). Lower chloride-to-sulfate ratios may be indicative of lower lead release due to the formation of an insoluble sulfate precipitate with lead. Higher ratios may result in the formation of a soluble chloride complex, where lead is galvanically connected to another metal such as copper (Nguyen et al., 2010; 2011).

The chloride and sulfate content in water can change with a switch from sulfate-based coagulants (such as aluminum sulfate (alum) and ferric sulfate) to chloride-based coagulants (such as ferric chloride). Conversely, a change from ferric chloride to alum may increase the sulfate content in the water, potentially reducing lead release. Other scenarios that may affect lead release by altering the chloride and sulfate concentration in the water (and hence the chloride-to-sulfate mass ratios) include blending of desalinated seawater, using anion exchange, or brine leaks from on-site hypochlorite generators (Nguyen et al., 2010; 2011). Galvanic connections and galvanic corrosion can occur in the distribution system with the use of lead solder on copper pipes, or from partial lead line replacements (Oliphant, 1983; Gregory, 1985; Reiber, 1991; Singley, 1994; Lauer, 2005; Nguyen et al., 2010; Triantafyllidou and Edwards, 2011; Clark et al., 2013; Wang et al., 2013).

2.3.8 Natural Organic Matter

NOM is a complex mixture of organic compounds that occur in both ground and surface water sources, but are more prevalent in surface water. NOM is difficult to measure, so utilities often use UV_{254} (specific absorption, the ratio of UV absorption to organic carbon concentration) as a surrogate (APHA, AWWA, and WEF, 2005).

The impact of NOM on metals release is unclear. NOM in finished water can help form the protective films that reduce corrosion, but it has also been shown to react with corrosion products to form soluble complexes with lead, which may increase lead levels in the water (Korshin et al., 1996, 1999, 2000, 2005). Organic matter can also provide nutrients for microorganisms, exacerbating problems with biofilm growth and depleting chlorine residuals. This additional microbial growth can cause microbially-induced copper corrosion (pinhole leaks)

through localized decreases in pH or, in the case of sulfate-reducing bacteria, through the formation of sulfide (Schock and Lytle, 2011).

2.3.9 Iron, Manganese, and Aluminum

Iron and manganese are present in many ground water sources and in the lower depths of some thermally stratified lakes and reservoirs. While there is no health-based maximum contaminant level for these metals, EPA has established secondary maximum contaminant levels (SMCLs) for iron and manganese of 0.3 mg/L and 0.05 mg/L, respectively. These SMCLs are based on aesthetic issues (red water, staining of clothing). While aluminum occurs naturally in groundwater and soil due to the erosion of aluminum-bearing minerals (USEPA, 2006a), it is more frequently found in drinking waters treated with alum for coagulation. It can also be an impurity in lime. Aluminum can color water, so EPA has set a SMCL of 0.05 to 0.2 mg/L.[14] Iron, manganese, and aluminum are common water quality parameters that can be measured by a certified laboratory.

Systems that increase pH for lead and/or copper control may experience black or red water complaints due to oxidation of iron and manganese in the distribution system. Iron and manganese removal at the treatment plant, or possibly the use of sequestering agents or silicates, can be used in these cases (see Chapter 3 for more information).

New research has shown that manganese and iron can react with dissolved lead and form deposits on lead service lines and other pipes in premise plumbing. In the well-studied case of Madison, WI, manganese that accumulated on pipe scales (up to 10 percent by weight of scale composition) captured dissolved lead and later released it back into the drinking water (Schock, Cantor, et al., 2014). Manganese can also interfere with the formation of PbO_2 and other passivating films (Schock, Cantor, et al., 2014).

Aluminum can interfere with orthophosphate effectiveness by forming aluminum phosphate precipitates, which reduce the amount of orthophosphate available for lead and copper control. Aluminum phosphate precipitates also have the potential to form scales on the interior of piping systems that may reduce the effective diameter of the pipes, resulting in loss of hydraulic capacity and increases in system headloss and operational costs (AWWA, 2005).

The 2006 EPA Report, Inorganic Contaminant Accumulation in Potable Water Distribution Systems notes that, “Based on scale sample analysis from 10 water utilities that practice alum coagulation, Snoeyink et al. (2003) confirmed that aluminum is frequently a major component of lead pipe scale” (USEPA, 2006a). These scales, however, are generally not as stable compared to orthophosphate scales and are prone to sloughing with changes in flow or water quality, or when lead service lines are physically disturbed during routine maintenance and

[14] “While EPA encourages utilities to meet a level of 0.05 mg/l for aluminum where possible, the Agency still believes that varying water quality and treatment situations necessitate a flexible approach to developing the SMCL. What may be appropriate in one case may not be appropriate in another. Hence, a range was developed for the aluminum SMCL.” (USEPA, 1991a).

repair activities. These dislodged scales can release metals that may become entrapped in the interior (premise) plumbing and/or the faucet screen, potentially increasing lead and copper levels in the water (Schock, 2007b).

2.4 Physical and Hydraulic Factors Affecting Release of Lead and Copper

In addition to water quality parameters, physical factors such as pipe disturbances, hydraulics, water use, and water temperature can affect lead and copper levels at the customer's tap. Understanding these factors can help primacy agencies and systems interpret lead and copper data and evaluate the effectiveness of OCCT.

2.4.1 Physical Disturbances

Field sampling has shown that physical disturbances to LSLs related to infrastructure work can result in lead release. Del Toral et al. (2013) found that most lead sampling results above the LCR lead action level of 0.015 mg/L occurred at sites with physical disturbances compared to undisturbed sampling sites.[15] Lower water usage at the disturbed sites may have also been a factor in the higher lead levels found.

Any physical disturbance to the premise plumbing system, from service to tap, can cause lead particulate release. Physical disturbances resulting in lead particulate release can occur during:

- Meter installation or replacement.
- Auto-meter-reader installation.
- Service line repair or partial replacement.
- External shut-off valve repair or replacement.
- Significant street excavation directly in front of the house.
- Repair or replacement of home plumbing fixtures or piping.

When any part of a home plumbing system is drained for repair work, or when infrastructure upgrades or repairs are completed (e.g., main breaks), air may get into the lines and scour deposits from the service lines to the tap. Tap flushing to remove air bubbles can disrupt pipe scales and release lead, copper and other accumulated material in the scales.

2.4.2 Hydraulic Factors

High water velocity can help reduce lead and/or copper by transporting the corrosion inhibitor to pipe surfaces at a higher rate; however, in some cases it can increase lead and/or copper corrosion by increasing the rate at which the oxidants in water come into contact with the metal surface. High water velocity can cause corrosion in copper pipes, and can also mobilize loosely adherent scale and cause sporadic lead release (Schock, 1999). Low water velocity in

[15] Sampling included first draw and lead profile sampling. The percent of samples with lead levels greater than 0.015 mg/L was 36% for sites with known disturbances (13 sites and 327 samples), 37 % for indeterminate sites where the disturbance could not be verified (2 sites, 81 samples), and 2% for undisturbed sites (16 sites, 372 samples).

areas of low water usage can reduce the effectiveness of the corrosion control inhibitor in forming a passivating scale. Increased water age due to less frequent use can cause water quality changes such as reductions in pH and loss of free chlorine residual that could exacerbate corrosion as well as microbial problems.

Other hydraulic factors that can affect lead and copper release into the customer's service line or a building's plumbing include flow reversals and hydraulic pressure transients. Pressure transients may occur when valves are closed to perform maintenance (Friedman et al., 2010) or due to backflow from a cross connection. Residential backflow is more common than previously thought, according to a recent study that identified backflow events in 5 percent of homes with backflow sensing meters (Schneider et al., 2010). Hydraulic pressure transients may occur when there are sudden changes in water velocity due to valves slamming shut, power outages, or pump start/stop cycles (Friedman et al., 2010).

2.4.3 Water Use

The effectiveness of corrosion control inhibitors depends on delivery of the inhibitors to the pipe wall to form the passivating scale. Reductions in water use may adversely affect this process. Also, as stated above, increased water age from less frequent use can cause water quality changes, such as reductions in pH and loss of free chlorine residual, that can exacerbate corrosion as well as microbial problems.

2.4.4 Water Temperature

Water temperature effects are complex and depend on the water chemistry and type of plumbing material. More lead is often mobilized during warmer weather seasons, although temperature effects can vary depending on water quality conditions and plumbing configuration. For example, as reported by Schock and Lytle (2011), orthophosphate reacts more quickly at higher temperatures, so reduction in lead levels may take longer in colder months than in warmer months. Higher temperature can also exacerbate copper corrosion, although elevated temperature has been found in some instances to facilitate a better passivating copper pipe scale (Schock and Lytle, 2011).

Seasonal changes in water temperature can result in significant changes in water quality and can impact lead and copper release. Because of the many reactions happening in the distribution system, it is difficult to generalize temperature's impacts. Water systems should collect water quality and lead and copper data throughout the year to determine their own trends.

Chapter 3: Corrosion Control Treatment for Lead and Copper

This chapter provides technical information on available corrosion control treatment (CCT) methods for lead and copper (Section 3.1), technical recommendations for identifying treatment alternatives for individual systems (Section 3.2), and technical recommendations for identifying target water quality and dosages for treatment alternatives (Section 3.3). The information in this chapter can be used to support systems and primacy agencies in meeting CCT requirements of the Lead and Copper Rule (LCR). Note that this chapter provides background information and technical recommendations - see Chapters 4 and 5 for a review of the required CCT steps under the LCR and when CCT requirements apply.

3.1 Available Corrosion Control Treatment Methods

Alkalinity and pH adjustment have been used by many systems for corrosion control. The discussion of this method is expanded in this section to include dissolved inorganic carbon (DIC) adjustment because all three parameters are a better indicator of corrosion control effectiveness than pH and alkalinity alone.

Phosphate-based corrosion inhibitors have been widely used to control lead and copper release. Their applications for corrosion control have been updated in this chapter to include more recent information on chemical formulations, optimal pH ranges, and limitations to their use.

Information on the use and effectiveness of silicate-based corrosion inhibitors continues to be limited and more research is needed. They may be effective in reducing lead and copper release in some cases, however, so they are included as a treatment technique in this chapter.

Calcium hardness adjustment is not discussed in this chapter because newer research has shown that calcium carbonate films only rarely form on lead and copper pipe and are not considered an effective form of corrosion control (Schock and Lytle, 2011; Hill and Cantor, 2011). Calcium hardness is important, however, in evaluating the amount of pH adjustment that can be made without causing calcium carbonate precipitation and resultant scaling problems in the distribution system.

New research has found that lead service lines (LSLs) with PbO_2 scales can have very low lead release (levels as low as or lower than those found when orthophosphate treatment is used (Schock, Cantor, et al., 2014; Triantafyllidou et al., 2015)). This new information has significant implications for management of treatment and distribution systems to minimize the release of lead. Questions remain, however, on how systems and primacy agencies can ensure that disinfectant residuals required for the formation and maintenance of PbO_2 scales are maintained in LSLs throughout the distribution system. This may be a particular challenge with homes that go unoccupied for an extended period of time. Therefore, formation of PbO_2 scale is not included in this section as a corrosion control technique. If systems have PbO_2 scales,

they should be very careful about making disinfection changes (see Chapter 6 for more information).

The remainder of this sub-subsection describes the specific chemical/physical methods that can be used for pH/alkalinity/DIC adjustment, phosphate-based corrosion inhibitors, and silicate-based corrosion inhibitors.

3.1.1 pH/Alkalinity/DIC Adjustment

As noted in Chapter 2, there are ranges of pH, alkalinity, and DIC that result in formation of insoluble compounds in the scale and in this way prevent the release of lead and copper (see Section 3.3.1 for recommended target pH/alkalinity/DIC ranges). Adjustment of pH/alkalinity/DIC can be accomplished by chemical or non-chemical means. Typical chemicals used for pH/alkalinity/DIC adjustment for corrosion control are listed in Exhibit 3.1. Additional information and guidance on pH adjustment methods are provided in USEPA (1992a) and Hill and Cantor (2011).

In addition to chemical methods, pH/alkalinity/DIC adjustment can be accomplished using limestone contactors or aeration. Limestone contactors, which are enclosed filters containing crushed high-purity limestone, have been used at small systems because they are relatively easy to operate. As the water passes through the limestone, the limestone dissolves, raising the pH, alkalinity, DIC, and calcium of the water. An empty bed contact time of 20 to 40 minutes is typically used to optimize pH and alkalinity adjustment. If a high pH is needed, other media types (e.g., dolomite, dolomitic materials) may be available regionally. The pH can be hard to control in limestone contactors and can depend on initial water quality and type of limestone used. When using limestone contactors, it is important to limit influent water quality to properly control effluent water chemistry. Suggested values for the influent are pH < 7.2, calcium < 60 mg/L, and alkalinity < 100 mg/L (Hill and Cantor, 2011). For influent pH > 7.2, carbon dioxide can be added prior to the contactors. Limiting iron, manganese, and aluminum is also recommended to prevent filter fouling. Limestone contactors can also be used for iron removal but require backwash capabilities to remove iron that accumulates on the limestone. Recommendations on the design and application of limestone contactors can be found on the following Environmental Protection Agency (EPA)-funded website www.unh.edu/wttac/WTTAC_Water_Tech_Guide_Vol2/limestone_intro.html. Calcite filters are a similar treatment that operate using the same principles as limestone contactors, except that they use a finer material that is housed in a cartridge. For the purposes of this document, “limestone contactor” is the generic term used to represent any filtration process of calcite-containing material used to add pH, alkalinity, and DIC to the water.

Aeration is a non-chemical method for adjusting pH where air is introduced into the water. Aeration is the only method that ***reduces*** excess DIC by removing carbon dioxide, which results in an increase in pH. Aeration systems include Venturi injector systems, tray systems, packed tower systems, and diffuse bubble systems. They can be designed to remove other constituents

such as iron, manganese, radon, volatile organic compounds (VOCs) and hydrogen sulfide (H_2S). Aeration is most effective when there is an adequate carbon dioxide concentration in the water (4 - 10 mg/L CO_2), and the pH is < 7.2 (Spencer and Brown, 1997; Lytle et al., 1998; Spencer, 1998; AWWA, 1999; Schock et al., 2002; AWWA, 2005).

Exhibit 3.1: Typical Chemical Processes for pH/Alkalinity/DIC Adjustment

Chemical	Use	Composition	Alkalinity Change	DIC Change[1]	Notes
Baking Soda, $NaHCO_3$ (sodium bicarbonate)	Increases alkalinity with moderate increase in pH.	98% purity. Dry storage with solution feed.[2]	0.60 mg/L as $CaCO_3$ alkalinity per mg/L as $NaHCO_3$ [2, 3, 4]	0.14 mg/L as C per mg/L as $NaHCO_3$	Good alkalinity adjustment chemical but expensive.[2]
Carbon Dioxide, CO_2	Lowers pH. Converts hydroxide to bicarbonate and carbonate species.	Pressurized gas storage. Fed either through eduction or directly.[2]	None [2]	0.27 mg/L as C per mg/L as CO_2	Can be used to enhance NaOH or lime feed systems.[2]
Caustic Potash, KOH (potassium hydroxide)	Raises pH. Converts excess carbon dioxide to carbonate alkalinity species.	KOH is available as a 45% solution.[5] Has a low freezing point and may be stored at higher concentrations.	0.89 mg/L as $CaCO_3$ alkalinity per mg/L as KOH [3, 4]	None	pH control is difficult when applied to poorly buffered water.[5] Is a hazardous chemical, requires safe handling and containment areas.
Caustic Soda, NaOH (sodium hydroxide) [6]	Raises pH. Converts excess carbon dioxide to carbonate alkalinity species.	93% purity liquid bulk, but generally shipped and stored at < 50% purity to prevent freezing.[2]	1.25 mg/L as $CaCO_3$ alkalinity per mg/L as NaOH [3, 4]	None	pH control is difficult when applied to poorly buffered water.[2] Is a hazardous chemical, requires safe handling and containment areas.
Hydrated Lime, $Ca(OH)_2$ (calcium hydroxide) [7]	Raises pH. Increases alkalinity and calcium content (i.e., hardness).	95 to 98% purity as $Ca(OH)_2$. 74% active ingredient as CaO. Dry storage with slurry feed.[2]	1.35 mg/L as $CaCO_3$ alkalinity per mg/L as $Ca(OH)_2$ [3, 4]	None	pH control is difficult when applied to poorly buffered water. Slurry feed can cause excess turbidity. O&M is intensive.[2]
Potash, K_2CO_3 (potassium carbonate)	Increases alkalinity with moderate increase in pH.	Dry storage with solution feed.[5]	0.72 mg/L as $CaCO_3$ alkalinity per mg/L K_2CO_3 [3, 4]	0.09 mg/L as C per mg/L as K_2CO_3	More expensive than soda ash but more soluble and easier to handle.[5]

Chemical	Use	Composition	Alkalinity Change	DIC Change[1]	Notes
Soda Ash, Na_2CO_3 (sodium carbonate)	Increases alkalinity with moderate increase in pH.	95% purity. Dry storage with solution feed.[2]	0.94 mg/L as $CaCO_3$ alkalinity per mg/L as Na_2CO_3 [3, 4]	0.11 mg/L as C per mg/L as Na_2CO_3	More pH increase compared with $NaHCO_3$, but less costly.[2] Has increased buffer capacity over hydroxides.
Sodium Silicates, Na_2SiO_3	Moderate increases in alkalinity and pH.	Available in liquid form mainly in 1:3.2 or 1:2 ratios of Na_2O:SiO_2.[8]	Depends on formulation	None	More expensive than other options but easier to handle than lime and other solid feed options. Has additional benefits in sequestering or passivating metals.[8]

Notes and adapted sources:

[1] Calculated by the formula DIC Change = 12 x (moles carbon/mole compound) / molecular weight of compound.

[2] USEPA, 1992a

[3] Wachinski, 2016

[4] Simon, 1991

[5] USEPA, 2003

[6] Caustic potash (KOH), or potassium hydroxide, is an alternative that does not add sodium to water.

[7] Lime is available as hydrated or slaked lime ($Ca(OH)_2$) and quicklime (CaO).

[8] Schock, 1996

3.1.2 Phosphate-Based Inhibitors[16]

As noted in Chapter 2, phosphate-based corrosion inhibitors are chemicals that have orthophosphate in their formulation.[17] Orthophosphate reacts with divalent lead and copper (i.e., Pb^{++} and Cu^{++}) to form compounds that have a strong tendency to stay in solid form and not dissolve into water. The extent to which orthophosphate can control lead and copper release depends on the orthophosphate concentration, pH, DIC, and the characteristics of the existing corrosion scale (e.g., whether it contains other metals such as iron or aluminum).

Orthophosphate is available as phosphoric acid, in salt form (potassium or sodium), and as zinc orthophosphate. Phosphoric acid (H_3PO_4) is a common form that is available in concentrations between 36 and 85 percent. Because it is an acid, it requires special handling and feed facilities. Zinc orthophosphate inhibitors typically have zinc: phosphate weight ratios between 1:1 and 1:10. Recent research found that zinc orthophosphate did not provide additional lead and

[16] As noted in Chapter 2, polyphosphates, which are used mainly as sequestrants for iron and manganese, have not been found to be effective on their own to control lead and copper release.

[17] Orthophosphate concentration can be measured as P (phosphorus) or PO_4 (phosphate). It is very important to be clear about which measurement is being used. An orthophosphate concentration of 3 mg/L as PO_4 is roughly equivalent to 1 mg/L as P.

copper control compared to orthophosphate (Schneider et al., 2010). The zinc did, however, provide better corrosion protection for cement at low alkalinity/hardness/pH conditions.

Blended phosphates are a mix of orthophosphate and polyphosphate, with the orthophosphate fraction ranging from 0.05 to 0.7. It is possible that blends can provide both sequestration of metals and reduce metals release (Hill and Cantor, 2011). It is important to note that blended phosphates may not function as corrosion inhibitors strictly on the basis of concentration and relative amount of orthophosphate. See Section 3.3 for more information and recommended special considerations for using blended phosphates.

3.1.3 Silicate Inhibitors

Silicate inhibitors are mixtures of soda ash and silicon dioxide. These treatment chemicals are available in liquid or solid form (AwwaRF, 1990; Reiber et al., 1997; USEPA, 2003). They have been shown in a few cases to reduce lead and copper levels in first draw, first liter tap samples (LaRosa-Thompson et al., 1997; Schock, Lytle, et al., 2005). They have not been used in many full-scale plants because they have traditionally been more expensive than phosphate-based inhibitors and can require high doses.

The mechanisms by which silicate inhibitors control lead and copper release have been debated in the literature. Silicates may form an adherent film on the surface of the pipe that acts as a diffusion barrier. Silicates will also increase the pH of the water, which may reduce lead and copper release. The effectiveness of the formation of a diffusion barrier depends on pre-existing corrosion products on the scale to provide a site for the binding of the silicate layer (LaRosa-Thompson et al., 1997).

Silicates are defined by a weight ratio of SiO_2:Na_2O. A ratio of 3.22 is typical, although sodium silicate solutions with ratios as low as 1.6 are commercially available (Schock and Lytle, 2011; Schock, Lytle, et al., 2005).

3.2 Technical Recommendations for Selecting Treatment Alternatives

The process that systems must follow before the primacy agency designates OCCT is established in the LCR and differs in part based on system size. All systems, however, must recommend to the primacy agency a treatment option for designation as OCCT. This section contains technical recommendations to support primacy agencies, water systems, and if applicable, outside technical consultants in evaluating treatment alternatives to control lead and copper release. These technical recommendations may be particularly useful for systems serving 50,000 or fewer people when developing their OCCT recommendation, or for larger systems identifying corrosion control alternatives for further study. See Chapters 4 and 5 for a review of CCT requirements under the LCR.

This section includes flowcharts to support the corrosion control selection process. These flowcharts are based on the 1997 EPA document, *Guidance for Selecting Lead and Copper*

Control Strategies (1997) and the revised guidance with the same name, published in 2003. This section reflects new research related to the control of copper corrosion and blended phosphates, as well as new research related to corrosion control in systems with raw water iron and manganese. These flowcharts are intended to serve as a general screening tool for identifying potential alternatives. They are not meant to substitute for pilot studies and other site-specific investigations or preclude the use of other technologies identified by the system, primacy agency, or technical experts. It is the system and primacy agency's responsibility to assess the pros and cons of each treatment alternative, and to ensure its optimization once installed.

The following technical recommendations are discussed in this section:

- STEP 1. Review Water Quality Data and Other Information.
- STEP 2. Evaluate Potential for Scaling.
- STEP 3. Select One or More Treatment Option(s).
- STEP 4. Identify Possible Limitations for Treatment Options.
- STEP 5. Evaluate Feasibility and Cost.

Section 3.3 follows with technical recommendations on setting dose and target water quality parameters. Special considerations for systems with LSLs, small systems, and systems with multiple sources are provided below.

- Considerations for ***systems with LSLs:*** Systems with LSLs may want to evaluate the feasibility and cost effectiveness of fully removing all LSLs (utility-side and customer-side). Full LSL removal has several operational benefits - for example, systems using orthophosphate may be able to reduce their dose when LSLs have been fully removed. Also, removing the source of lead reduces the vulnerability of the system to unexpected changes in lead release due to future water quality changes.

- Considerations for ***very small community water systems (CWSs) and non-transient, non-community water systems (NTNCWSs):*** Systems that directly control 100 percent of their plumbing fixtures and components may want to consider physically replacing all lead-containing or copper plumbing materials. Systems should verify that the new components are certified *"lead-free"* according to current standards (See Section 2.1 for the definition of "lead-free"). Point-of-use (POU) treatment units, if they meet the SDWA requirements, may be an option in limited circumstances.[18] Note systems that select plumbing replacement or POU devices must continue the CCT steps described in

[18] For additional information refer to: 1) the preamble to the 2007 LCR Short-Term Revisions (USEPA, 2007a); and 2) *Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems*, EPA 815-R-06-10 (USEPA, 2006b). https://nepis.epa.gov/Exe/ZyPDF.cgi/P1009UBF.PDF?Dockey=P1009UBF.PDF.

Section 4.1 unless they are deemed optimized.[19] In cases where very small CWSs and NTNCWSs are identifying CCT, it may be beneficial to consider technologies that are easy to operate (e.g., limestone contactors, aeration) and select chemicals that are easy to store and work with, such as baking soda.

- Considerations for ***systems with more than one source:*** Many systems will have unique source and treatment scenarios that make system-wide corrosion control recommendations difficult. It may be prudent for systems with multiple wells or multiple sources, or systems that purchase waters of differing quality that enter the distribution system at various locations, to determine the most appropriate treatment separately for each source then undertake a system-wide evaluation of the most effective way to implement and operate corrosion control.

It is also important to recognize the potential limitations of treatment in chronic low water usage homes and homes that have been unoccupied for extended periods of time. The treatment may not be effective at lowering lead and/or copper levels at these sites, which can pose an ongoing risk to these residents. Systems can consider other potential actions they or residents can take to address the potential risk at these sites.

3.2.1 Technical Recommendations for Reviewing Water Quality Data and Other Information (STEP 1)

Lead and Copper Data

The forms in Appendix D can be used to organize lead and copper tap sampling data for system and primacy agency review. In addition to their own data, systems and primacy agencies should review any additional lead and copper data collected by others (e.g., universities).

Systems and primacy agencies should consider evaluating the dates and locations of individual sample results above the lead or copper action level(s) to determine if there are any spatial or temporal patterns. These results could be compared to water quality data collected at nearby distribution system locations at similar times to determine if they coincided with unusual water quality (e.g., changes in pH, corrosion inhibitor concentration, or microbiological activity). Systems should determine if sample results above the action level(s) coincided with a change in treatment or source. Lastly, systems should compare these sample results to previous rounds of lead and copper tap monitoring to see if there is a reoccurring pattern of lead and/or copper occurrence above the action level(s) at specific locations.

Systems may want to talk to residents where the sample results were above the action level(s) to discuss the resident's sampling procedure, ask for information on water use patterns and stagnation time prior to sampling, and ask about any physical disturbances that may have

[19] One way for systems serving 50,000 or fewer people to be deemed to have optimized corrosion control is they conducted lead and copper tap monitoring for two consecutive 6-month monitoring periods without a lead or copper action level exceedance (§141.81(b)(1)).

occurred prior to sampling (e.g., building renovations and other construction work on the property). A good way to collect information ahead of time is on a comprehensive chain of custody (COC) form. The COC form, given to the resident to send in with the sample, can be designed to collect information on sampling procedure, stagnation time, and flushing time. Talking with residents about their sample results provides an opportunity for systems to discuss one-on-one with consumers the public health implications of lead and copper and ways in which residents can reduce their exposure.[20]

For locations with sample results above the action level(s), systems and primacy agencies may want to consider additional sampling[21] to determine the source of the lead so that the system and property owner might consider site-specific remediation in addition to actions required by the regulations. See Appendix C for technical recommendations on investigative sampling methods to determine the source of lead and copper.

Other Water Quality Data and System Information

Systems and primacy agencies should collect and review water quality data and other system information pertinent to corrosion of lead and copper containing materials. Systems can use the forms in Appendix D to organize available water quality data and information and submit it to their primacy agency.

Analysis of a broad range of water quality constituents can be a very cost effective approach to identification of appropriate treatment technologies. For example:

- Having very accurate pH and alkalinity/DIC data is important for assessing the feasibility of such simple treatments as aeration or limestone contactors.
- Having calcium, magnesium, sulfate, iron, manganese, and other water quality data may help define constraints on pH adjustment, phosphate dosing, use of packed tower aerators, membranes or other processes, because of scale buildup issues.
- Knowing whether arsenic or radon is present in the source water will dictate CCTs that are compatible with the removal processes for those contaminants. For example, aeration can be used for radon removal as well as for pH adjustment for corrosion control, potentially reducing or eliminating the need for chemical treatment.
- If iron and/or manganese are present, they can interfere with the effectiveness of CCT. A combination of a removal process or filtration following oxidation (e.g.,

[20] Note that systems must conduct public education as required by the LCR when they exceed the lead action level (§141.85). Public education guidance for CWSs is provided in the document, "Implementing the Lead Public Education Provisions of the Lead and Copper Rule: A Guide for Community Water Systems" (USEPA, 2008a) and in a similarly titled guidance for NTNCWSs (USEPA, 2008b).

[21] All lead and copper tap sample results from the system's sampling pool collected within the monitoring period must be included in the 90th percentile calculation along with any samples where the system is able to determine that the site selection criteria in §141.86(a)(3)-(8) for the sampling pool are met. Other lead and copper tap data such as from customer requested sampling, investigative sampling, and special studies also must be submitted to the primacy agency (USEPA, 2004c; §141.90(g)).

aeration/disinfection) might be cost-effective and would reduce or eliminate the need for sequestration. Similarly, iron removal processes can often remove arsenic if present.

Primacy agencies and systems can use the information in Chapter 2 to review the data and identify water quality and physical factors that may be contributing to lead and/or copper release. When lead and copper monitoring data appear to be at odds with corrosion control theory, additional unknown factors may be involved. Those critical factors can only be determined by more specific evaluation and studies, such as direct examination of the pipe scales, additional data collection and evaluation, or examining the physical layouts of individual sampling sites.

3.2.2 Technical Recommendations for Evaluating the Potential for Scaling (STEP 2)

The presence of calcium in the water may limit the system's ability to raise the pH due to scaling problems in the distribution system. Scaling can clog pipes, reduce carrying capacity, and cause the water to be cloudy. Before selecting possible treatments, EPA recommends that systems and primacy agencies identify the ***saturation pH*** for calcium carbonate for the system. Maintaining the pH below the saturation pH should help to minimize, although not eliminate, the potential for precipitating calcium carbonate. It is important to note that other constituents in the water such as trace metals, natural organic matter (NOM), ligands, and phosphates can affect calcium carbonate precipitation rates and result in a higher or lower saturation pH.

The steps for determining the saturation pH are as follows:

- Determine the DIC of the water. If DIC data are not available but alkalinity and pH are known, use the table in Appendix B to determine the target DIC (in mg/L as carbon).
- Determine the finished water calcium concentration in mg/L. If this is not known but the system has total hardness data, approximate the calcium concentration by dividing the finished water hardness (as mg/L $CaCO_3$) by 2.5.
- On Exhibit 3.2, find the intersection of DIC on the x-axis (in "mg C/L") and calcium on the y-axis (in "mg Ca/L"). Find the pH curve closest to the intersection. This is the saturation pH for the system.

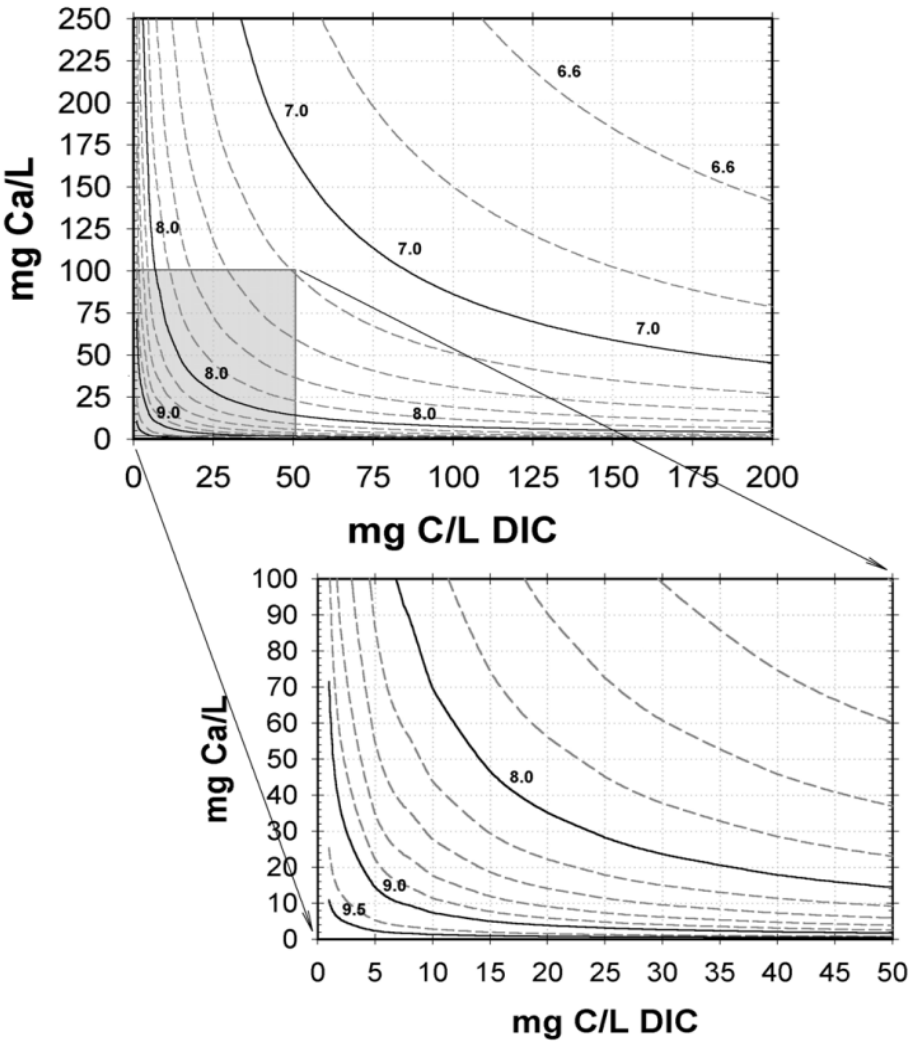


Exhibit 3.2: Theoretical Saturation pH for Calcium Carbonate Precipitation (USEPA, 2003)

Notes:
Solid lines are pH in whole numbers. Dashed lines are pH increments of 0.2
Calcium values are in mg Ca/L. To approximate calcium concentration (in mg Ca/L) from a measured hardness (as mg/L $CaCO_3$), divide the hardness value by 2.5.

3.2.3 Technical Recommendations for Selecting One or More Treatment Option(s) (STEP 3)

Systems and primacy agencies can use Flowcharts 1a through 3b in this section to select candidates for CCT. Exhibit 3.3 is a starting point for systems and primacy agencies to select the most appropriate flowchart for their situation based on whether the system has iron and/or manganese in finished water, is treating for lead and/or copper, and on pH in the distribution system.

These flowcharts were originally developed as a tool for small systems in EPA's 2003 revised guidance manual on selecting lead and copper corrosion strategies (USEPA, 2003), but they can

be useful for all system types. The flowcharts have been updated to reflect new research conducted since 2003.

These flowcharts are a screening tool and are not meant to substitute for pilot studies and other site-specific investigations. They are meant to indicate likely possibilities and do not include information on optimizing any of the treatments. In particular, systems with LSLs should work with their primacy agencies to select treatment that most effectively reduces lead release from the service line and should also consider full LSL replacement as recommended earlier in this chapter. Also, as stated elsewhere in this document, the presence of other chemicals in the finished water such as aluminum, iron, manganese, and calcium may interfere with CCT and point to a need for additional studies and/or alternative control options.

Additional information on setting water quality parameters and dose for the treatment options is provided in Section 3.3.

Exhibit 3.3: Identifying the Appropriate Flowchart for Preliminary CCT Selection

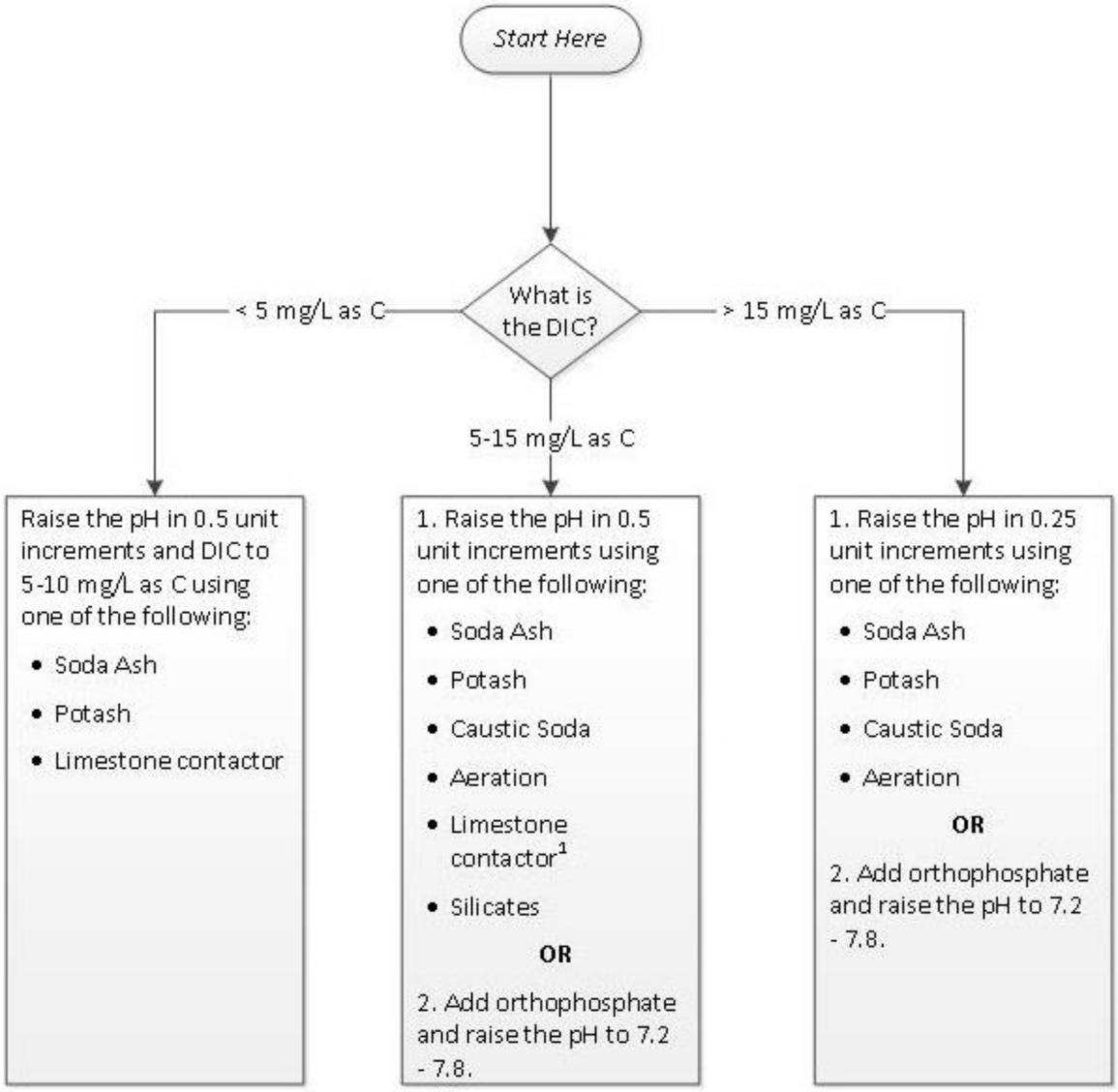
Is iron or manganese present in finished water?[1]	What is the contaminant to be addressed?	What is the finished water pH?	Use This Flowchart[2]
No	Lead only, or Both Lead and Copper	< 7.2	**1a**
		7.2 - 7.8	**1b**
		>7.8 - 9.5	**1c**
		>9.5	**1d**
	Copper only	< 7.2	**2a**
		7.2 - 7.8	**2b**
		>7.8	**2c**
Yes	Lead and/or Copper	< 7.2	**3a**
		≥ 7.2	**3b**

Notes:

[1] Flowcharts 3a and 3b present several treatment options for lead and copper that also reduce iron and manganese. Systems can also consider removing iron and manganese first, then using flowcharts 1a through 2c to control for lead and/or copper.

[2] As discussed in Section 3.1.1, the term "limestone contactor" generically identifies filtration processes where calcite-containing materials are used to add pH, alkalinity, and DIC to water.

Flowchart 1a: Selecting Treatment for Lead only or Lead and Copper with pH < 7.2

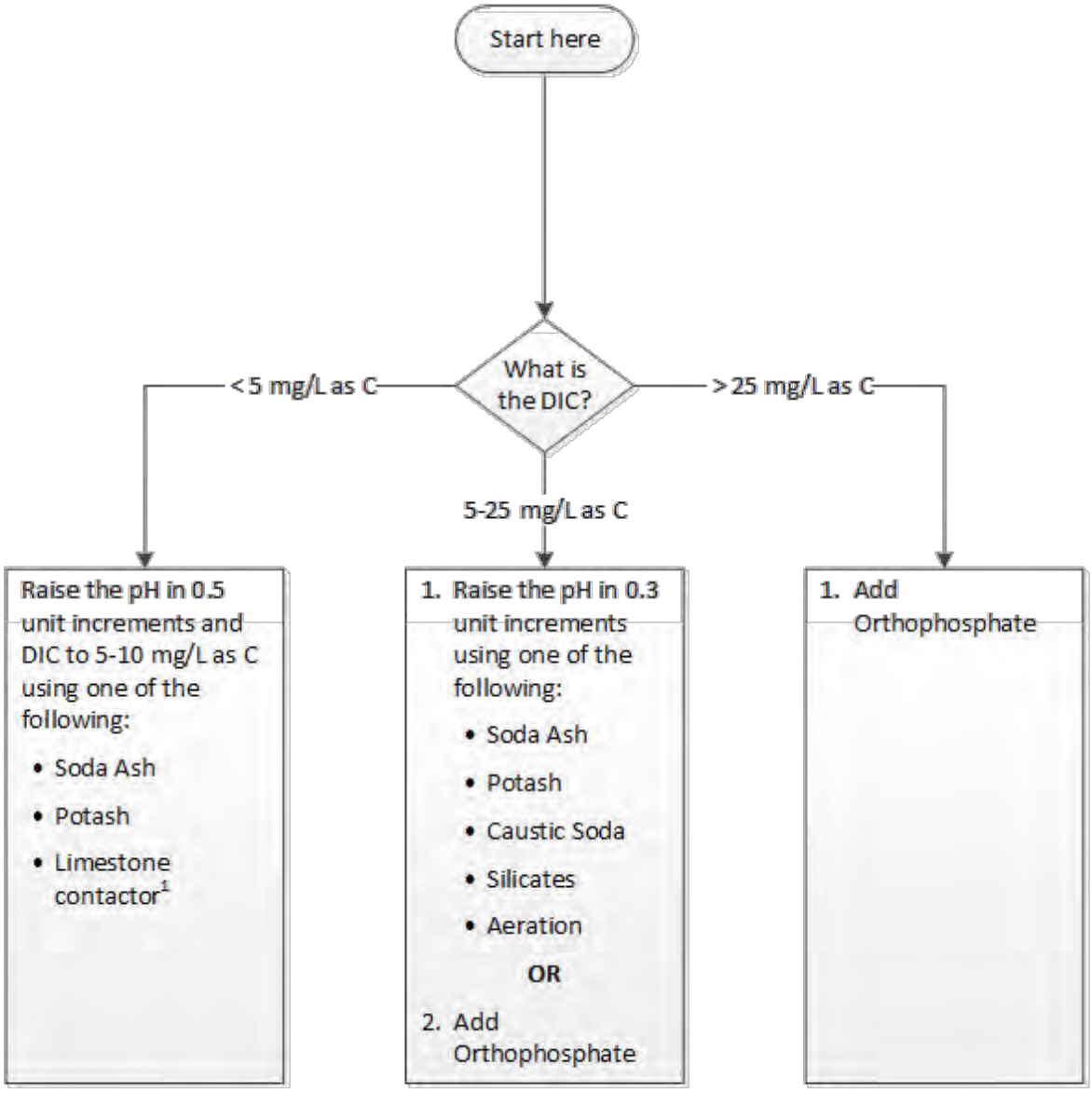


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K2CO3)
Soda ash = sodium carbonate (Na2CO3)

Footnotes:

1. Limestone contactors may not be appropriate when DIC > 10mg/L as C.

Flowchart 1b: Selecting Treatment for Lead only or Lead and Copper with pH from 7.2 to 7.8

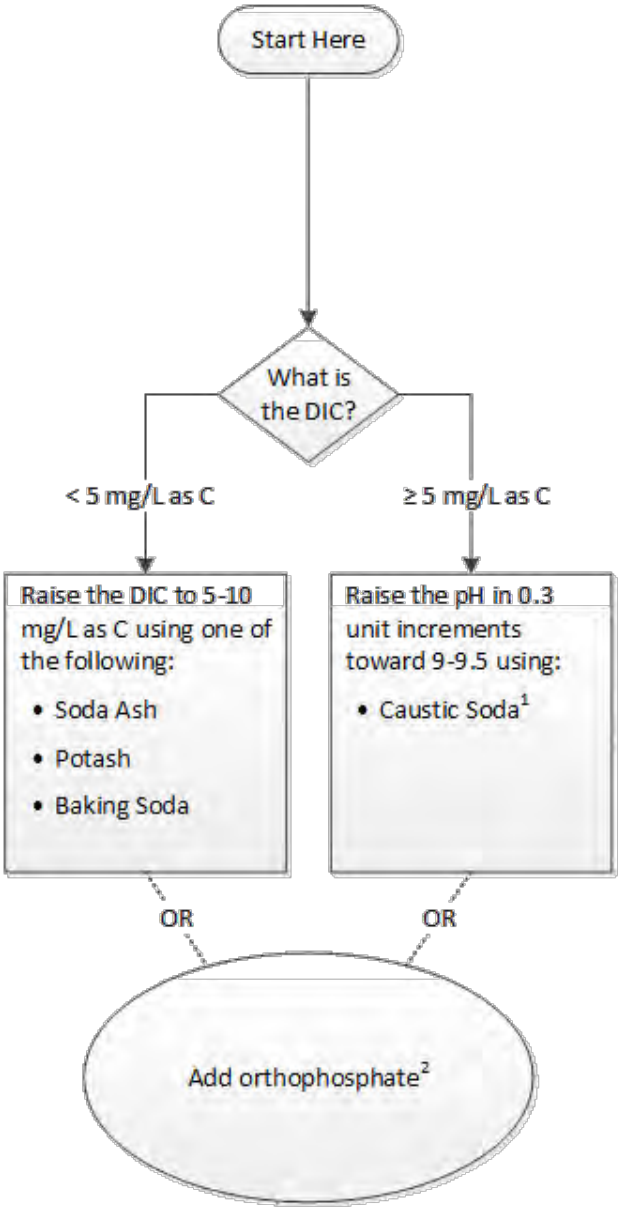


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

1. Carbon dioxide feed before the limestone contactor may be necessary.

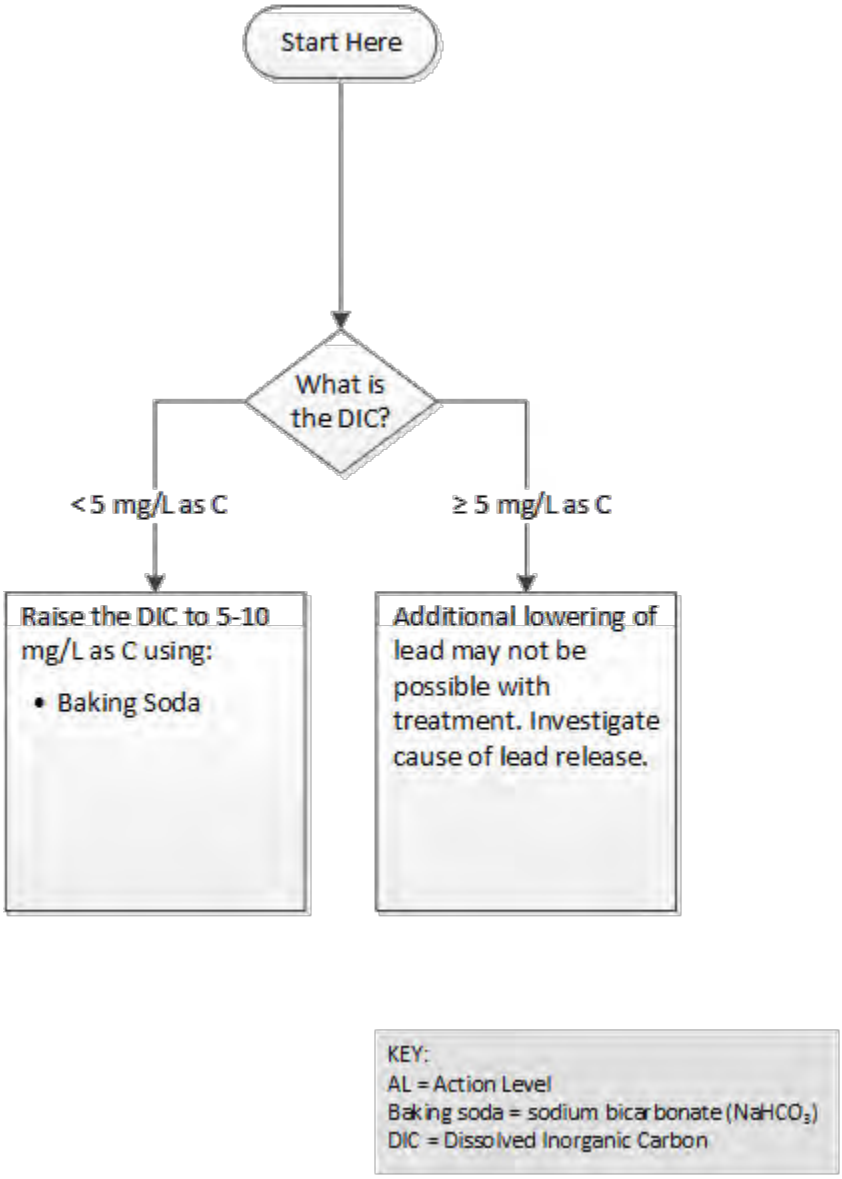
Flowchart 1c: Selecting Treatment for Lead only or Lead and Copper with pH > 7.8 to 9.5



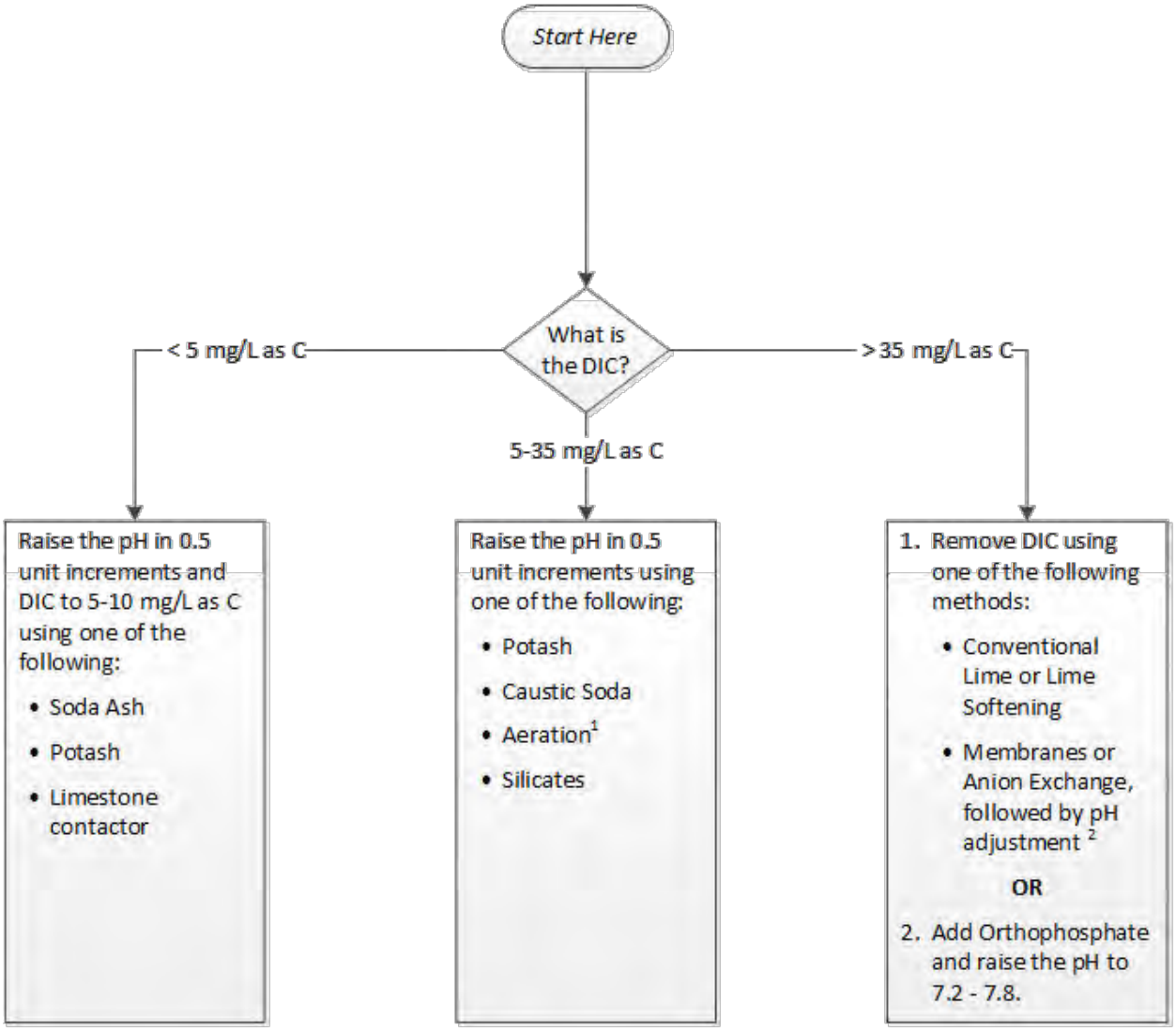
KEY:
AL = Action Level
Baking soda = sodium bicarbonate ($NaHCO_3$)
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:
1. Systems with copper plumbing may experience copper pitting problems when operating at pH 9 – 9.5 and DIC of 5 – 15. Orthophosphate may be a better option for these systems.
2. Optimal pH range for orthophosphate is 7.2 - 7.8 but phosphate may be effective at higher pH depending on dose. Orthophosphate effectiveness is lowest in the pH range of 8 – 8.5. Systems should also avoid this range because of inadequate buffering in the distribution system.

Flowchart 1d: Selecting Treatment for Lead only or Lead and Copper with pH > 9.5



Flowchart 2a: Selecting Treatment for Copper Only with pH < 7.2

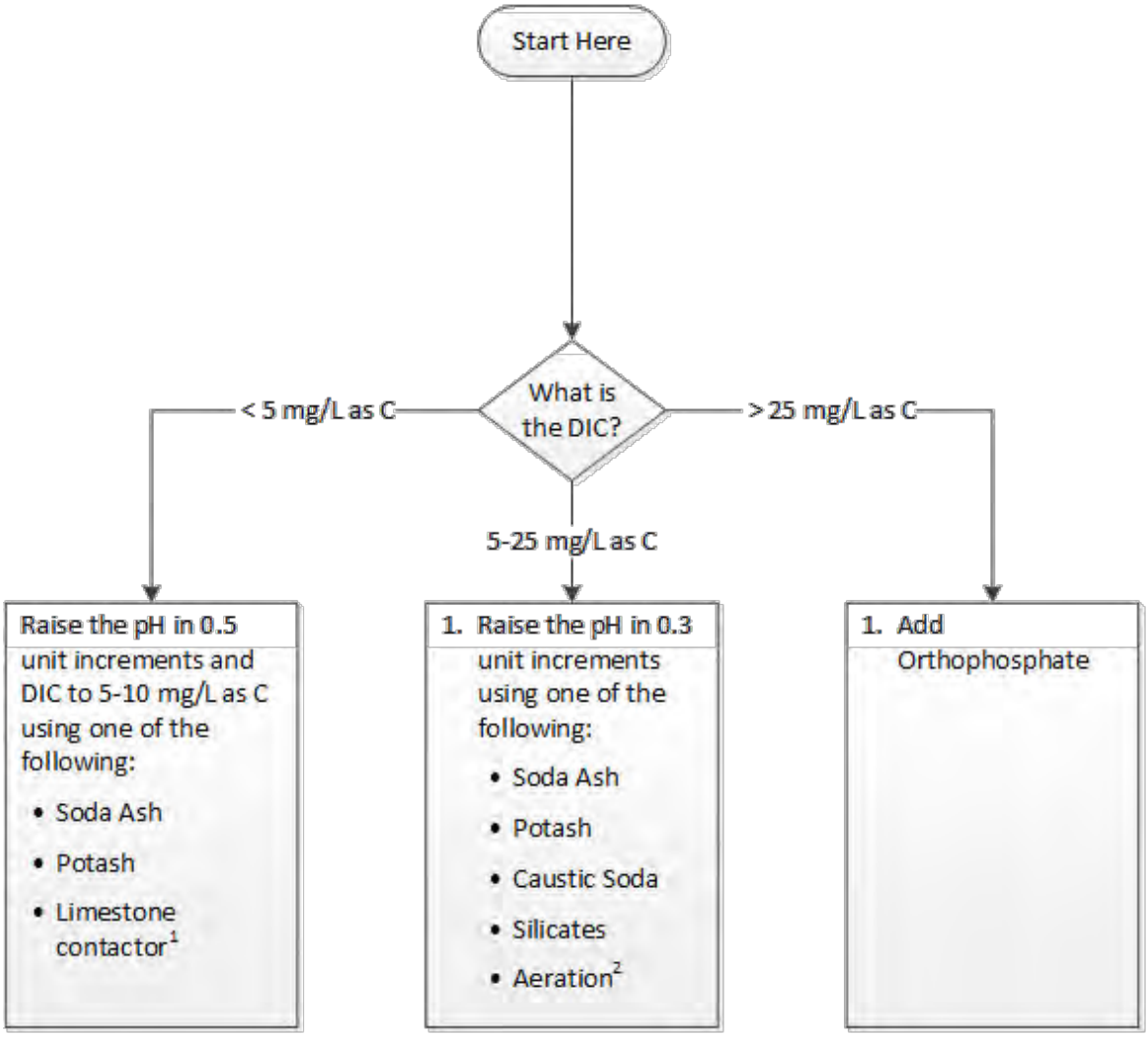


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

1. May be most appropriate at higher end of DIC range
2. To achieve optimal levels, consider treating less than 100 percent of the water (i.e., split stream).

Flowchart 2b: Selecting Treatment for Copper Only with pH from 7.2 to 7.8

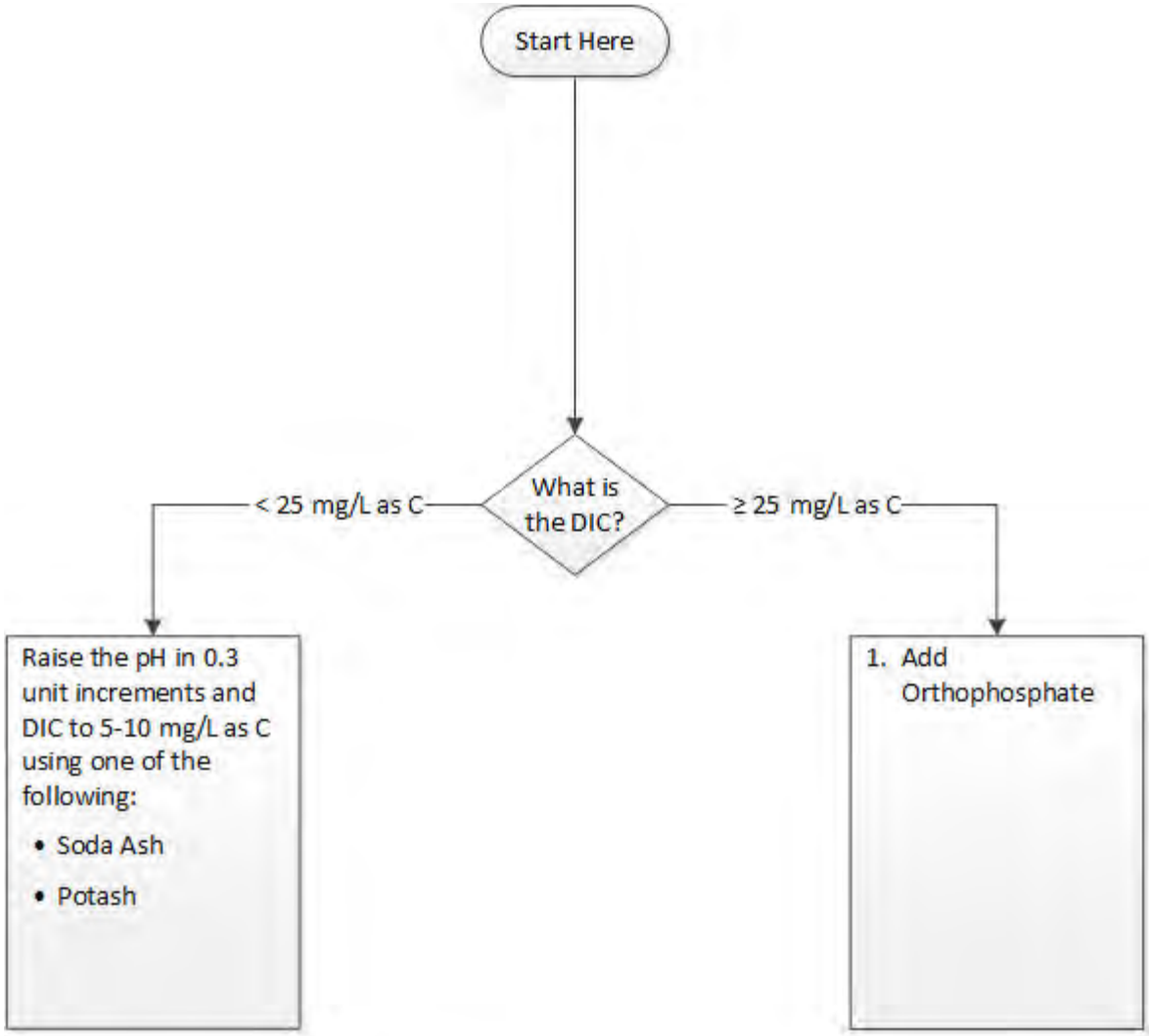


KEY:
AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

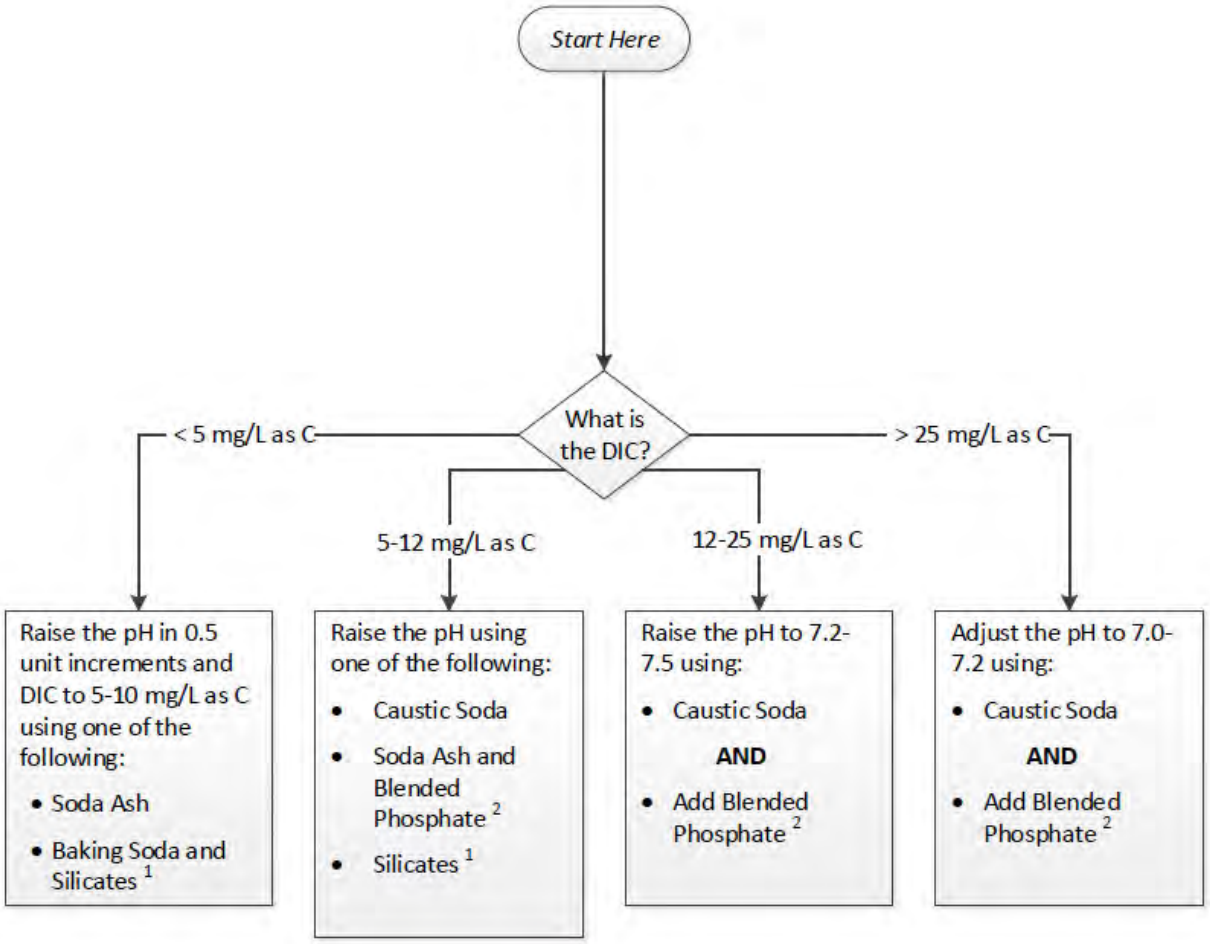
1. Carbon dioxide feed before the limestone contactor may be necessary.
2. May be most appropriate at higher end of DIC range

Flowchart 2c: Selecting Treatment for Copper Only with pH > 7.8



KEY:
AL = Action Level
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Potash = potassium carbonate (K_2CO_3)
Soda ash = sodium carbonate (Na_2CO_3)

Flowchart 3a: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH < 7.2

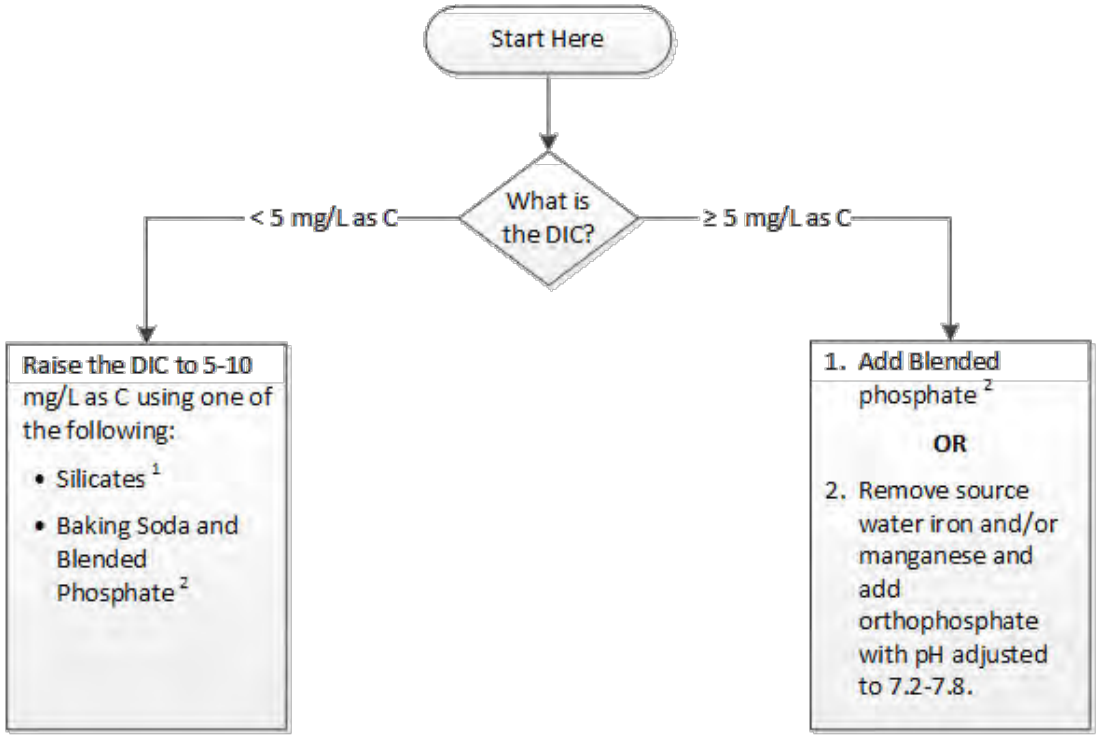


KEY:
AL = Action Level
Baking soda = sodium bicarbonate ($NaHCO_3$)
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon
Soda ash = sodium carbonate (Na_2CO_3)

Footnotes:

1. Silicates are most effective when combined iron and manganese concentrations are less than 1.0 mg/L.
2. The effectiveness of blended phosphate varies based on the formulation. Additional evaluation and/or monitoring is recommended. See Section 3.3.2 for additional discussion.

Flowchart 3b: Selecting Treatment for Lead and/or Copper with Iron and Manganese in Finished Water and pH ≥ 7.2



KEY:
AL = Action Level
Baking soda = sodium bicarbonate ($NaHCO_3$)
DIC = Dissolved Inorganic Carbon
mg/L as C = milligrams per liter as carbon

Footnotes:

1. Silicates are most effective when combined iron and manganese concentrations are less than 1.0 mg/L.
2. The effectiveness of blended phosphate varies based on the formulation. Additional evaluation and/or monitoring is recommended. See Section 3.3.2 for additional discussion. Blended phosphates are less effective for controlling copper at DIC greater than 25 mg/L as C.

3.2.4 Technical Recommendations for Identifying Possible Limitations for Treatment Options (STEP 4)

Once the treatment option(s) are selected from the flowcharts, review the information in this section to identify secondary impacts and possible constraints. Many of these constraints can be overcome with additional treatment modifications at the water treatment plant or wastewater treatment plant (WWTP). Observations and actions to address secondary impacts can be documented using Form E.2 in Appendix E.

Possible Limitations of pH/alkalinity/DIC Adjustment

Although many systems have successfully adjusted pH, alkalinity, and DIC to control lead and copper release, this corrosion control method has secondary impacts that may limit its use. Because silicate addition raises the pH of the water, secondary impacts for this treatment option are similar to the secondary impacts of raising pH for controlling lead and copper release.

Three factors that could limit the use of pH/alkalinity/DIC adjustment and silicates are: (1) optimal pH for other processes, particularly disinfection; (2) calcium carbonate precipitation; and (3) oxidation of iron and manganese. Observations and actions to address secondary impacts can be documented using Form E.2 in Appendix E.

(1) Optimal pH for other processes

Different treatment processes within the plant such as coagulation and disinfection have different target pH ranges. Determining the proper location to add a pH and/or alkalinity adjustment chemical should be considered in light of other process objectives.

Adjusting pH for corrosion control can affect disinfection performance and compliance with Surface Water Treatment Rules and possibly the Ground Water Rule (for those ground water systems that are required to provide 4-log virus inactivation). For systems that use chlorine for primary disinfection, increasing the pH prior to the chlorine contact chamber may reduce disinfection performance and require an increase in chlorine dose or contact time to meet the required CT.[22] For systems that consider contact time in the piping prior to the first customer as part of their CT calculation, a higher chlorine dose may be needed to meet CT. To minimize disinfection impacts, systems should adjust pH for corrosion control after CT has been achieved if possible. A system that plans to make a significant change to its disinfection practice to comply with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), such as a change in disinfectant type or process, must develop disinfection profiles and calculate disinfection benchmarks for *Giardia lamblia* and viruses (§§141.708-709).

[22] CT is chlorine concentration multiplied by contact time. Required CT for chlorine is very dependent on pH, with greater CT required at higher pH levels.

Changing the pH and/or alkalinity may also impact the ability of a system to maintain a disinfectant residual in the distribution system. In most cases however, increasing the pH for corrosion control can help maintain the disinfectant residual because the disinfectant will react at a slower rate with metals being released at the pipe surface.

Changes in pH can also affect formation of disinfection byproducts (DBPs). Total trihalomethanes (TTHM) formation tends to increase at higher pH levels, while formation of haloacetic acids (HAA5) tends to decrease. See the EPA Simultaneous Compliance Guidance Manual for the Stage 2 and LT2 Rules (USEPA, 2007b) for more information on how pH changes can impact DBP formation.

(2) Calcium Carbonate Precipitation

If the finished water has high hardness (specifically the calcium portion of hardness), raising the pH and DIC may cause calcium carbonate to precipitate in the distribution system, clogging hot water heaters and producing cloudy water. Calcium carbonate precipitation is site-specific and depends on many factors; therefore, a system evaluation should be conducted as described in Step 2 above.

If calcium carbonate precipitation is determined to be a potential problem, systems can take one of the following approaches:

- Choose a different CCT method such as using phosphate-based corrosion inhibitor,
- Remove DIC with ion exchange or membrane filtration, or
- Add softening to remove calcium.

(3) Oxidation of Iron and Manganese

Iron and manganese in oxidized form can agglomerate into larger particles causing aesthetic problems in water distribution systems, resulting in black and/or red water complaints. Dissolved oxygen and chemical oxidants such as chlorine may oxidize iron and manganese, and increasing the pH can increase the rate of oxidation. The two standard approaches for these situations are removing iron and manganese at the plant, or sequestering it. Wherever possible, removal of source water iron and manganese is the preferred approach. A common removal strategy is aeration or chlorination followed by filtration. Aeration will also raise the pH so this strategy may meet the system's goals of both iron and manganese removal and pH adjustment for reducing lead and copper release.

Sequestering agents such as polyphosphates and sodium hexametaphosphate may reduce black and/or red water complaints from iron and manganese oxidation, but may also cause increases in lead and copper levels measured at the tap (Schock, 1999; Cantor et al., 2000; Edwards and McNeil, 2002). Vendors often recommend blended phosphates as a lead and copper control strategy for systems with elevated iron and manganese. Blended phosphates include both polyphosphate and orthophosphate in different percentages. Blended phosphates

should be used with caution; see Section 3.3 for more information. Silicates can also be used to sequester iron and manganese depending on their concentration in the raw water (Schock et al., 1996; Kvech and Edwards, 2001).

Possible Limitations of Phosphate-Based Corrosion Inhibitors

Although phosphate-based corrosion inhibitors are used widely by water systems, there are limitations to their application. Two factors that could limit the use of phosphate-based corrosion inhibitors are: (1) reactions with aluminum; and (2) impacts on wastewater treatment plants. Observations and actions to address secondary impacts can be documented using Form E.2 in Appendix E.

(1) Reactions with Aluminum

Aluminum can occur in the distribution system as an impurity introduced with lime or when a system uses alum for coagulation. As noted in Section 2.3.9, aluminum can interfere with orthophosphate effectiveness by forming aluminum phosphate ($AlPO_4$) precipitates, which reduces the amount of orthophosphate available for lead and copper control. Aluminum phosphate precipitates can result in smaller pipe diameters, increased head-loss, and increased operational cost (AWWA, 2005). Although aluminum may also provide some protection of lead surfaces by forming films with hydroxide, silicate, or phosphate, these films are prone to sloughing when there are changes in flow or water quality or when LSLs are physically disturbed during routine maintenance and repair activities. These dislodged scales can release metals that may become entrapped in the interior (premise) plumbing, potentially increasing lead and copper levels in the water (Schock, 2007b).

(2) Impacts on Wastewater

Because of problems with nutrient enrichment of surface waters in the United States, there has been concern about adding phosphate-based corrosion inhibitors to drinking water because it will increase the phosphorus loading to the wastewater treatment plant. Some wastewater utilities have stringent limits on the amount of phosphorus that can be discharged to receiving waters and remove it at the plant using biological and/or chemical treatment. Regardless of the situation, it is important that systems communicate with wastewater treatment personnel and evaluate potential impacts of adding phosphate-based corrosion inhibitors before making the final treatment selection and setting the target dose.

Survey findings from 14 utilities showed that adding a phosphate-based corrosion inhibitor increased the phosphorus load to the wastewater treatment plant by 10 to 35 percent, with a median of 20 percent (Rodgers, 2014). Slightly less than half of the survey's respondents removed phosphorus at the WWTP (Rodgers, 2014). This percentage might increase in the future. Rodgers (2014) reported that in 2013, five states had statewide phosphorus limits for lakes and reservoirs.

Phosphorus can be removed at the WWTP using biological or chemical means. In the District of Columbia, the Blue Plains WWTP added more ferric chloride to chemically remove phosphorus after an orthophosphate corrosion inhibitor was added to drinking water; the additional cost was minor compared to their overall operations budget (Cadmus Group, 2004). Wastewater utilities can also use biological phosphorus removal or a combination of biological and chemical removal techniques.

Prior to selecting a phosphate-based corrosion inhibitor, water systems and primacy agencies should work with wastewater utility personnel to estimate the additional phosphorus load to the WWTP and assess if the load could cause the plant to exceed permit limits or cause other operational problems. Additional information on nutrient enrichment and phosphorus removal strategies can be found in EPA's Nutrient Control Design Manual (USEPA, 2010a).

Use of a zinc orthophosphate corrosion inhibitor can increase zinc loading to the WWTP. Schneider et al. (2011) noted that, based on three case studies, most of the zinc in zinc orthophosphate makes its way into the wastewater treatment stream. Although many systems have successfully used zinc orthophosphate for corrosion control, zinc can inhibit biological wastewater treatment processes, particularly nitrification and denitrification. Moreover, EPA has set limits for zinc in processed sludge that is land applied (USEPA, 2004b). Schneider et al. (2011) notes that "The results of the utility case studies indicate that release of zinc in wastewater residuals and/or receiving streams can be a concern for some utilities." Water systems and primacy agencies should work with wastewater utility personnel to determine if additional zinc loading may be an issue.

3.2.5 Technical Recommendations for Evaluating Feasibility and Cost (STEP 5)

Systems should consider operability, reliability, system configuration, and other site-specific factors when evaluating CCT alternatives. In cases where more than one treatment option can meet the OCCT definition of the rule,[23] systems may want to consider cost factors including costs for capital equipment, operations, and maintenance.

3.3 Setting the Target Dose and Water Quality

This section provides technical recommendations on setting the target dose and water quality for pH/alkalinity/DIC adjustment, phosphate-based corrosion inhibitors, and silicate inhibitors. Note that the recommendations provided in this section are intended as generalized guidelines for the reader's reference. The characteristics of individual systems (e.g., water quality, distribution system configuration, sources of lead and copper, etc.) may warrant considering other values that are distinct from those provided below. For these reasons, they should not be interpreted or prescribed as default minimums and/or maximums.

[23] As noted in Chapter 1 and Appendix A, the LCR defines OCCT as "the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations." (§141.2)

3.3.1 pH/Alkalinity/DIC Adjustment

As explained previously, the pH, alkalinity, and DIC of the water have a significant influence on lead and copper release. As a reminder, these three parameters are interrelated – if you know two of them, you can estimate the third using the table in Appendix B. The following discussion provides technical recommendations for determining the target pH, alkalinity, and DIC when controlling for lead only or lead and copper, or when controlling for copper only.

To Control for Lead Only or Lead and Copper

The following technical recommendations can assist with the establishment of target pH, alkalinity, and DIC ranges for controlling lead only, or both lead and copper release in drinking water systems. Note that in general, lower pH levels can be used when controlling only for copper release – see the next section for guidelines for those systems that do not have a lead release problem but are targeting copper corrosion control only. Note also that the guidelines below are based on formation of adherent lead carbonate scales based on Pb(II) chemistry[24].

- The target pH should be **8.8 to 10**. Systems with lead service lines that are not using a corrosion inhibitor should consider increasing the pH to **9.0 or greater**. Note that lower pH values, particularly between 8.2 and 8.5, can result in poor buffer intensity of the water (regardless of DIC levels) and wide swings in distribution system pH. See Section 2.3.4 for additional discussion of buffer intensity.

- Sufficient alkalinity and DIC are needed to form the protective scale and provide buffer intensity, but too much can solubilize lead. These factors should be considered when determining a target alkalinity/DIC range. The graph in Exhibit 2.3 can be used to evaluate the effect of DIC on buffer intensity and identify a minimum DIC range for the system's target pH. In general, the higher the pH is in the 8.8 to 10 range, the less DIC is needed to buffer the water. Information on the relationship between DIC and lead solubility is provided in Schock and Lytle (2011) for a modeled water. Lead solubility increases (i.e., more lead is released into the water) with increasing DIC concentrations above approximately 20 mg/L (as C). Schock and Lytle (2011, Figure 20-21) show minimum lead solubility at DIC between 5 and 10 mg/L as C.

As a reminder, increasing the pH to 8.8 – 10 may cause calcium carbonate precipitation if calcium is present, see Section 3.2.2 for additional discussion.

To Control for Copper Only

Adjustment of pH/alkalinity/DIC for copper control can generally be achieved at a lower target pH (as low as 7.8) than the pH needed for lead control. Copper corrosion can be controlled at even lower pH levels (i.e., between 7.0 and 7.8), but alkalinity and DIC become the limiting factors. Schock and Lytle (2011) note that hard, high alkalinity ground waters are often

[24] For more information on Pb(II) chemistry and also influences of Pb(IV) scale, see Sections 2.2.1 and 2.3.6.

aggressive towards copper and hard to treat with pH adjustment because of calcium carbonate precipitation potential. These waters may not be candidates for pH/alkalinity/DIC adjustment and warrant considering orthophosphate or possibly removal of DIC through ion exchange, membranes, or aeration.

3.3.2 Phosphate-Based Inhibitors

The effectiveness of orthophosphate treatment depends on many factors, including phosphate dose, pH, DIC, and other constituents in the water (e.g., aluminum, iron, manganese). As noted earlier, polyphosphates alone should *not* be used to treat for lead and copper; they are mainly used to sequester iron and manganese. Special considerations for use of blended phosphates are provided at the end of this section.

Conventional wisdom is that orthophosphate treatment for controlling lead and copper should target residual concentrations of **0.33 to 1.0 mg/L as P** (1.0 to 3.0 mg/L as PO_4)[25] at the tap when pH is within the range of **7.2 to 7.8**. ***Higher orthophosphate doses*** (1.0 to 1.2 mg/L as P, or 3 to 3.5 mg/L PO_4 and higher) may be needed under the following circumstances:

- To control lead release from LSLs.
- To control copper corrosion from new copper pipe in high DIC water.
- To mitigate copper pitting in some water qualities.
- If the system has aluminum carry-over from alum coagulation and/or presence of iron, manganese, and/or magnesium in finished water.

While the pH range of 7.2 to 7.8 is still considered optimal, systems ***should not*** automatically reduce the pH of their water if it is 8 or higher when starting orthophosphate treatment. Orthophosphate may be effective at pH as high as 9, although dose requirements may not be the same as for pH from 7.2 to 7.8. Laboratory results suggest that less effective control of lead release occurs between pH 8 and 8.5 than either above or below that range (Schock et al., 1996; Miller, 2014). Systems should therefore avoid operating between pH 8 and 8.5, if possible, to control for lead release. For copper, orthophosphate effectiveness is not strongly affected by pH when pH is between 7 and 8; dose is much more important.

Systems and primacy agencies should also consider the DIC of finished water when determining the target orthophosphate dose. In general, orthophosphate is more effective at low DIC (<10 mg C/L). Also, the pH is less important for lead control in low DIC waters.

Note that the target orthophosphate concentration is the level needed to control corrosion in ***premise plumbing***. Because orthophosphate will react with metals and other compounds, the concentration leaving the treatment plant may need to be higher to achieve the target

[25] Note that these concentrations are a general point of reference; they are not intended to be interpreted or universally prescribed as default minimums or maximums. Characteristics of individual systems (e.g., water quality, distribution system configuration, sources of lead and copper, etc.) may warrant consideration of other target concentrations, distinct from those provided above. Systems may also benefit from supplemental diagnostic monitoring to verify optimization.

concentration at the tap. In particular, aluminum (e.g., that was carried over from alum coagulation) can react with orthophosphate and reduce the amount available in premise plumbing. During start-up, systems should be prepared to adjust the dose at the treatment plant to meet the target dose at the tap throughout the distribution system. See Chapter 5 for additional recommendations on start-up of orthophosphate treatment.

Some systems have started orthophosphate treatment using a higher passivation dose, followed by a lower maintenance dose for long-term treatment. Hill and Cantor (2011) recommend that the passivation dose be 2 to 3 times higher than the target maintenance dose in order to build up a protective film as quickly as possible. The amount of time needed for the initial passivation dose to form adequate scale is unknown, and will vary depending on the system's specific water quality. Lead levels may continue to decline for years after an optimal orthophosphate dose has been applied, due to the slow rate of scale formation.

Systems with LSLs should evaluate whether the orthophosphate dose is enough to passivate disturbed LSLs in a timely manner. Routine maintenance or repairs such as water main replacements, meter installations, service line and shut-off valve replacements, and leak repairs may disrupt LSL scales and result in high lead levels. When evaluating the success of OCCT, systems and primacy agencies should consider the impact of these physical disturbances on lead levels at the tap (Del Toral et al., 2013). In addition, when establishing a maintenance dosage, it is important to consider other factors such as homes with chronically low water use that have LSLs. Ongoing diagnostic monitoring at these sites before and after treatment installation or adjustment can provide useful information for establishing a proper maintenance dose.

Special Consideration for Blended Phosphates

Blended phosphates have been used for corrosion control and to sequester iron and manganese. Blended phosphates have been shown to be effective for reducing lead levels; however, the lead corrosion scale may not be as robust as the scale created by orthophosphate and, thus, may be more susceptible to physical disturbances and low water use conditions (Del Toral et al., 2013; Wasserstrom et al., 2017). It is unclear if blended phosphates work well to control copper corrosion, especially at high alkalinities.

The effectiveness of blended phosphates cannot be based on the orthophosphate concentration in the blend for the following reasons:

- Blended phosphates control corrosion by creating a barrier film from the interaction of calcium and aluminum in the bulk water with phosphorus containing compounds (Wasserstrom et al., 2017). Thus, calcium and aluminum play a role in effectiveness.

- If the polyphosphate portion of the blend has a high affinity for sequestering lead or copper, it may counteract the benefit of the orthophosphate portion in forming solid lead and copper compounds.

The percent of orthophosphate in the blend can vary widely (from 5 to 70 percent (Hill and Cantor, 2011)). Blended phosphate should contain a minimum orthophosphate concentration of 0.5 mg/L as P (1.5 mg/L as PO_4) as a starting point for evaluation. The orthophosphate ratio in the blend and/or the dose may need to be increased to provide adequate lead control. In some cases, however, simply adding more blended phosphate may not be effective because, if there is excess polyphosphate available beyond what is bound up with other constituents in the water, it can sequester the lead and copper. EPA recommends a demonstration study, additional monitoring, or both for systems that recommend blended phosphates to control lead release.

3.3.3 Silicate Inhibitors

The effectiveness of silicate inhibitors depends on silicate level, pH, and DIC of the water. Adding silicates can raise the pH, so lead and copper level reductions may occur due to an increase in pH as well as passivation. In addition to providing lead and copper control, silicates can sequester iron and manganese if the levels of these constituents are not too high (not greater than 1 mg/L combined) (Schock et al., 1996; Schock, Lytle, et al., 2005).

Many systems have not considered silicate inhibitors for lead and copper control due to the lack of research and field information proving its effectiveness, the estimated operating costs and high dosage rates required, and the time it takes to reduce lead concentrations (Hill and Cantor, 2011).The literature does report a successful case study for a small system in Massachusetts that instituted chlorination and sodium silicate addition in three wells to address LCR compliance and intermittent red water problems (Schock, Lytle, et al., 2005). An initial silicate dosage rate of 25-30 mg/L was effective for reducing lead and copper levels by 55 and 87 percent, respectively, and raised the pH from 6.3 to 7.1. LCR compliance was achieved when the silicate dosage rate was increased to 45-55 mg/L at two wells which raised the pH to 7.5. In another study, Vaidya (2010) found that sodium silicate significantly reduced lead and copper release in bench-scale studies using coupons from 30 to 35-year-old distribution pipes.

Relatively high silicate doses (in excess of 20 mg/L) may be required to control lead release (Schock, Lytle, et al., 2005). A startup dose of 24 mg/L is recommended, followed by a gradual reduction after 60 days to a maintenance dose of 8 to 12 mg/L (Schock and Lytle, 2011; Hill and Cantor, 2011). Chloride, calcium, and magnesium concentrations in the water can affect the optimum dose (Hill and Cantor, 2011). A review of several case studies and literature reports suggested that a pre-existing layer of corrosion products on the pipes was required in order for silicate to properly form a protective layer, at least in copper pipes (LaRosa-Thompson et al., 1997). Similar to phosphate-based inhibitors, it is important to maintain continuous dosing of the silicate inhibitor to ensure effective corrosion control.

Chapter 4: Review of Corrosion Control Treatment Steps under the LCR

Corrosion control treatment (CCT) requirements under the Lead and Copper Rule (LCR) differ depending on the system size (i.e., population served). Most systems serving more than 50,000 people were required to meet a series of deadlines beginning in 1993 to determine optimal corrosion control treatment steps (OCCT) and install OCCT by January 1, 1997.[26] Any system that served 50,000 or fewer people at the time of the LCR, but that grew in population or combined with another system so that they now serve more than 50,000 people (called systems ***newly*** serving more than 50,000 people for the purposes of this document) must also complete CCT steps. Because the regulatory deadlines for systems serving more than 50,000 people have passed, systems newly serving 50,000 people must follow the schedule for systems serving 3,301-50,000 people.[27] Systems serving 50,000 or fewer people are not required to conduct CCT steps under the LCR unless they exceed the lead and/or copper action level (AL).

This chapter presents a review of CCT steps as required by the LCR along with additional technical recommendations to systems and primacy agencies for the following categories of systems:

- Those serving 50,000 or fewer people that exceed the lead and/or copper AL (Section 4.1).
- Systems newly serving more than 50,000 people (Section 4.2).
- Existing systems serving more than 50,000 people that previously installed CCT but have subsequent action level exceedances (Section 4.2).

Chapter 5 follows with a review of LCR requirements and provides additional technical recommendations for CCT installation, startup, follow-up monitoring, and long-term corrosion control monitoring.

These sections are supported by the following appendices:

- Appendix D contains forms that can be used by systems to submit water quality data and system information to the primacy agency.
- Appendix E contains OCCT recommendation forms for systems serving 50,000 or fewer people.
- Appendix F summarizes tools available for conducting a corrosion control study.

Systems and primacy agencies can use the ***OCCT evaluation templates*** to complete many of the tables in the appendices related to their OCCT determination. The templates also provide an

[26] All systems serving more than 50,000 people are required to conduct CCT steps unless they are deemed to have optimized corrosion control under §141.81(b)(2) or (b)(3).

[27] The schedule for completing CCT was clarified in the guidance manual, *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (USEPA, 2010b) as footnote 1 in Exhibit I-1. It specifies that a "system whose population exceeds 50,000 after July 1, 1994, must follow the schedule for medium-size systems, beginning with the requirement to complete a corrosion control study."

opportunity for primacy agencies to customize forms and to enter specific dates for compliance milestones. As a reminder, requirements in this section are based on the LCR as of the date this document was published.

4.1 Corrosion Control Treatment Steps for Systems Serving ≤ 50,000 People

Exhibit 4.1 summarizes the required CCT actions and deadlines when a system serving 50,000 or fewer people exceeds the lead and/or copper action level. The column furthest to the right shows the related section or Chapter where relevant technical recommendations are provided for the system or primacy agency.

It is important to note that in accordance with the LCR, systems serving 50,000 or fewer people have no more than ***6 months*** from the end of the monitoring period in which they had the AL exceedance to recommend OCCT to their primacy agency. The primacy agency then determines if a study is needed. If a study is not required, the primacy agency designates the OCCT within 24 months from the end of the monitoring period in which the system had the AL exceedance for those serving 3,300 or fewer people or within 18 months for those serving 3,301 to 50,000 people. If the primacy agency requires a study, the system must complete the study within 18 months after the primacy agency required the study to be conducted, after which the primacy agency designates the OCCT.

Also note that in accordance with the LCR, systems serving 50,000 or fewer people can discontinue the steps outlined in Exhibit 4.1 whenever their 90th percentile levels are at or below both ALs for two consecutive six-month monitoring periods. However, if these systems then exceed the lead or copper AL, they must recommence completion of the applicable CCT steps beginning with the first treatment step that was not completed in its entirety. The primacy agency may require a system to repeat treatment steps previously completed by the system where the Agency determines that this is necessary to properly implement the treatment requirements.

Exhibit 4.1: Review of CCT Requirements and Deadlines for Systems Serving ≤ 50,000 People (§141.81(e))

Requirement	Timetable for Completing Corrosion Control Treatment Steps[1]	Section Where Technical Recommendations Can Be Found
STEP 1: System exceeds the lead or copper action level (AL).		
STEP 2: System recommends OCCT.	Within 6 months[2]	Section 4.1.1
STEP 3: Primacy agency decides whether system must perform a corrosion control study. If system must conduct a corrosion control study, go to Step 5. If not, go to Step 4.	Within 12 months[2]	Section 4.1.2
STEP 4: Primacy agency designates OCCT for systems that were not required to conduct a study. Go to Step 7.	• Within18 months[2] for systems serving 3,301-50,000 people • Within 24 months[2] for systems serving ≤ 3,300 people	Section 4.1.3
STEP 5: System completes corrosion control study.[3]	Within 18 months after primacy agency requires that such a study be conducted	Section 4.1.4
STEP 6: Primacy agency designates OCCT.[3]	Within 6 months after completion of Step 5	Section 4.1.5
STEP 7: System installs OCCT.	Within 24 months after the primacy agency designates such treatment	Section 5.1
STEP 8: System conducts follow-up sampling for 2 consecutive 6-month periods.	Within 36 months after the primacy agency designates OCCT	Section 5.2
STEP 9: Primacy agency designates OWQPs.[4]	Within 6 months after completion of Step 8	Section 5.3
STEP 10: System conducts continued WQP and lead and copper tap sampling.	The schedule for required monitoring is based on whether the system exceeds an AL and/or complies with OWQP ranges or minimums	Section 5.4

Notes:

[1] Systems serving 50,000 or fewer people can discontinue these steps whenever their 90th percentile levels are at or below both action levels for two consecutive six-month monitoring periods. However, if these systems then exceed the lead or copper action level, they must recommence completion of the applicable CCT steps.

[2] The required timetable (i.e., number of months) for completing Steps 2, 3, and 4 represent the number of months after the end of the monitoring period during which the lead and/or copper action level was exceeded in Step 1.

[3] These steps only apply to systems that were required to conduct a corrosion control study.

[4] If a small or medium system has installed corrosion control treatment, the primacy agency is obligated to fulfill Step 9. The primacy agency shall review the system's installation of treatment and designate optimal water quality parameters within 6 months after completion of Step 8, in accordance with 141.81(e)(7) and 141.82(f).

4.1.1 System Serving ≤ 50,000 People Makes OCCT Recommendation (STEP 2)

The LCR does not specify precisely how systems serving ≤ 50,000 are required to develop their OCCT recommendation. To help systems evaluate CCT alternatives and make their recommendation, EPA has provided technical information and recommendations in Chapter 3. Systems can use the forms in Appendix D to organize water quality data and other information and forms in Appendix E to document the results of their assessment and submit their data and recommendation to the primacy agency. Note that primacy agencies may also require a system to collect additional data/information under §141.82(a).

4.1.2 Primacy Agency Determines Whether a Study Is Required for System Serving ≤ 50,000 People (STEP 3)

Primacy agencies should review the data provided by the system (using forms in Appendices D and E) for completeness. If data are not sufficient to make a CCT determination, the primacy agency can request additional information from the system.

Once primacy agencies have reviewed the data and OCCT recommendation, they should determine if a study is needed. Exhibit 4.2 provides a checklist to support the primary agency in determining whether or not to require a CCT study. If more than two questions are answered "Yes," the primacy agency should consider requiring a study. Importantly, as stated in EPA's LCR guidance, EPA recommends that primacy agencies require all systems with ***lead service lines*** to conduct a corrosion control study.

If the primacy agency does not require a study, their next step is to designate OCCT (go to Section 4.1.3). Section 4.1.4 provides technical recommendations to support primacy agencies in the event that a corrosion control study is required.

Exhibit 4.2: Recommended Checklist to Support Determination of the Need for a CCT Study for Systems Serving ≤ 50,000 People

Category	Question	Response (YES or NO)
Presence of LSLs	Does the System have lead service lines?[1]	
pH stability	Is the range of pH values measured at the Entry Point > 1.0 pH units (Range = Max entry point pH – Min entry point)?	
	Is the range of pH values measured in the Distribution System > 1.0 pH units (Range = Max pH – Min pH)?	
Iron Deposition Potential	Is average Entry Point iron > 0.3 mg/L?	
	Is average Distribution System iron > 0.3 mg/L?	
Manganese Deposition Potential	Is average Entry Point manganese > 0.05 mg/L?	
	Is average Distribution System manganese > 0.05 mg/L?	
Calcium Carbonate Deposition Potential	Is average Hardness > 150 mg/L as $CaCO_3$? *Entry point of distribution system values may be used.*	
Chloride-to-Sulfate Mass Ratio (CSMR) Issues	Is the CSMR for either Entry Point or Distribution System data > 0.6? *Use Average Chloride Level divided by the Average Sulfate Level.*	
Source Water Changes in the Future	Did the system indicate that there may be source water changes in the future?	
Treatment Process Changes	Did the system indicate that there may be treatment process changes in the future including changes in coagulant?	

Note:
[1] If the system has LSLs, EPA guidance recommends the primacy agency require a study.

4.1.3 Primacy Agency Designates OCCT for System Serving ≤ 50,000 People (STEP 4)

As stated in the LCR, if the primacy agency determines that a study is not required, they must either approve the OCCT option recommended by the system or designate alternative CCT(s) from among those listed in §141.82(c)(1) (§141.82(d)). They must do this ***within 18 months*** after the end of the monitoring period during which the system exceeds the lead or copper AL for systems serving more than 3,300 people, ***and within 24 months*** for systems serving 3,300 or fewer people. Primacy agencies can use information in Chapters 2 and 3 to help make this determination.

The primacy agency must notify the system of its OCCT decision in writing and explain the basis for the determination (§141.82(d)(2)). The primacy agency should work closely with the system to determine the implementation approach and follow-up monitoring (See Chapter 5 for technical recommendations).

4.1.4 System Serving ≤ 50,000 People Conducts Corrosion Control Study (STEP 5)

As stated in the LCR and summarized in Exhibit 4.1, systems are required to complete the corrosion control study ***within 18 months*** of the primacy agency's determination that a study is required. Exhibit 4.3 summarizes corrosion control study requirements for systems from the LCR. Following the exhibit are: (1) technical recommendations for primacy agencies on what type of study to require; (2) technical recommendations for systems on study tools and other considerations; and (3) technical recommendations for systems on corrosion control study reporting.

Exhibit 4.3: Corrosion Control Study Requirements[1]

Corrosion Control Study Component	LCR Requirements
Corrosion Control Study Tools	Systems must evaluate the effectiveness of each CCT specified in §141.82(c)(1) and, if appropriate, combinations of treatments using either pipe rig/loop tests, metal coupon tests, partial-system tests, or analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration (§141.82(a) and (c)(2)).
Monitoring Requirements	Systems must measure the following water quality parameters in any tests before and after evaluating the CCTs: Lead, copper, pH, alkalinity, calcium, conductivity, orthophosphate (when an inhibitor containing a phosphate compound is used), silicate (when an inhibitor containing a silicate compound is used), and water temperature (§141.82(c)(3)).
Identification of Constraints	Systems must identify all chemical or physical constraints that limit or prohibit the use of a particular CCT and document such constraints with at least one of the following (§141.82(c)(4)): • Data and documentation showing that a particular CCT has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or • Data and documentation demonstrating that the water system has previously attempted to evaluate a particular CCT and has found that the treatment is ineffective or adversely affects other water quality treatment processes.
Effects on Other Treatment Processes	Systems must evaluate the effect of the chemicals used for CCT on other water quality treatment processes (§141.82(c)(5)).
Reporting	On the basis of an analysis of the data generated during each evaluation, the water system must recommend to the primacy agency in writing the treatment option that the corrosion control studies indicate constitutes OCCT for that system. Systems must provide a rationale for their recommendation along with all supporting documentation (§141.82(c)(6)).

Note:

[1] Corrosion control studies may be required by the primacy agency. If they are, specific requirements for conducting the studies apply regardless of system size. They are from the LCR and are current as of the date of this publication.

(1) Technical Recommendations Regarding Type of Corrosion Control Study

There are several potential approaches to a CCT study. A study can be approached as a "desktop study" based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration, or a "demonstration study" using at least one of the following study tools: pipe rig/loop tests, metal coupon tests, or partial system tests. Systems serving 50,000 or fewer people may be able to satisfy CCT study requirements by performing a desktop study of analogous systems. Exhibit 4.4 provides a recommended checklist for primacy agencies to use when evaluating case-specific factors that may warrant requiring those systems to perform a demonstration study instead.

Exhibit 4.4: Recommended Checklist to Support Primacy Agency Determination of When to Require a Demonstration Study for Systems Serving ≤ 50,000 People

Question	Response (YES or NO)	Recommended Next Step
1. Does the system serve more than 10,000?		If **Yes**, consider requiring a ***demonstration study***. If **No**, continue to question 2.
2. Are lead service lines present in the system?		If **Yes**, consider requiring a ***demonstration study***. If **No**, continue to questions 3-5.
3. Does the system have multiple sources of water?		If the answer to any of these questions is **Yes**, consider requiring a ***desktop study***.
4. Is the system planning future treatment changes?		
5. Is the system planning future source water changes?		

(2) Corrosion Control Study Tools

Appendix F describes tools that can be used for conducting desktop and demonstration corrosion control studies. It includes the study tools required by the rule (analyses based on documented analogous treatments (desktop study); or pipe rig/loop tests, metal coupon tests, or partial-system tests (demonstration studies)) – along with other tools such as pipe scale analysis and models that can be used to supplement the requirements. The appendix is not meant to be exhaustive – other tools might also be useful for determining the most effective CCT for the system.

Note that systems conducting desktop studies must at a minimum evaluate ***analogous treatments at other systems*** of similar size, water chemistry, and distribution system configuration to meet the corrosion control study requirements of the LCR.

(3) Corrosion Control Study Reporting

The system must provide the primacy agency with its recommended OCCT option along with the rationale for its recommendation and supporting documentation as described §141.82(c)(1) – (6). The system must also identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment and document such constraints with at least one of the following (§141.82(c)(4) and (c)(6)):

- Data and documentation showing that a particular CCT has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or

- Data and documentation demonstrating that the water system has previously attempted to evaluate a particular CCT and has found that the treatment is ineffective or adversely affects other water quality treatment processes.

The system must also evaluate the effect of the chemicals used for CCT on other water quality treatment processes (§141.82(c)(5) and (c)(6)).

EPA recommends that the system submit to the primacy agency a report that includes the required information identified above and additional data and analyses as follows:

- Options for addressing identified constraints, so that the system would be able to achieve and maintain OCCT, meet other water quality goals, and remain in compliance with all applicable drinking water regulations.

- The corrosion control study's conclusion (i.e., the recommended treatment) and a target level for pH, alkalinity, and corrosion inhibitors (if used).

- Recommended operating ranges for key parameters (pH, alkalinity, and inhibitor (if used)) both at the entry point and in the distribution system.

- Treatment chemicals and dosages that will be used to maintain OCCT, recommendations for quality assurance testing of chemicals, and follow-up monitoring recommendations.

- The system's plan for treatment start-up (see Sections 3.3 and 5.1 for technical recommendations for start-up of pH/alkalinity/dissolved inorganic carbon (DIC) adjustment and phosphate-based corrosion inhibitor treatment).

Exhibit 4.5 and Exhibit 4.6 provide possible outlines for desktop and demonstration study reports, respectively.

Exhibit 4.5: Possible Outline for a Desktop Study Report

Executive Summary

- **I. Introduction**
- **II. Project Background**
- **III. Review of Existing Information**
  - A. Water System Information (provide a system schematic)
  - B. Water Quality Data
    1. Raw water
    2. Entry Point
    3. Distribution system
    4. Tap
  - C. Pipeline and Plumbing Materials
  - D. Summary of Water Quality Complaints
  - E. Analogous System Information
- **IV. Potential Causes of Elevated Lead and/or Copper Levels in the System**
- **V. Identification and Assessment of Corrosion Control Alternatives**
- **VI. Evaluation of Corrosion Control Alternatives**
  - A. Performance
  - B. Constraints
  - C. Recommended OCCT

Exhibit 4.6: Possible Outline for a Demonstration Study Report

Executive Summary

- **I. Introduction**
- **II. Project Background**
- **III. Review of Existing Information**
  - A. Water System Information (provide a system schematic)
  - B. Water Quality Data
    1. Raw Water
    2. Entry Point
    3. Distribution System
    4. Tap
  - C. Pipeline and Plumbing Materials
  - D. Summary of Water Quality Complaints
  - E. Analogous System Information
- **IV. Special Studies**
  - A. Bench Scale Studies
    1. Methods and Materials
    2. Results
  - B. Pipe Loop Studies
    1. Methods and Materials
    2. Results
  - C. Partial System Testing
    1. Methods and Materials
    2. Results
- **V. Potential Causes of Elevated Lead and/or Copper Levels in the System**
- **VI. Identification and Assessment of Corrosion Control Alternatives**
- **VII. Evaluation of Corrosion Control Alternatives**
  - A. Performance
  - B. Constraints
  - C. Recommended OCCT

4.1.5 Primacy Agency Designates OCCT for Systems Serving ≤ 50,000 People (STEP 6)

Exhibits 4.7 and 4.8 provide technical recommendations for primacy agencies for their review of desktop and demonstration study reports, respectively. Primacy agencies should refer to Chapter 2 for background on sources of lead and copper and impacts of water quality and physical system characteristics on lead and copper release. The information in Chapter 3 can also be used as a reference when evaluating the recommended OCCT option.

Upon its own initiative or in response to a request from a water system, a primacy agency may modify its OCCT determination or optimal water quality control parameters for the system (§141.82(h)). The primacy agency may modify its determination where it concludes that such a change is needed to ensure the water system will continue to provide optimized corrosion control treatment. Such modifications may be appropriate where water systems are contemplating changes to their source water, treatment, or other system components in a manner that could adversely impact their current treatment optimization.

Exhibit 4.7: Recommendations for Primacy Agency Review of Desktop Study

1) Make sure all components of a desktop study are included in the report.
   → If they are not, coordinate with system to complete study and check against recommended outline of required components for desktop studies.
   → If they are, continue.
2) Evaluate raw, entry point, and distribution system water quality information.
   → Evaluate key water quality parameters (pH, alkalinity, conductivity, hardness, other anions and cations) and their impact on lead and/or copper release to water (entry point and distribution system) and treatability (raw water).
   → Evaluate differences in entry point versus distribution system data for key water quality parameters, particularly variations in pH and DIC.
3) Review regulatory tap monitoring data for lead and copper and other supplemental lead and copper data (e.g., from special studies by universities).
   → Assess 90th percentile lead and copper levels and that sites selected for regulatory monitoring meet the criteria in the LCR.
   → Assess available supplemental lead and copper data, if available.
4) Review materials and customer complaint history.
   → Determine primary sources of lead and copper in drinking water (lead pipe, lead solder, brass, copper pipe).
   → Identify other materials in the system that may be impacted by CCT (unlined cast iron pipe, asbestos cement pipe, etc.).
5) Review analogous system information.
   → Ensure that systems described are similar in source, water quality, and materials profiles.
6) Evaluate causes of elevated lead and/or copper levels.
   → Use water quality and materials information along with corrosion theory to determine primary causes of elevated lead and/or copper levels.
7) Evaluate potential CCT alternatives identified in study.
   → Evaluate if alternatives have been compared with respect to their abilities to reduce lead and/or copper levels in the system (performance) and the effects that additional CCT will have on water quality parameters (WQPs) and on other water quality treatment processes.
8) Evaluate final recommended OCCT and approve installation if warranted.

Exhibit 4.8: Recommendations for Primacy Agency Review of Demonstration Study

1) Make sure all components of a demonstration study are included in the report.
   → If they are not, coordinate with system to complete study and check against recommended outline of required components for demonstration studies.
   → If they are, continue.
2) Evaluate raw, entry point, and distribution system water quality information.
   → Evaluate key water quality parameters (pH, alkalinity, conductivity, hardness, other anions and cations) and their impact on lead and/or copper release to water (entry point and distribution system) and treatability (raw water).
   → Evaluate differences in entry point versus distribution system data for key water quality parameters, particularly variations in pH and DIC.
3) Review regulatory tap monitoring data for lead and copper and other supplemental lead and copper data (e.g., from special studies by universities).
   → Assess 90th percentile lead and copper levels and that sites selected for regulatory monitoring meet the criteria in the LCR.
   → Assess available supplemental lead and copper data, if available.
4) Review materials and customer complaint history.
   → Determine primary sources of lead and copper in drinking water (lead pipe, lead solder, brass, copper pipe).
   → Identify other materials in the system that may be impacted by CCT (unlined cast iron pipe, asbestos cement pipe, etc.).
5) Review analogous system information.
   → Ensure that systems described are similar in source, water quality, and materials profiles.
6) Evaluate causes of elevated lead and/or copper levels.
   → **Bench scale/Pipe Rack:** Ensure that materials evaluated are similar to lead and copper source materials in system. Also ensure that water quality conditions are similar to system conditions. For pipe rack studies, ensure that study was conducted long enough for stable scales to form on the pipes.
   → **Scale Analyses:** Identify if representative pipe specimens were gathered in the field (representative of lead and/or copper source material that is contributing to elevated lead and copper levels in the water) and that scale analyses were completed using appropriate methods with proper quality assurance and quality control.
   → **Partial System Testing:** Testing area should be selected to represent sites with elevated lead and/or copper levels similar to those used for regulatory compliance sampling under the LCR. Study should continue long enough for CCT to be effective.
   → **Other:** Any additional sampling should be conducted at sites representative of sites used for LCR compliance sampling.
   → Results from special studies should be used to inform recommendations on causes of elevated lead and/or copper levels, performance of potential treatment alternatives, and constraints and secondary impacts that may occur with implementation of CCT.
7) Evaluate potential CCT alternatives identified in study.
   → Evaluate if alternatives have been compared with respect to their abilities to reduce lead and/or copper levels in the system (performance) and the effects that additional CCT will have on WQPs and on other water quality treatment processes.
8) Evaluate final recommended OCCT and approve installation if warranted.

4.2 Corrosion Control Steps for Systems Serving > 50,000 People

As noted earlier in this chapter, most systems serving more than 50,000 people were required to install OCCT by January 1, 1997. Systems that served 50,000 people or fewer at that time may have since experienced population growth, combined with other systems, and/or made other changes so that their new population served is more than 50,000 people. These systems then become subject to the requirements for large systems, including the specific CCT steps applicable to large systems unless they are deemed to have optimized CCT under §141.81(b)(2) or (b)(3).

Exhibit 4.9 summarizes the required actions and deadlines for CCT steps for these systems. It also shows the related section in this document where additional technical recommendations are provided for the system or primacy agency. Those systems serving more than 50,000 people with existing CCT – but that have subsequent lead or copper action level exceedances – can also follow these steps, where applicable, while also complying with the LCR's ALE-triggered source water, public education, and lead service line replacement requirements in §§141.83-85. Note that for these systems, the LCR does not prescribe a schedule for CCT adjustment; instead, one will likely be set by the primacy agency.

Exhibit 4.9: Summary of CCT Requirements and Deadlines for Systems Serving > 50,000 People (§141.81(e))

Requirement[1]	Timetable for Completing Corrosion Control Treatment Steps	Corresponding Section of this Document
STEP 1: System completes Corrosion Control Study.	Within 18 months after the end of the monitoring period which triggered a study[2]	Section 4.2.1
STEP 2: Primacy agency designates OCCT.	Within 6 months after study is completed	Section 4.2.2
STEP 3: System installs OCCT.[3]	Within 24 months after primacy agency's decision regarding type of treatment to be installed	Section 5.1
STEP 4: System conducts follow-up monitoring for 2 consecutive 6-month periods.	Within 36 months after primacy agency designates OCCT	Section 5.2
STEP 5: Primacy agency designates OWQPs.	Within 6 months of Step 4	Section 5.3
STEP 6: System conducts continued WQP and lead and copper tap monitoring.	The schedule for required monitoring is based on whether the system exceeds an AL and/or complies with OWQP ranges or minimums	Section 5.4

Notes:

[1] This schedule applies to systems newly serving > 50,000 people that are installing CCT. Because the regulatory deadlines for systems serving more than 50,000 people have passed, systems newly serving 50,000 people must follow the schedule for systems serving 3,301-50,000 people.

[2] In other words, the end of the monitoring period in which the system became a system serving > 50,000 people.

[3] For systems with existing CCT, this step would involve adjusting CCT.

4.2.1 Systems Serving >50,000 People Conduct a Corrosion Control Study (STEP 1)

Corrosion control study requirements (e.g., study tools, identification of constraints, reporting) were summarized previously in this Chapter in Exhibit 4.3.

In addition to the corrosion control study and OCCT recommendation, EPA recommends that systems provide their primacy agencies with the water quality and other system-specific information as identified in Appendix D. Primacy agencies may also require a system to collect this additional data/information as per §141.82(a) and (d)(2). The recommended data and information collection forms in Appendix D can be customized for individual systems. Data should be sufficient to characterize raw water, treated water quality (entry point), distribution system water quality, and lead and copper in tap samples. The frequency of data collection should be based on the complexity of the system and how water quality may vary over time and location. Systems should be encouraged to provide multiple years of data that represent different seasons (e.g., quarterly data). Water quality samples should be collected as close in time as possible to lead and copper tap samples. Primacy agencies may be able to verify information using the system's latest sanitary survey report. Recommendations for reviewing water quality data are provided in Section 3.2.1.

As noted in Exhibit 4.3, systems performing corrosion control studies must use either pipe rig/loop tests, metal coupon tests, partial-system tests, or analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration for their CCT study. Because there is less likelihood of truly analogous systems once the population served is more than 50,000 people, EPA recommends that these systems use one of the demonstration study tools (i.e., pipe rig/loop, metal coupon, or partial-system test) to meet CCT requirements. Additional desktop and demonstration study tools can be used to supplement the requirements – see Appendix F for a description of the required and additional CCT study tools. Systems may also find the recommended approach for selecting OCCT (provided in Chapter 3) helpful as a screening tool for identifying which treatments warrant further study.

The system must provide the primacy agency with its recommended OCCT option along with the rationale for its recommendation and supporting documentation as described §141.82(c)(1) – (6). The system must also identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment and document such constraints with at least one of the following (§141.82(c)(4) and (c)(6)):

- Data and documentation showing that a particular CCT has adversely affected other water treatment processes when used by another water system with comparable water quality characteristics; and/or
- Data and documentation demonstrating that the water system has previously attempted to evaluate a particular CCT and has found that the treatment is ineffective or adversely affects other water quality treatment processes.

The system must also evaluate the effect of the chemicals used for CCT on other water quality treatment processes (§141.82(c)(5) and (c)(6)).

EPA recommends that the system submit to the primacy agency a report that includes the required information identified above and additional data and analyses as follows:

- Options for addressing identified constraints, so that the system would be able to achieve and maintain OCCT, meet other water quality goals, and remain in compliance with all applicable drinking water regulations.
- The corrosion control study's conclusion (i.e., the recommended treatment) and a target level for pH, alkalinity, and corrosion inhibitors (if used).
- Recommended operating ranges for key parameters (pH, alkalinity, and inhibitor (if used)) both at the entry point and in the distribution system.
- Treatment chemicals and dosages that will be used to maintain OCCT, recommendations for quality assurance testing of chemicals, and follow-up monitoring recommendations.
- The system's plan for treatment start-up (see Sections 3.3 and 5.1 for technical recommendations for start-up of pH/alkalinity/DIC adjustment and phosphate-based corrosion inhibitor treatment).

Exhibit 4.5 and Exhibit 4.6, presented earlier in this section, provide possible outlines for desktop and demonstration study reports, respectively.

4.2.2 Primacy Agency Reviews the Study and Designates OCCT for System Serving > 50,000 People (STEP 2)

Primacy agencies can use the checklist in Exhibit 4.8 in Section 4.1.5 to support their review of the study's design and findings. Primacy agencies should refer to Chapter 2 for background on sources of lead and copper and impacts of water quality and physical system characteristics on lead and copper release. The information in Chapter 3 can also be used as a reference when evaluating the recommended OCCT option.

Upon its own initiative or in response to a request from a water system, a primacy agency may modify its OCCT determination or optimal water quality control parameters for the system (§141.82(h)). The primacy agency may modify its determination where it concludes that such a change is needed to ensure the water system will continue to optimize corrosion control treatment. Such modifications may be appropriate where water systems are contemplating changes to their source water, treatment, or other system components in a manner that could adversely impact their current treatment optimization.

Chapter 5: Requirements and Technical Recommendations for OCCT Start-Up and Monitoring

This chapter picks up where Chapter 4 ended – after the primacy agency designates optimal corrosion control treatment (OCCT), the system will install OCCT and conduct follow-up monitoring. The primacy agency will then designate optimal water quality parameters (OWQPs). This chapter is organized as follows:

- Section 5.1 provides technical recommendations for systems on corrosion control treatment (CCT) start-up.
- Section 5.2 discusses required and recommended elements of follow-up monitoring during the first year of OCCT operation.
- Section 5.3 provides requirements and technical recommendations for primacy agencies on evaluating OCCT and setting OWQPs.
- Section 5.4 provides requirements and technical recommendations for comprehensive long-term monitoring for corrosion control.

Systems are encouraged to refer to the document *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (USEPA, 2010b) for direction on follow-up and continued lead and copper tap and water quality parameter (WQP) monitoring.[28]

5.1 CCT Start-up

In accordance with the Lead and Copper Rule (LCR), after the primacy agency designates OCCT, the system has 24 months to install it (§141.81(e)(5)).[29] During that time, systems may be adding a new chemical (i.e., a corrosion inhibitor) to the finished water and/or adjusting the finished water pH by adding a new chemical or increasing the dose of an existing chemical. These types of changes can have temporary adverse impacts on water quality in the distribution system (e.g., red water from sloughing of corrosion scale, microbial changes). Therefore, the Environmental Protection Agency (EPA) has provided recommendations in the next two sections for systems to consider when starting pH/alkalinity/dissolved inorganic carbon (DIC) adjustment (5.1.1) and when adding a corrosion inhibitor (5.1.2) to help minimize these potential adverse effects.[30] EPA recommends that systems discuss corrosion control treatment start-up procedures with their primacy agency when the agency is designating OCCT. Additional recommendations for CCT start-up can be found in Hill and Cantor (2011).

[28] This guidance is available at http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.pdf.
[29] The required time period for installing OCCT (24 months) applies to systems serving ≤ 50,000 people and systems newly serving > 50,000 people. The schedule for CCT adjustment for systems that already have CCT is not prescribed in the LCR. The primacy agency will likely set a schedule for systems serving > 50,000 people that previously installed CCT but have a subsequent action level exceedance.
[30] Silicate-based inhibitors are not included here because information on their use and effectiveness continues to be limited and more research is needed.

5.1.1 Start-up of pH/Alkalinity/DIC Adjustment

Changes in pH/alkalinity/DIC result in a new water quality equilibrium to be established in the distribution system. To minimize adverse impacts (e.g., sloughing of corrosion scale, aesthetic issues), systems should consider raising the pH in increments, e.g., by 0.2 or 0.3 pH units over a 12-month period, or increasing the pH incrementally every 3 months (USEPA, 2007b; MOE, 2009). The approach will be system specific, but consideration should be given to the amount of lead and/or copper reduction that is needed and the potential for secondary impacts as the distribution system equilibrates. The amount of time needed to see results from implementation of pH adjustment will also be system specific. Some systems have seen lead and/or copper reduction within a matter of days following pH adjustment (MOE, 2009); however, other systems have required up to a year to produce a new stable target pH in the distribution system (MWRA, 2010).

5.1.2 Start-up of Phosphate-Based Corrosion Inhibitors

When starting orthophosphate treatment, some systems have gradually increased their orthophosphate doses over time. For example, in a partial distribution system test, an initial orthophosphate dose of 1 mg/L as PO_4 (~0.3 mg/L as P) was gradually increased to 3 mg/L as PO_4 (~1 mg/L as P) over seven months. At three weeks, the orthophosphate concentration reached the target dose at the far ends of the system (MOE, 2009).

Some systems have started orthophosphate treatment with a higher passivation dose, then after a certain time period, switched to a lower maintenance dose for long-term corrosion control. For example, Hill and Cantor (2011) recommend starting inhibitors at 2 to 3 times the maintenance dose in order to more quickly establish a passivating layer. See Section 3.3.2 for technical recommendations related to passivation and maintenance doses.

5.2 Follow-up Monitoring during First Year of Operation

The LCR requires systems to conduct two types of follow-up monitoring during the two consecutive, 6-month periods directly following installation of OCCT (§141.81(d)(5) and (e)(6)):

- Lead and copper tap monitoring; and
- WQP monitoring.

The next two sections summarize follow-up monitoring requirements and recommendations. Systems can use the forms in Appendix G and the forms in the ***OCCT evaluation templates*** to document the results of follow-up monitoring.

As will be discussed in Section 5.3, the primacy agency will use the results of follow-up lead and copper tap monitoring and results from samples collected prior to the system's installation of CCT to determine if the system has properly installed and operated OCCT, and to set OWQPs.

5.2.1 Follow-up Lead and Copper Tap Monitoring

All systems, regardless of size, must conduct two consecutive six-month rounds of follow-up lead and copper tap monitoring at the same number of sites as required for routine monitoring under the LCR (§141.86(c) and (d)(2); see Exhibit 5.1).

Exhibit 5.1: Required Number of Sites for Follow-up Lead and Copper Tap Monitoring

Population Served	Required Number of Sites[1]
≤100	5
101 – 500	10
501 – 3,300	20
3,301 – 10,000	40
10,001 – 100,000	60
>100,000	100

Note:
[1] §141.86(c) and (d)(2). The number of sites is the same as the number of sites required for routine monitoring.

EPA recommends that systems with lead service lines (LSLs) and their primacy agencies consider collecting special tap samples during follow-up monitoring to evaluate the lead released directly from the LSLs. Systems can conduct premise plumbing profiles (see Appendix C for more information), or ask homeowners to collect samples that would capture water from within the LSL for lead analysis. Dissolved and particulate lead should be measured for these special samples. In addition, primacy agencies may wish to consider data from chronically low flow homes and homes with LSL disturbances when evaluating the effectiveness of the CCT.[31]

5.2.2 Follow-up WQP Monitoring

Requirements for WQP follow-up monitoring and recommendations for additional monitoring are summarized in Exhibits 5.2 and 5.3, respectively. Required WQP follow-up monitoring must be conducted at entry points to the distribution system and at tap monitoring locations. Entry point samples must be collected from locations that are representative of each source after treatment. Systems with multiple sources that are combined before distribution must sample at each entry point to the distribution system during periods of normal operating conditions to allow the sample to be representative of all sources being used (§141.87(a)(1)(ii); USEPA 2010b). Tap samples must be representative of water quality throughout the distribution system taking into account the number of persons served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. Tap monitoring

[31] All lead and copper tap sample results from the system's sampling pool collected within the monitoring period must be included in the 90th percentile calculation along with any samples where the system is able to determine that the site selection criteria in §141.86(a)(3)-(8) for the sampling pool are met. Other lead and copper tap data such as from customer requested sampling, investigative sampling, and special studies also must be submitted to the primacy agency (USEPA, 2004c; §141.90(g)).

locations can be the sites used for coliform monitoring or the sites used for lead and copper tap monitoring (§141.87(a)(1)(i)).

As summarized in Exhibit 5.2, the LCR requires:

- One sample from each entry point at least once every two weeks for:[32]
    - pH;
    - When alkalinity is adjusted, a reading of the dosage rate of the chemical used to adjust alkalinity and the concentration of alkalinity; and
    - When an inhibitor is used, a reading of the dosage rate of the inhibitor used and the concentration of orthophosphate or silicate (whichever is used).
- AND two sets of samples from a specified number of taps (see Exhibit 5.3) during both consecutive 6-month monitoring periods for:
    - pH;
    - Alkalinity;
    - Calcium, when calcium carbonate stabilization is used;
    - Orthophosphate, when a phosphate-based inhibitor is used; and
    - Silica, when a silicate-based inhibitor is used.

Note that the LCR requires systems serving 50,000 or fewer people to conduct follow-up WQP monitoring only during monitoring periods in which they have a lead and/or copper action level exceedance (§141.87(c)). Monitoring is not required if these systems no longer exceed the action level after installing OCCT. However, EPA recommends that primacy agencies consider requiring follow-up WQP monitoring during the first year after OCCT installation regardless of whether the system exceeds the action level in order to demonstrate that the treatment is operating properly.

[32] Except ground water systems that have primacy agency approval to limit this monitoring to representative sites.

Exhibit 5.2: Follow-up WQP Monitoring Requirements[1] and Recommendations

Type	Parameters	Required [1]		Recommended	
		Number of Sites	Frequency of Sampling	Number of Sites	Frequency of Sampling
Entry point	pH, alkalinity dosage rate and concentration,[2] inhibitor dosage rate and orthophosphate or silicate concentration (whichever is used)[3]	At each entry point[4]	At least once every two weeks	No Change	No Change
Tap (Distribution system samples)[5]	pH, alkalinity, orthophosphate or silica[3], calcium[6]	Number of sites based on system size, See Exhibit 5.3	At least twice per tap every six months (4 sample periods)	At ***more taps than required.*** See Exhibit 5.3.	All parameters: ***Monthly***

Notes:

[1] Required for all systems serving more than 50,000 people (§141.87(c)). Systems serving 50,000 or fewer people are required to conduct follow-up WQP monitoring during any monitoring period in which they exceed either action level or if required by the primacy agency (§141.81(b) and §141.87(c)). Follow-up monitoring occurs during the 12-month period following OCCT installation (§141.81(e)(6) and §141.87(c)).

[2] Required at entry point locations if alkalinity is adjusted as part of corrosion control (§141.87(c)(2)(ii)).

[3] Required if an inhibitor is used. Monitoring for orthophosphate is only required if a phosphate-containing inhibitor is used (§141.87(c)(1)(iii) and (c)(2)(iii)). Monitoring for silica is only required if a silicate-containing inhibitor is used (§141.87(c)(1)(iv) and (c)(2)(iii)).

[4] Ground water systems can limit entry point monitoring to representative sites with approval from their primacy agency (§141.87(c)(3)).

[5] WQP tap samples are collected at locations that are representative of the water quality throughout the distribution system. Systems may sample from sites used for coliform monitoring (§141.87(a)).

[6] Required if calcium carbonate stabilization is used (§141.87(c)(1)(v)).

Exhibit 5.3: Required and Recommended Number of Sites for Follow-up WQP Tap Monitoring

Population Served	Required Number of Sites[1]	Recommended Number Sites
≤100	1	2
101 – 500	1	5
501 - 3,300	2	10
3,301 - 10,000	3	15
10,001 - 50,000	10	20
50,001 - 75,000	10	25
75,001 - 100,000	10	30
100,001 - 500,000	25	40
500,001 - 1,000,000	25	50
>1,000,000	25	>50

Note:

[1] Required each six-month monitoring period for systems serving more than 50,000 people (§141.87(c)). Systems serving 50,000 or fewer people are required to conduct follow-up WQP monitoring during any monitoring period in which they exceed either action level or if required by the primacy agency (§141.81(b) and §141.87(c)).

For follow-up WQP tap monitoring, two samples must be collected from the required number of sites shown in Exhibit 5.3 during both six-month monitoring periods specified in §141.86(d)(2) (§141.87(c)(1)). As shown in Exhibit 5.2, EPA recommends that systems and primacy agencies consider increasing the frequency of WQP tap sampling to ***monthly.*** More frequent monitoring is recommended to capture seasonal variations and influences of temperature on treatment effectiveness.

EPA also recommends that systems and primacy agencies consider follow-up WQP tap monitoring at more locations than required by the LCR (See Exhibit 5.3). Collecting WQP samples at an increased number of tap monitoring locations is especially important for systems that experience fluctuations in distribution system water quality. In particular, pH variations can have a large impact on corrosion control treatment effectiveness. The pH can fluctuate widely in systems with low buffering capacity, high water age (e.g., in dead-end areas), high microbiological activity, and in systems that experience nitrification. It is important that distribution system monitoring represents all pressure and water quality zones to adequately assess treatment effectiveness in all parts of the system. Follow-up WQP samples from tap sites

should be collected as close in time as possible to when lead and copper tap samples are collected so that the system can evaluate the influence of water quality fluctuations on lead and copper tap monitoring results.

Primacy agencies and systems may want to consider additional monitoring for iron, manganese, chloride, sulfate, hardness, calcium, total dissolved solids (TDS), and/or oxidation-reduction potential (ORP) if they believe that these parameters may change or were not adequately characterized prior to CCT installation.[33] Primacy agencies can use the forms in Appendix G and electronic versions in the ***OCCT Evaluation Templates*** to document additional follow-up monitoring requirements for systems.

5.3 Evaluating OCCT and Setting Optimal Water Quality Parameters

Primacy agencies are required to evaluate results of follow-up tap and water quality monitoring and results collected prior to the installation of CCT to determine whether the system has properly installed and operated the OCCT and to designate (§141.82(f)):

- A minimum value or a range of values for pH measured at each entry point to the distribution system;
- A minimum pH value, measured in all tap samples, that is equal to or greater than 7.0, unless the primacy agency determines that meeting a pH level of 7.0 is not technologically feasible or is not necessary for the system to optimize corrosion control;
- If alkalinity is adjusted as part of OCCT, a minimum concentration or a range of concentrations for alkalinity, measured at each entry point to the distribution system and in all tap samples;
- If a corrosion inhibitor is used, a minimum concentration or a range of concentrations for the inhibitor, measured at each entry point to the distribution system and in all tap samples, that the primacy agency determines is necessary to form a passivating film on the interior walls of the pipes of the distribution system; and
- If calcium carbonate is used as part of corrosion control, a minimum concentration or a range of concentrations for calcium, measured in all tap samples.

Primacy agencies can designate values for additional water quality control parameters (e.g., free chlorine residual, conductivity, ORP) that reflect optimal corrosion control for the system (§141.82(f)).

[33] Under §141.82(f), the primacy agency may designate values for additional water quality control parameters determined by the primacy agency to reflect optimal corrosion control for the system. The primacy agency must notify the system in writing of these determinations and explain the basis for its decisions.

EPA recommends that primacy agencies also use results of follow-up monitoring to further evaluate the OCCT and recommend re-evaluation if the results of the treatment are not what were predicted.

Note that the LCR includes a provision (§141.82(h)) for primacy agencies to modify their determination of OCCT or OWQP designations where they conclude that such change is necessary to ensure that the system continues to optimize CCT. Such modifications may be appropriate where water systems are contemplating changes to their source water, treatment, or other system components that could adversely impact their current CCT optimization. A request for modification can also be in response to a written request with supporting documentation from a system or other interested party. The revised determination must be in writing, and include the new treatment requirements, the basis for the primacy agency's decision, and an implementation schedule for completing the treatment modifications.

Appendix G provides technical recommendations for primacy agencies to consider when designating OWQPs for pH/alkalinity/DIC adjustment, orthophosphate treatment, blended phosphate treatment, and use of a silicate inhibitor based on data gathered during the follow-up monitoring.

A recent publication by Cornwell et al. (2015) examined the use of control charts as a diagnostic tool for determining parameter variability and setting acceptable ranges. This approach may be useful to primacy agencies and systems for controlling WQPs and determining when treatment adjustment is needed to bring a parameter back within its goal range.

5.4 Required and Recommended Long-Term Corrosion Control Monitoring

This section describes WQP monitoring required by the LCR once the primacy agency has set OWQPs. It also provides technical recommendations for additional data collection and tracking that could be used to enhance a system's understanding of CCT effectiveness. For the purposes of this document, the combination of required WQP monitoring and additional recommended monitoring is referred to as "long-term corrosion control monitoring."

Generally, systems serving more than 50,000 people must conduct routine monitoring and determine compliance with OWQPs every six months, while systems serving 50,000 or fewer are required to conduct monitoring during periods in which they have a lead and/or copper action level exceedance (§141.87(d)).

Required WQP Monitoring

Systems are required to collect two sets of samples every six months (§141.87(c)(1) and (d)) at the number of WQP tap sampling sites specified for the system size in §141.87(a)(2) (see Exhibit 5.3) for:

- pH;
- Alkalinity;

- Calcium, when calcium carbonate stabilization is used;
- Orthophosphate, when a phosphate-based inhibitor is used; and
- Silica, when a silicate-based inhibitor is used.

They must also collect one set of samples at each entry point (except those ground water systems that can limit entry point monitoring to representative sites) at least once every two weeks for:

- pH;
- When alkalinity is adjusted as part of optimal corrosion control, a reading of the dosage rate of the chemical used to adjust alkalinity and the concentration of alkalinity; and
- When an inhibitor is used, a reading of the dosage rate of the inhibitor used and the concentration of orthophosphate or silicate (whichever is used).

Systems that meet their OWQPs for a specified period of time can qualify for reduced WQP monitoring that allows for fewer and less frequent monitoring at tap locations (§141.87(e)). The LCR does not allow reduced monitoring for WQP samples collected at entry points. Refer to Section III.H in the *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (USEPA, 2010b) for additional information.

Technical Recommendations for Additional Monitoring

Additional monitoring could include monitoring for additional WQPs, customer complaint tracking, and monitoring associated with lead source replacement programs.

In addition to required WQP monitoring, systems may want to consider analyzing other water quality parameters that can affect lead and copper release. These may include ORP, ammonia, chloride, sulfate, aluminum, iron, and manganese. See Section 2.3 for discussion of how these water quality parameters influence corrosion.

Customer complaints provide useful information on conditions occurring at customer's taps. Common complaints include red water (iron) and darker tint to the water (manganese), which can indicate an increase in source water levels of iron and manganese or sloughing of scale from cast iron pipe. Complaints of taste/odor issues (earthy or musty flavor) can indicate changes in natural organic matter (NOM) due to algae blooms. Systems can obtain important information from customer complaints of blue water or a metallic taste, which can indicate copper corrosion (customers can begin to notice the taste from copper at concentrations of 3 to 10 mg/L per Dietrich et al., 2008). It is important to note that while customer complaint records can provide information on copper corrosion, lead in drinking water has no taste or color.

Systems should consider additional monitoring to evaluate the effectiveness of lead source replacement programs. The monitoring, whether taken at the tap or directly from the service line, would occur before and after the lead source is removed. Both total and dissolved lead

should be analyzed to determine the percentages of particulate and dissolved lead. Replacement of lead sources, such as lead service lines, may increase lead levels (especially particulate lead levels) for a period of time due to the physical disturbance of the system (Sandvig et al., 2008; Muylwyk et al., 2009; Swertfeger et al., 2006; Del Toral et al., 2013). Some disturbances, along with other factors, may elevate lead levels for years (Del Toral et al., 2013). Particulate lead can also be released as part of normal (ongoing) corrosion processes in the system and is common when pipe scales contain substantial amounts of iron, manganese, and other coatings, or when corrosion of brass or solder is galvanically driven.

Recommendations for monitoring programs can be found in Kirmeyer et al. (2000, 2002, 2004); USEPA (2003, 2007d); and MOE (2009).

Chapter 6: Impacts of Source Water and Treatment Changes on Lead and Copper in Drinking Water

Research over the last several years has shed new light on the impacts of source water and treatment changes on lead and copper corrosion control. In particular, for systems with lead service lines, research has shown that lead release is dependent upon many water quality parameters (WQPs), and that treatment change once thought to be independent of corrosion control can have a significant impact on lead release.

Section 6.1 reviews the Lead and Copper Rule (LCR) requirements for maintaining optimal corrosion control treatment (OCCT) and explains when a system is required under the LCR to notify their primacy agency and obtain approval prior to a source or treatment change. Section 6.2 provides technical information on the effects of source water changes and Section 6.3 follows with technical information about the effects of treatment changes on lead and copper levels in drinking water.

6.1 Review of LCR Requirements Related to a Change in Source or Treatment

All systems optimizing corrosion control must continue to operate and maintain the treatment, including maintaining WQPs at or above minimum values or within ranges established by the primacy agency (§141.81(b) and §141.82(g)). Prior to the addition of a new source or any long-term change in water treatment, water systems are required to notify the primacy agency in writing of the change or addition. The primacy agency must review and approve the addition of a new source or long-term change in treatment before it is implemented by the water system. Primacy agencies also have the authority to modify OCCT determinations or OWQP designations upon their own initiative or in response to a request from a water system or other interested party (§141.82(h)). The primacy agency may modify these where it concludes the modifications are necessary to ensure the system will continue to provide optimized corrosion control treatment after changing the source water, treatment, or other system components in such a way that could adversely impact the current optimization.

Switching from purchased water to a new source is an example of source change (USEPA, 2015b). Examples of long-term treatment changes are provided in the LCR and discussed later in this section. The systems that are subject to this requirement are systems that are either: (1) deemed to have optimized corrosion control pursuant to §141.81(b)(3); (2) subject to reduced monitoring under §141.86(d)(4); or (3) subject to a monitoring waiver under §141.86(g). (§141.90(a)(3)).

As described in a November 3, 2015, memorandum from Dr. Peter Grevatt, Director of the Environmental Protection Agency (EPA) Office of Ground Water and Drinking Water (USEPA, 2015b):

1) The LCR requires that any large system (i.e., those serving > 50,000 people) that has met OCCT requirements through the installation of corrosion control treatment to continue

operating and maintaining the treatment and to continue meeting the OWQPs established by the primacy agency (§141.81(b) and §141.82(g)).

2) Systems deemed to have OCCT without the installation of corrosion control treatment are required to notify the primacy agency in writing of any upcoming changes in treatment or source and request that the primacy agency modify its determination of the OCCT and OWQPs applicable to the system. The primacy agency must then review and approve the change and designate OCCT and OWQPs prior to its implementation by the system (§141.81(b)(3)(iii)).

3) Systems subject to reduced monitoring under §141.86(d)(4) or monitoring waivers under §141.86(g) must notify the primacy agency of any upcoming changes in treatment or source and the primacy agency must subsequently review or approve it (§141.90(a)(3)).

EPA recommends that systems that are not subject to a notification requirement also notify the primacy agency prior to the addition of a new source or treatment and request the primacy agency to modify its determination of the OCCT and OWQPs applicable to the system (USEPA, 2015b).

Examples of long-term treatment changes include the addition of a new process or modification of an existing treatment process ((§141.90(a)(3)). Examples of modifications include switching secondary disinfectants, switching coagulants (e.g., alum to ferric chloride), and switching corrosion inhibitor products (e.g., orthophosphate to blended phosphate). Long-term changes can include dose changes to existing chemicals if the system is planning long-term changes to its finished water pH or residual inhibitor concentration. Long-term treatment changes would not include chemical dose fluctuations associated with daily raw water quality changes ((§141.90(a)(3)).

Due to the unique characteristics of each system (e.g., source water, existing treatment processes, distribution system materials) it is critical that public water systems, in conjunction with their primacy agencies and, if necessary, outside technical consultants, evaluate and address potential impacts resulting from treatment and/or source water changes prior to making the change. The evaluation may include a system-wide assessment of source water or treatment modifications to identify existing or anticipated water quality, treatment, or operational issues that may interfere with or limit the effectiveness of corrosion control treatment (CCT) optimization or re-optimization. In addition, systems should conduct ongoing monitoring to ensure compliance with OCCT prior to, during, and after a source or treatment change (USEPA 2015b).

6.2 Impacts of Source Water Changes

Changes in source water can have a significant impact on water quality, corrosion control treatment effectiveness, and lead and copper release. Examples of source changes include:

- Switching from a purchased treated water source to an untreated water source that requires treatment;
- Switching from a purchased treated water source to a different treated source;
- Changing from a ground to surface water source; and
- Adding a new source, such as a new ground water or purchased source, in the distribution system.

Not only can source water changes directly impact corrosion control treatment (e.g., pH, alkalinity, dissolved inorganic carbon (DIC), and corrosion inhibitor concentration), but they can also impact the effectiveness of corrosion control treatment through changes in water quality parameters such as natural organic matter (NOM), metals (e.g., iron and manganese), ions such as chloride and sulfate, oxidation-reduction potential (ORP), and buffer intensity. See Section 2.3 for information on how water quality can impact the release of lead and copper into drinking water.

The literature includes examples of how source water changes have impacted lead and copper release (Boyd et al., 2006; 2008). For example, changes in lead release associated with blending groundwater, treated surface water, and desalinated seawater sources were determined to be a function of temperature, alkalinity, pH, chloride and sulfate (Taylor et al., 2005; Tang et al., 2006). Total copper release has been attributed to changes in temperature, alkalinity, pH, sulfate, and silica (Imran et al., 2006; Xiao et al., 2007). In another study (Zhang et al., 2012), lead release from leaded solder increased with blending of desalinated seawater in pilot-scale pipe loops.

Source water changes can impact trace inorganic contaminant release from deposits or scales in the distribution system (Lytle et al., 2004; Schock, Hyland, and Welch, 2008; Friedman et al., 2010; Peng et al., 2012). As discussed in Section 2.3.9, dissolved lead can react with iron and manganese and form deposits on lead service lines and other pipe materials (Schock, Cantor, et al., 2014). Shifts in water chemistry (e.g., changes associated with blending disparate sources) can potentially affect release and remobilization of these contaminants in the distribution system (Schock, Lytle, et al., 2005; Hill et al., 2010; McFadden et al., 2011; Friedman et al., 2016), which can then impact the formation of passivating scales on lead- and copper-containing materials.

6.3 Impacts of Treatment Changes

Treatment changes that can potentially affect the corrosivity of treated water are identified in several references (USEPA, 2003; USEPA, 2007b; MOE, 2009; Schendel et al., 2009; Grigg, 2010), and discussed in more detail below.

6.3.1 Corrosion Control Treatment

Any proposed change to a system's CCT can have consequences for water quality in the distribution system and corrosion control effectiveness. Even small changes to pH/alkalinity/DIC adjustment processes and inhibitor doses can affect lead and copper levels. If a system proposes changes to any of these key parameters (e.g., lowers pH, lowers or shuts off corrosion inhibitor), there is the potential for increases in lead and/or copper in the water.

Changes in the inhibitor chemical used for treatment can also affect lead and copper release. For example, changing from an orthophosphate chemical to a blended phosphate chemical is significant because the mechanisms by which the two chemicals control lead release are different, and the effectiveness of blended phosphates depends on other constituents in the water (e.g., calcium). Changing to a different manufacturer of blended phosphates can impact lead and copper release, even if the percentage of orthophosphate in the blend is similar (see Chapter 3 for more information on blended phosphates). Systems may design for a specific corrosion control product, but obtain bids for different products with different formulations. Additional drivers for changing the inhibitor chemical include pricing, finished water quality, operational changes, and changes at the receiving wastewater treatment plant (Brown et al., 2013a).

6.3.2 Disinfection

Changing disinfectant from free chlorine to chloramine may destabilize Pb(IV) scales formed under highly oxidizing conditions (high free chlorine residual). This destabilization may cause higher lead levels to be observed (Boyd et al., 2008; Boyd et al., 2009). In order to prevent elevated lead levels, systems can maintain the current conditions where Pb(IV) was the predominant scale, can adjust the pH/alkalinity/DIC to convert scales to Pb(II) passivating films (i.e., pH greater than approximately 9.0 and DIC of 5 to 10 mg/L as C), or can use an orthophosphate inhibitor (optimally at pH in the 7.2 to 7.8 range) (Lytle et al., 2009). There may be a period of time during the conversion from Pb(IV)-based to Pb(II)-based scales where lead levels may increase. A real-world example occurred in the District of Columbia with the DC Water and Sewer Authority (currently known as DC Water) (Schock and Giani, 2004; USEPA, 2007b), in which conversion from free chlorine to chloramines for disinfection, along with pH variations in the distribution system and the presence of lead service lines, contributed to elevated lead levels over a sustained period of time.

Additional monitoring can help determine the typical range of ORP values (i.e., the baseline) in the distribution system prior to disinfectant changes. Special laboratory studies to determine the composition of the lead scales present in the system (e.g., Pb(II) or Pb(IV) scales) can be completed using pipe sections removed from the distribution system (Clement et al., 1998b; Sandvig et al., 2008). Primacy agencies can identify systems that may switch to chloramines or another disinfectant in the future by reviewing compliance with the Stage 2 Disinfection By-products Rule (DBPR).

For systems that use chloramines, nitrification may occur in the distribution system. In a corrosion control guidance manual developed for the Province of Ontario, a case study was presented in which nitrification reduced the pH from approximately 8.5 to 7.8, which resulted in increased lead release. In response, the system raised the finished water pH to 9.2 and observed reductions in lead levels at some sites (MOE, 2009). Nitrification can also be a problem for ground water systems that add chlorine and have high levels of ammonia in their source water.

Important Information about Pb(IV)

Do my lead service lines have Pb(IV) scales?

Pb(IV) (also known as Lead IV or Pb^{++++}) can occur on any lead surface. It forms under highly oxidative conditions. If you have lead service lines with a moderate pH (7 to 8), a consistent free chlorine residual throughout the system (typically 1 to 2 mg/L or higher), no corrosion inhibitor, and no lead problems, you might have predominantly Pb(IV) scales. To help determine if your systems is a candidate for Pb(IV) scales, you can measure ORP of the water. E_h values of 0.7 volts or higher are indicative of Pb(IV) scales. You can also evaluate the scale on exhumed lead service lines to find out for sure.

Can I promote formation of Pb(IV) scales to reduce lead levels?

Although some utilities are targeting the development of a Pb(IV) scale in their systems to control lead release (Brown et al., 2013a), questions remain as to how systems and primacy agencies can ensure that disinfectant residuals required for the formation and maintenance of Pb(IV) scales are maintained within lead service lines throughout the distribution system and to the customer's taps. This may be a particular challenge with homes that go unoccupied for an extended period of time. Therefore, EPA has not included formation of Pb(IV) scale as a corrosion control treatment technique in this document at this time.

What happens if I have Pb(IV) scales and I change treatment?

Changing disinfectant from free chlorine to chloramine for disinfection may destabilize Pb(IV) scales. Systems can use other corrosion control treatments such as pH/alkalinity/DIC adjustment or phosphate-based corrosion inhibitors, but lead levels may increase as the scale is converting from Pb(IV) to Pb(II)-based scale.

The type of chlorine used for disinfection may also have an impact on corrosion. Use of gaseous chlorine lowers the pH of the water resulting in potentially more corrosive water. For systems with low alkalinity water, this effect can be amplified (Schock, 1999). Sodium hypochlorite, a base, can increase the pH of the water.

6.3.3 Coagulation

Switching from a sulfate-based to a chloride-based coagulant may increase the chloride content of the water, increasing the chloride-to-sulfate mass ratio (CSMR). This may aggravate lead

release from galvanic connections such as lead solder on copper pipes or partial lead line replacements (Oliphant, 1983; Gregory, 1985; Reiber, 1991; Singley, 1994; Lauer, 2005; Nguyen et al., 2010; Triantafyllidou and Edwards, 2011; Clark et al., 2013; Wang et al., 2013). See Section 2.3.7 for additional discussion on the impacts of changes in chloride and sulfate on lead release.

Changes in pH to optimize the effectiveness of a new coagulant may impact the distribution system pH and cause changes in lead and copper release (USEPA, 2007d; Duranceau et al., 2004). Switching coagulants, or increased use of coagulants to achieve enhanced coagulation will also remove additional NOM. Changes in NOM can impact corrosion control in the distribution system; see Section 2.3.8 for more information.

6.3.4 Water Softening

Changing how softening is practiced at a treatment plant can affect corrosion control. Adding softening will raise the pH and change alkalinity, helping to control lead and copper release, whereas discontinuing softening will change these parameters, which may cause metal release (USEPA, 2007b).

6.3.5 Filtration

Nanofiltration and reverse osmosis remove alkalinity, hardness, and other dissolved compounds but do not remove carbon dioxide, resulting in a lower pH which can cause increases in lead and copper levels measured at the tap. They also remove NOM, which can impact corrosivity of the water (AwwaRF and DVGW-T, 1996; Mays, 1999; Kirmeyer et al., 2000; Duranceau et al., 2004; Schippers et al., 2004; USEPA, 2007b).

Chapter 7: References

APHA, AWWA, and WEF, 2005. *Standard Methods for the Examination of Water and Wastewater, 21st ed.* American Public Health Association. Washington, DC.

Appelo, C.A.J., and Postma, D. 2005. *Geochemistry, Groundwater and Pollution*. CRC Press. New York, NY.

ASTM D2688-11. 2005. *Standard Test Methods for the Corrosivity of Water in the Absence of Heat Transfer (Weight Loss Methods)*. ASTM International.

AWWA. 1993. *Initial Monitoring Experiences of Large Water Utilities under EPA's Lead and Copper Rule.* Water Industry Technical Action Fund (WITAF). AWWA. Denver, CO.

AWWA. 1999. *Water Quality and Treatment, a Handbook of Community Water Supplies*. 5th edition. Raymond Letterman, Editor. AWWA and McGraw-Hill. Denver, CO.

AWWA. 2004. Proceedings of Workshop - Getting the Lead Out: Analysis and Treatment of Elevated Lead Levels in DC's Drinking Water. Water Quality Technology Conference. San Antonio. AWWA. Denver, CO.

AWWA. 2005. *Managing Change and Unintended Consequences: Lead and Copper Rule Corrosion Control Treatment*. AWWA. Denver, CO.

AwwaRF. 1990. *Lead Control Strategies*. AwwaRF Report #90559. Project #406. AWWA Research Foundation (now Water Research Foundation) and AWWA. Denver, CO.

AwwaRF and DVGW-Technologiezentrum Wasser. 1996. *Internal Corrosion of Water Distribution Systems*. 2nd edition. AwwaRF Order 90508. Project #725. AWWA Research Foundation (now Water Research Foundation) and AWWA. Denver, CO.

Boyd G.R., Dewis, K.M., Sandvig, A.M., Kirmeyer, G.J., Reiber, S.H., and Korshin, G.V. 2006. What Effect Does Background Water Chemistry Have on Metals Release and Galvanic Coupling? Chapter 7 in *Effect of Changing Disinfectants on Distribution System Lead and Copper Release, Part 1 – Literature Review.* AwwaRF Order #91152. Project#3107a. AWWA Research Foundation. Denver, CO.

Boyd, G.R., Dewis, K.M., Korshin, G.V., Reiber, S.H., Schock, M.R., Sandvig, A.M., and Giani, R., 2008. Effects of Changing Disinfectants on Lead and Copper Release. *J. AWWA*, 100(11):75-87.

Boyd, G.R., McFadden, M.S., Reiber, S.H., Sandvig, A.M., Korshin, G.V., Giani, R., and Frenkel, A.I. 2009. *Effect of Changing Disinfectants on Distribution System Lead and Copper Release: Part 2 – Final Report*. WRF Order #3107. Water Research Foundation. Denver, CO.

Boyd, G.R., Tuccillo, M.E., Sandvig, A., Pelaez, M., Han, C., and Dionysiou, D.D. 2013. Nanomaterials: Removal Processes and Beneficial Applications in Treatment. *J. AWWA*, 105(12): E699-E708.

Britton, A., and Richards, W.N. 1981. Factors Influencing Plumbosolvency in Scotland. *J. Inst. Water Engrs. and Scientists*, 35(5):349-364.

Brown, R., McTigue, N., and Cornwell, D.A. 2013a. Strategies for Assessing Optimized Corrosion Control Treatment of Lead and Copper. *J. AWWA*, 105(5): 62-75.

Brown, R., McTigue, N., and Cornwell, D.A. 2013b. LSL Flushing and OCCT Case Studies. In *Proceedings of the AWWA Annual Conference*. AWWA. Denver, CO.

Brown, M.J., Raymond, J., Homa, D., Kennedy, C., and Sinks, T. 2011. Association Between Children's Blood Lead Levels, Lead Service Lines, and Water Disinfection, Washington, DC, 1998–2006. *Environ. Res.,* 111(1): 67-74.

Butler, J.N., and Cogley, D.R. 1998. *Ionic Equilibrium Solubility and pH Calculations*. John Wiley and Sons, New York, NY.

Cadmus Group. 2004. Investigation of Potential Environmental Impacts Due to the Use of Phosphate-Based Corrosion Inhibitors in the District of Columbia. Report Prepared for EPA Region 3.

Cantor, A.F., Denig-Chakoff, D., Vela, R.R., Oleinik, M.G., and Lynch, D.L. 2000. Use of Polyphosphate in Corrosion Control. *J. AWWA*, 92(2):95.

Carlson, K.H., Via, S., Bellamy, B., and Carlson, M. 2000. Secondary Effects of Enhanced Coagulation and Softening. *J. AWWA*. 92(6): 63-75.

Clark, B., Cartier, C., St. Clair, J., Triantafyllidou, S., Prévost, M., and Edwards, M. 2013. Effect of Connection Type on Galvanic Corrosion Between Lead and Copper Pipes. *J. AWWA,* 105: E576-E577.

Clement, J.A., Daly, W.J., Shorney, H.J., and Capuzzi, A.J. 1998a. An Innovative Approach to Understanding and Improving Distribution System Water Quality. *Proceedings of AWWA Water Quality Technology Conference, San Diego, CA*. AWWA. Denver, CO.

Clement, J., Sandvig, A., Snoeyink, V., Kriven, W., and Sarin, P. 1998b. *Analyses and Interpretation of the Physical, Chemical, and Biological Characteristics of Distribution System Pipe Scales*. Water Quality Technology Conference. AWWA. Denver, CO.

Clement, J. A., and Schock, M.R. 1998. *Buffer Intensity: What is It, and Why It's Critical for Controlling Distribution System Water Quality*. AWWA Water Quality Technology Conference, San Diego, CA. AWWA. Denver, CO.

Copeland, A., and Lytle, D.A. 2014. Measuring the Oxidation-Reduction Potential of Important Oxidants in Drinking Water. *J. AWWA*, 106(1): E10-E20.

Cook, J.B. 1992. Achieving Optimum Corrosion Control for Lead in Charleston, S.C.; A Case Study. *Jour. NEWWA*, 111(2):168.

Cornwell, D., Brown, R., and McTigue, N. 2015. Controlling Lead and Copper Rule Water Quality Parameters. *J. AWWA*, 107(2): E86-E96.

Del Toral, M.A., Porter, A., and Schock, M.R. 2013. Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study. *Environ. Sci. Tech*. 47(16): 9300-9307.

DeSantis, M.K., and Schock, M.R. 2014. Ground Truthing the 'Conventional Wisdom' of Lead Corrosion Control Using Mineralogical Analysis. AWWA Water Quality Technology Conference. November 19, 2014.

Dietrich A.M., Cuppett J.D., and Duncan S.E. 2008. How Much Copper Is Too Much? *OpFlow*, 34(9):8-30.

Dodrill, D.M., and Edwards, M. 1995. Corrosion Control on the Basis of Utility Experience. *J. AWWA*, 87(7):74.

Douglas, I., Guthmann, J., Muylwyk, Q. and Snoeyink, V. 2004. Corrosion Control in the City of Ottawa-Comparison of Alternatives and Case Study for Lead Reduction in Drinking Water. In: *11th Canadian National Drinking Water Conference and 2nd Policy Forum*, W. Robertson and T. Brooks (eds.). April 3-6, Calgary, AB. Canadian Water and Wastewater Association. Ottawa, ON.

Duranceau, S.J., Townley, D., and Bell, G.E.C. 2004. *Optimizing Corrosion Control in Distribution Systems*. AwwaRF Order #90983. Project #2648. AWWA Research Foundation. Denver, CO.

Edwards, M., and Dudi, A. 2004. Role of Chlorine and Chloramine in Corrosion of Lead-Bearing Plumbing Materials. *J. AWWA*, 96(10):69-81.

Edwards, M., Giani, R., Wujek, J., and Chung, C. 2004. *Use of Lead Profiles to Determine Source of Action Level Exceedances from Residential Homes in Washington, DC*, Sunday Workshop, AWWA Water Quality Technology Conference, San Antonio, TX.

Edwards, M., Jacobs, S., and Dodrill, D. 1999. Desktop Guidance for Mitigating Pb and Cu Corrosion By-Products. *J. AWWA*, 91(5):66-77.

Edwards, M., and McNeill, L.S. 2002. Effect of Phosphate Inhibitors on Lead Release from Pipes. *J. AWWA*, 94(1):79-90.

Edwards, M., Meyer, T.E., Rehring, J., Ferguson, J., Korshin, G., and Perry, S. 1996. *Role of Inorganic Anions, NOM, and Water Treatment Process in Copper Corrosion.* AwwaRF Order #90687. Project #831. AWWA Research Foundation. Denver, CO.

Estes-Smargiassi, S., and Cantor, A. 2006. Lead Service Line Contributions to Lead Levels at the Tap. AWWA Water Quality Technology Conference. Denver, CO. November 2006.

Freeze, R.A., and Cherry, J.A. 1979. *Groundwater*. Prentice Hall, NJ.

Friedman, M., Hill, A., Booth, S., Hallett, M., McNeil, L., McLean, J., Stevens, D., Sorenson, D., Hammer, T., Kent, W., De Hann, M., MacArthur, K., and Mitchell, K. 2016. *Metals Accumulation and Release within the Distribution System: Evaluation and Mitigation,* Project #4509. Water Research Foundation. Denver, CO.

Friedman, M.J., Hill, A.S., Reiber, S.H., Valentine, R.L., Larsen, G., Young, A., Korshin, G.V., and Peng, C.Y. 2010. Assessment of Inorganics Accumulation in Drinking Water System Scales and Sediments. WRF Project #3118. Water Research Foundation. Denver, CO

Gardels, M.C., and Sorg, T.J. 1989. A Laboratory Study of the Leaching of Lead from Water Faucets. *J. AWWA*, 81(7):101-113.

Giani, R., Edwards, M., Chung, C., and Wujek, J. 2004. *Lead Profiling Methodologies and Results*. Presented at Getting the Lead Out: Analysis and Treatment of Elevated Lead Levels in DC's Drinking Water at the AWWA Water Quality Technology Conference. Denver, CO.

Gregory, R. 1985. *Galvanic Corrosion of Lead and Copper Pipework: Phase I, Measurement of Galvanic Corrosion Potential in Selected Waters*. Water Research Centre Engineering, Swindon, England.

Grigg, N.S. 2010. *Secondary Impacts of Corrosion Control on Distribution System and Treatment Plant Equipment*. Project # 4029. Water Research Foundation. Denver, CO. www.waterrf.org/PublicReportLibrary/4029.pdf.

Hayes, C. R., Incledion, S., and Balch, M. 2008. Experience in Wales (UK) of the Optimization of Ortho-Phosphate Dosing for Controlling Lead in Drinking Water. *Journal of Water and Health***,** 6 (2), 177-185.

Hill, C.P., and Cantor, A.F. 2011. *Internal Corrosion Control in Water Distribution Systems. AWWA Manual M58, First Edition*. American Water Works Association. Denver, CO.

Hill, A.S., Friedman, M.J., Reiber, S.H., Korshin, G.V., and Valentine, R.L. 2010. Behavior of Trace Inorganic Contaminants in Drinking Water Distribution Systems. *J. AWWA,* 107(7): 107-118.

Holm, T.R., and Schock, M.R. 1991. Potential Effects of Polyphosphate Products on Lead Solubility in Plumbing Systems. *J. AWWA*, 83(7):76-82.

Hu, J., Gan, F., Triantafyllidou, S., Nguyen, C.K., and Edwards, M.A. 2012. Copper-Induced Metal Release from Lead Pipe into Drinking Water. *Corrosion,* 68(11): 1037-1048.

Imran, S.A., Dietz, J.D., Mutoti, G., Xiao, W., Taylor, J.S., and Desai, V. 2006. Optimizing Source Water Blends for Corrosion and Residual Control in Distribution Systems. *J. AWWA,* 98(5): 107-115.

James, C.N., Copeland, R.C., and Lytle, D.A. 2004. Relationships between Oxidation-Reduction Potential, Oxidant, and pH in Drinking Water. In *Proceedings of the AWWA Water Quality Technology Conference*. AWWA. Denver, CO.

Kimbrough, D.E. 2001. Brass Corrosion and the LCR Monitoring Program. *J. AWWA*, *93*(2):81-91.

Kimbrough, D.E. 2007. Brass Corrosion as a Source of Lead and Copper in Traditional and All-Plastic Distribution Systems. *J. AWWA*, *98*(8):70-76.

Kimbrough, D.E. 2009. Source Identification of Copper, Lead, Nickel, and Zinc Loading in Wastewater Reclamation Plant Influents from Corrosion of Brass in Plumbing Fixtures. *Environ. Pollut.,* 157(4):1310-6.

Kirmeyer, G.J., Clement, J. and Sandvig, A. 2000. *Distribution System Water Quality Changes Following Implementation of Corrosion Control Strategies*. AwwaRF Order #90764. Project #157. AWWA Research Foundation. Denver, CO.

Kirmeyer, G.J., Friedman, M., Martel, K., Thompson, G., Sandvig, A., Clement, J., and Frey, M. 2002. *Guidance Manual for Monitoring Distribution System Water Quality.* AwwaRF Order# 90882. Project #2522*.* AWWA Research Foundation. Denver, CO.

Kirmeyer, G.J., Murphy, B., Sandvig, A., Korshin, G., Shaha, B., Fabricino, M., and Burlingame, G. 2004. *Post-Optimization Lead and Copper Control Monitoring Strategies*. AwwaRF Order #90996F. Project #2679. AWWA Research Foundation. Denver, CO.

Kirmeyer, G.J., Sandvig, A.M., Pierson, G.L., and Neff, C.H. 1994. *Development of a Pipe Loop Protocol for Lead Control.* AwwaRF Order# 90650. Project #604. AWWA Research Foundation. Denver, CO.

Korshin, G.V., Perry, S.A.L., and Ferguson, J.F. 1996. Influence of NOM on Copper Corrosion. *J. AWWA*, 88(7): 36–47.

Korshin, G.V., Ferguson, J.F., Lancaster, A.N., and Wu, H. 1999. Corrosion and Metal Release for Lead-Containing Materials: Influence of NOM, AwwaRF Report No. 90759. Denver, CO: AWWA Research Foundation.

Korshin, G.V., Ferguson, J.F., and Lancaster. A.N. 2000. Influence of Natural Organic Matter on the Corrosion of Leaded Brass in Potable Water. *Corrosion Science*, 42: 53–66.

Korshin, G.V., Ferguson, J.F., and Lancaster, A.N. 2005. Influence of Natural Organic Matter on the Morphology of Corroding Lead Surfaces and Behavior of Lead-Containing Particles. *Water Research*, 39(5): 811–818.

Kvech, S., and Edwards, M. 2001. Role of Aluminosilicate Deposits in Lead and Copper Corrosion. *J. AWWA*, 93(11):104-112.

LaRosa-Thompson, J., Scheetz, B.E., Schock, M.R., Lytle, D.A., and Delaney, P.J. 1997. Sodium Silicate Corrosion Inhibitors: Issues of Effectiveness and Mechanism. Presented at AWWA Water Quality Technology Conference.

Lauer, W.C. 2005. *Water Quality in the Distribution System*. AWWA. Denver, CO.

Letterman, R.D. 1995. *Calcium Carbonate Dissolution Rate in Limestone Contactors, Research and Development Report*, EPA/600/SR-95/068, Risk Reduction Engineering Laboratory, Cincinnati, OH.

Letterman, R.D. Driscoll, C.T., Haddad, M., and Hsu, H.A. 1986. *Limestone Bed Contactors for Control of Corrosion at Small Water Utilities*. EPA 600/S2-86/099.

Letterman, R.D. Haddad, M. and Driscoll, C.T., Jr. 1991. Limestone Contactors: Steady State Design Relationships. *Jour. Envir. Engrg. Div.- ASCE,* 117(3):339-358.

Letterman, R.D., and Kathari, S. 1996. A Computer Program for the Design of Limestone Contactors. *Jour. NEWWA*, 110(1):42-47.

Lytle, D.A., and Schock, M.R. 1996. S*tagnation Time, Composition, pH and Orthophosphate Effects on Metal Leaching from Brass.* EPA/600/R-96/103. National Risk Management Research Laboratory, Office of Research and Development, USEPA. Cincinnati, OH.

Lytle, D.A., and Schock, M.R. 2005. The Formation of Pb (IV) Oxides in Chlorinated Water. *J. AWWA*, 97(11):102.

Lytle, D.A., Schock, M.R., Clement, J.A., and Spencer, C.M. 1998. Using Aeration for Corrosion Control*. J. AWWA*, 90(3):74-88.

Lytle, D.A., Schock, M.R., and Scheckel, K. 2009. The Inhibition of Pb (IV) Oxide Formation in Chlorinated Water by Orthophosphate. *Environ. Sci. Tech.*, 43(17), 6624-6631.

Lytle, D. A., Schock, M. R., and Sorg, T. J. 1995. Investigation on Techniques and Control of Building Lead and Copper Corrosion by Orthophosphate and Silicate, NACE Corrosion/95, Orlando, FL, 1995; pp 609/1-609/29.

Lytle, D.A., Sorg, T.J., and Frietch, C. 2004. Accumulation of Arsenic in Drinking Water Distribution Systems. *Environ Sci Technol.,* 38(20): 5365.

Mays, L.W. 1999. *Water Distribution Systems Handbook*. AWWA. Denver, CO.

McFadden, M., Giani, R., Kwan, P., and Reiber, S. 2011. Contributions to Drinking Water Lead from Galvanized Iron Corrosion Scales. *J. AWWA,* 103(4):76-89.

McNeill, L.S., and Edwards, M. 2004. Importance of Pb and Cu Particulate Species for Corrosion Control. *J. Environ. Eng.*, 130(2):136-144.

Miller, S.A. Investigation of Lead Solubility and Orthophosphate Addition in High pH Low DIC Water. Master of Science, Department of Biomedical, Chemical, and Environmental Engineering, College of Engineering and Applied Science, University of Cincinnati, Cincinnati, OH, 2014.

MOE. 2009. *Guidance Document for Preparing Corrosion Control Plans for Drinking Water Systems*. Ontario Ministry of Environment. https://ia802301.us.archive.org/18/items/guidancedocument00snsn21738/guidancedocument00snsn21738.pdf.

Montgomery, W.H. 2005. *Water Treatment Principles and Design*. 2nd Edition. John Wiley and Sons.

Muylwyk, Q., Gilks, J., Suffoletta, V., and Olesiuk, J. 2009. *Lead Occurrence and the Impact of LSL Replacement in a Well Buffered Groundwater*. Water Quality Technology Conference Proceedings. AWWA. Denver, CO.

MWRA. 2010. Massachusetts Water Resources Authority 90th Percentile Lead Levels in MWRA System of Fully-Supplied Communities, March 2010. www.mwra.com/watertesting/lead/webgraphs/2010/2010-march-640.jpg.

Nguyen, C., Stone, K., Clark, B., Edwards, M. Gagnon, G., and Knowles, A. 2010. Impact of Chloride:Sulfate Mass Ratio (CSMR) Changes on Lead Leaching in Potable Water. WRF Project #4088. Water Research Foundation. Denver, CO.

Nguyen, C.K., Stone, K.R., and Edwards, M.A. 2011. Chloride-to-Sulfate Mass Ratio: Practical Studies in Galvanic Corrosion of Lead Solder. *J. AWWA*, 103(1): 81-92.

NSF. 2010. *NSF/ANSI 61-2010. Drinking Water System Components – Health Effects*. NSF International. Ann Arbor, Michigan.

Oliphant, R.J. 1983. *Summary Report on the Contamination of Potable Water by Lead from Soldered Joints*. Water Research Center Engineering, Swindon, External Report 125-E.

Peng, C.-Y., Hill, A.S., Friedman, M.J., Valentine, R.L., Larson, G.S., Romero, A.M.Y., Reiber, S.H., and Korshin, G.V. 2012. Occurrence of Trace Inorganic Contaminants in Drinking Water Distribution Systems, *J. AWWA* 104:E181-E193.

Plummer, L.N., and Busenberg, E. 1982. Solubilities of Calcite Aragonite and Vaterite in CO_2-H_2O Solutions Between 0 and 90°C, and an Evaluation of the Aqueous Model for the System $CaCO_3$-CO_2-H_2O. *Geochimica et Cosmochimica Acta (The Journal of The Geochemical Society and The Meteoritical Society),* 46: 1011.

Rego, C.A., and Schock, M.R. 2007. Case Studies in the Integrated Use of Scale Analyses to Solve Lead Problems. Distribution System Research Symposium, AWWA. Denver, CO.

Reiber, S. 1991. Galvanic Stimulation of Corrosion on Lead-Tin Solder-Sweated Joints. *J. AWWA,* 83(7): 83-91.

Reiber, S., Poulsom, S., Perry, S.A.L., Edwards, M., Patel, S., and Dodrill, D.M. 1997. *A General Framework for Corrosion Control Based on Utility Experience*. AwwaRF Order #90712A. Project #910. AWWA Research Foundation, Denver, CO.

Rezania, L.W., and Anderl, W.H. 1996. Copper Corrosion and Iron Removal Plants. *National Conference on Integrating Corrosion Control and Other Water Quality Goals*, Cambridge, MA.

Rezania, L.W., and Anderl, W.H. 1997. Corrosion Control for High DIC Groundwater: Phosphate or Bust. AWWA Annual Conference, Atlanta, GA.

Rodgers, M. 2014. Impact of Corrosion Control on Publicly Owned Treatment Works. In *Proceedings of the Water Quality and Technology Conference*. AWWA. Denver, CO.

Safe Drinking Water Act Amendments of 1996. *Public Law 104-182.* 104th Congress. www.congress.gov/104/plaws/publ182/PLAW-104publ182.pdf.

Sandvig, A.M., Boyd, G., Kirmeyer, G., Edwards, M., Triantafyllidou, S., and Murphy, B. 2007. *Performance and Metal Release of Non-Leaded Brass Meters, Components, and Fittings*. AwwaRF Order # 91174. AWWA Research Foundation. Denver, CO.

Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R.R., Trussell, S., Cantor, A., and Prescott, A. 2008. *Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues*. AwwaRF Order # 91229. Project #3018. AWWA Research Foundation. Denver, CO.

Schendel, D.B., Chowdhury, Z.K., Hill, C.P., Summers, R.S., Towler, E., Balaji, R., Raucher, R.S., and Cromwell, J. 2009. *Simultaneous Compliance Tool: A Decision Tool to Help Utilities Develop Simultaneous Compliance Strategies*. WRF Order # 91263. Project #3115. Water Research Foundation. Denver, CO.

Schippers, J.C., Kruithof, J.C., Nederlof, M.M., Hofman, J.A.M.H. and Taylor, J. 2004. *Integrated Membrane Systems*. AwwaRF Order #90899. Project #264. AWWA Research Foundation. Denver, CO.

Schneider, O.D. Parks, J., Edwards, M., Atassi, A., and Kashyap, A. 2011. *Comparison of Zinc Versus Non-zinc Corrosion Control for Lead and Copper*. WRF Project #4103. Water Research Foundation. Denver, CO.

Schneider, O.D., Hughes, D.M., Bukhari, Z., LeChevallier, M., Schwartz, P., Sylvester, P., and Lee, J.J. 2010. Determining Vulnerability and Occurrence of Residential Backflow. *J. AWWA*, 102(8):52-63.

Schock, M.R. 1980. Response of Lead Solubility to Dissolved Carbonate in Drinking Water. *J. AWWA*, 72(12):695-704.

Schock, M.R. 1981. Erratum—Response of Lead Solubility to Dissolved Carbonate in Drinking Water. *J. AWWA,* 73(3):36.

Schock, M.R. 1989. Understanding Corrosion Control Strategies for Lead. *J. AWWA,* 81(7):88-101.

Schock, M. 1996. Corrosion Inhibitor Applications in Drinking Water Treatment: Conforming to the Lead and Copper Rule. Presented at NACE Corrosion 1996 Conference.

Schock, M.R. 1999. Internal Corrosion and Deposition Control. In *Water Quality and Treatment,* 5th Edition. R. Letterman (Ed.). McGraw-Hill Inc. New York, NY.

Schock, M.R. 2001. Tetravalent Lead: A Hitherto Unrecognized Control of Tap Water Lead Contamination. AWWA Water Quality Technology Conference. Denver, CO.

Schock, M.R. 2005. Lead Chemistry Basics, Scale Formation, and Corrosion Control Treatment. Simultaneous Compliance: The Lead/Chloramine Example. April 13, 2005, Virginia Section AWWA, Richmond, VA.

Schock, M.R. 2007a. Distribution System Considerations for Treatment. Workshop on Inorganic Contaminant Issues. August 22, 2007, Cincinnati, OH.

Schock, M.R. 2007b. New Insights Into Lead Corrosion Control and Treatment Change Impacts (with Some Considerations Towards Cu). Presented at Emerging Issues in Water Treatment MI Section, AWWA. May 15, 2007.

Schock, M.R., Cantor, A.F., Triantafyllidou, S., DeSantis, M.K., Scheckel, K.G. 2014. Importance of Pipe Deposits to Lead and Copper Rule Compliance. *J. AWWA.* 106(7): E336-E349.

Schock, M.R., Clement, J.A., Lytle, D.A., Sandvig, A.M., and Harmon, S.M. 1998. Replacing Polyphosphate with Silicate to Solve Problems with Lead, Copper and Source Water Iron. AWWA Water Quality Technology Conference, November 1-4, San Diego, CA.

Schock, M.R., DeSantis, M. K., Metz, D. H., Welch, M. M., Hyland, R.N., and Nadagouda, M.N. 2008. Revisiting the pH Effect on the Orthophosphate Control of Plumbosolvency, *Proceedings of the AWWA Annual Conference and Exposition*, Atlanta, GA.

Schock, M.R., and Fox, J.C. 2001. Solving Copper Corrosion Problems while Maintaining Lead Control in a High Alkalinity Water Using Orthophosphate. AWWA Annual Conference, June 3-7, Washington, DC.

Schock, M.R., and Giani, R. 2004. *Oxidant/Disinfectant Chemistry and Impacts on Lead Corrosion*. AWWA Water Quality Technology Conference. Denver, CO.

Schock, M.R., Holldber, J., Lovejoy, T.R., and Lowry, J. 2002. California's First Aeration Plants for Corrosion Control. *J. AWWA*, 94(3):88-100.

Schock, M.R., Hyland, R., and Welch, M. 2008. Occurrence of Contaminant Accumulation in Lead Pipe Scales from Domestic Drinking Water Distribution Systems. *Environ. Sci. Technol.,* 42(12): 4285-91.

Schock, M.R., and Lemieux, F.G. 2010. Challenges in addressing variability of lead in domestic plumbing. *Water Science & Technology: Water Supply***,** 10(5): 792-798.

Schock, M.R., and Lytle, D.A. 2011. Chapter 20: Internal Corrosion and Deposition Control. In *Water Quality and Treatment.* 6th Edition. AWWA and McGraw-Hill, Inc.

Schock, M.R., Lytle, D.A., Sandvig, A.M., Clement, J., and Harmon, S.M. 2005. Replacing Polyphosphate with Silicate To Solve Lead, Copper, and Source Water Iron Problems. *J. AWWA*, 97(11): 84-93.

Schock, M.R., and Rego, C. 2005. Lead and Copper Corrosion Control Theory Update. New England Water Works Association Conference Spring Exposition and Conference.

Schock, M.R., and Sandvig, A.M. 2006. Long-Term Impacts of Orthophosphate Treatment on Copper. In *Proceedings of the AWWA Annual Conference and Exposition, San Antonio, TX, June 11 - 15, 2006.* AWWA. Denver, CO.

Schock, M.R., Sandvig, A.M., Lemieux, F.G., and Desantis, M.K. 2012. Diagnostic Sampling to Reveal Hidden Lead and Copper Health Risks. 15th Canadian National Conference and 6th Policy Forum on Drinking Water, Kelowna, BC, October 21-24.

Schock, M.R., Scheckel, K.G., DeSantis, M., and Gerke, T.L. 2005. Mode of Occurrence, Treatment and Monitoring Significance of Tetravalent Lead. AWWA Water Quality Technology Conference. Denver, CO.

Schock, M.R., Triantafyllidou, S., and DeSantis, M.K. 2014. Peak Lead Levels and Diagnostics in Lead Service Lines Dominated by PbO_2. In *Proceedings of the AWWA Annual Conference*. AWWA. Denver, CO.

Schock, M.R., Wagner, I., and Oliphant, R. 1996. The Corrosion and Solubility of Lead in Drinking Water. In *Internal Corrosion of Water Distribution Systems*; 2nd edition. AwwaRF Order #90508. Project #725. AWWA Research Foundation/DVGW Forschungsstelle. Denver, CO. 131-230.

Sheiham, I., and Jackson, P.J. 1981. The Scientific Basis for Control of Lead in Drinking Water by Water Treatment. *J. Inst. Water Engrs. and Scientists*, 35(6):491.

Simon, G.P. 1991. Tables and Conversion Factors – Chemical Equivalent Weights and Conversion Factors. In: *Ion Exchange Training Manual*. Springer Science+Business Media. New York.

Singley, J.E. 1994. Electrochemical Nature of Lead Contamination. *J. AWWA*, 86(7): 91-96.

Smith, S.E., Colbourne, J.S., Holt, D.M., Lloyd, B.J., and Bisset, A. 1997. An Examination of the Nature and Occurrence of Deposits in a Distribution System and their Effect on Water Quality. AWWA Water Quality Technology Conference, November 17-21. Denver, CO.

Snoeyink, V., and Jenkins, D. 1980. *Water Chemistry*. John Wiley and Sons. New York, NY.

Snoeyink, V.L., Schock, M.R., Sarin, P., Wang, L., Chen, A.S., Harmon, C., and S.M. 2003. Aluminum-Containing Scales in Water Distribution Systems: Prevalence and Composition. *Journal of Water Supply: Research and Technology —Aqua***,** *52* (7): 455-474.

Spencer, C.M. 1998. Aeration and Limestone Contact for Radon Removal and Corrosion Control. *Jour. NEWWA*, 112(1):60-69.

Spencer, C.M., and Brown, W.E. 1997. pH Monitoring to Determine Aeration Effectiveness for Carbon Dioxide and Radon Removal. In *Proceedings of AWWA Water Quality Technology Conference*, November 9-13, Denver, CO.

Stone, K., Nguyen, C. and Edwards, M. 2009. Practical Identification and Resolution of Lead Corrosion Issues Due to Elevated Chloride to Sulfate Mass Ratio. AWWA Annual Conference, June 2009, San Diego, CA.

Stumm, W., and Morgan, J.J. 1981. *Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters*. 2nd Edition. John Wiley and Sons, New York.

Swertfeger, J., Hartman, D.J., Shrive, C., Metz, D., and DeMarco, J. 2006. Water Quality Effects of Partial Lead Replacement. In *Proceedings of the AWWA Annual Conference.* AWWA. Denver, CO.

Tang, Z., Hong, S., Xiao, W., and Taylor, J. 2006. Impacts of Blending Ground, Surface and Saline Waters on Lead Release in Drinking Water Distribution Systems. *Water Research*, 40: 943-950.

Taylor, J.S., Dietz, J.D., Randall, A.A., Hong, S.K., Norris, C.D., Mulford, L.A., Arevalo, J.M., Imran, S., Le Puil, M., Liu, S., Mutoti, I., Tang, J., Xiao, W., Cullen, C., Heaviside, R., Mehta, A., Patel, M., Vasquez, F., and Webb, D. 2005. *Effects of Blending on Distribution System Water Quality*. AwwaRF Order #91065F. Project #2702. AWWA Research Foundation. Denver, CO.

Taylor, J.S., Dietz, J.D., Randall, A.A., Norris, C.D., Alsheri, A., Arevalo, J., Guan, X., Lintereur, P., MacNevin, D., Stone, E., Vaidya, R., Zhao, B., Glatthorn, S., and Shekhar, A. 2008. *Control of Distribution System Water Quality Using Inhibitors*. AwwaRF Order #91241F. Project #2702. AWWA Research Foundation. Denver, CO.

Triantafyllidou, S., and Edwards, M. 2010. Contribution of Galvanic Corrosion to Lead in Water after Partial Lead Service Line Replacements. Order #4088b. Project #4088. Water Research Foundation. Denver, CO.

Triantafyllidou, S., and Edwards, M. 2011. Galvanic Corrosion after Simulated Small-Scale Partial Lead Service Line Replacements. *J. AWWA*, 103(9): 85-98.

Triantafyllidou, S., Schock, M., DeSantis, M., and White, C. 2015. Low Contribution of PbO_2-Coated Lead Service Lines to Water Lead Contamination at the Tap. *Environmental Science and Technology*, 49(6): 3746−3754.

Uchida, M., and Okuwaki, A. 1999. Dissolution Behavior of Lead Plates in Aqueous Nitrate Solutions. *Corros. Sci.*, 41(10): 1977-1986.

USEPA. 1982. *EPA Method 150.1, pH (Electrometric).* www.nemi.gov/methods/method_summary/4685/.

USEPA. 1987. Amendments to the Safe Drinking Water Act. *52 FR 20674*, June 2, 1987.

USEPA. 1991a. National Primary Drinking Water Regulations – Synthetic Organic Chemicals and Inorganic Chemicals; Monitoring for Unregulated Contaminants; National Primary Drinking Water Regulations Implementation; National Secondary Drinking Water Regulations. *Federal Register,* 56(20): 3573. January 30, 1991.

USEPA. 1991b. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. *Federal Register,* 56(110): 26505. June 7, 1991.

USEPA. 1991c. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. Technical Correction. *Federal Register,* 56(135): 32112. July 15, 1991.

USEPA. 1992a. *Lead and Copper Rule Guidance Manual, Vol. II: Corrosion Control Treatment*. Report No. EPA/811-B-92/002. US Environmental Protection Agency. Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/91019DM4.PDF?Dockey=91019DM4.PDF

USEPA. 1992b. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. Technical Correction. *Federal Register,* 57(125): 28785. June 29, 1992.

USEPA. 1994. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. Technical Correction. *Federal Register,* 59(125): 33860. June 30, 1994.

USEPA. 1997. Interpretation of New Drinking Water Requirements Relating to Lead Free Plumbing Fittings and Fixtures. *Federal Register,* 62(63): 44684. Aug. 22, 1997.

USEPA. 2000. National Primary Drinking Water Regulations for Lead and Copper. *Federal Register*, 65(8): 1950-2015. January 12, 2000. www.gpo.gov/fdsys/pkg/FR-2000-01-12/pdf/00-3.pdf.

USEPA. 2001. *How to Determine Compliance with Optimal Water Quality Parameters as Revised by the Lead and Copper Rule Minor Revisions.* United States Environmental Protection Agency. Office of Water 4606. EPA 815-R-99-019. February 2001. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=901U0100.pdf.

USEPA. 2003. *Final Revised Guidance Manual for Selecting Lead and Copper Control Strategies.* Report No. EPA-816-R-03-001. US Environmental Protection Agency, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100999U.pdf.

USEPA. 2004a. Lead and Copper Rule. Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Final Rule. *Federal Register,* 69(124): 38850. June 29, 2004.

USEPA. 2004b. USEPA *Local Limits Development Guidance*. Office of Wastewater Management 1203. EPA 833-R-04-002A. July 2004. https://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi/300062Q1.PDF?Dockey=300062Q1.PDF.

USEPA. 2004c. *Lead and Copper Rule – Clarification of Requirements for Collecting Samples and Calculating Compliance.* Office of Water (4606). November 23, 2004. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100NEFJ.PDF?Dockey=P100NEFJ.PDF.

USEPA. 2006a. *Inorganic Contaminant Accumulation in Potable Water Distribution Systems.* Office of Water (4601M). December 2006.

USEPA. 2006b. *Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems*, EPA 815-R-06-10. April 2006. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1009UBF.PDF?Dockey=P1009UBF.PDF.

USEPA. 2007a. National Primary Drinking Water Regulations for Lead and Copper: Short-Term Regulatory Revisions and Clarifications. *Federal Register*, 72 (195) :57782-57820. October 10, 2007. www.federalregister.gov/articles/2007/10/10/E7-19432/national-primary-drinking-water-regulations-for-lead-and-copper-short-term-regulatory-revisions-and.

USEPA. 2007b. *Simultaneous Compliance Guidance Manual for Long Term 2 and Stage 2 DBP Rules*. Office of Water (4601). EPA 815-R-07-017. March 2007. http://nepis.epa.gov/Exe/ZyPDF.cgi/60000E2Q.PDF?Dockey=60000E2Q.PDF.

USEPA. 2007c. *Elevated Lead in D.C. Drinking Water – A Study of Potential Causative Events, Final Summary Report*. Office of Water (4607M). EPA 815-R-07-021. August 2007. http://nepis.epa.gov/Exe/ZyPDF.cgi/P1007ZEI.PDF?Dockey=P1007ZEI.PDF.

USEPA. 2007d. *Lead and Copper Rule 2007 Short Term Revisions and Clarifications State Implementation Guidance*. Office of Water (4606M). EPA 816-D-07-003. December 2007. http://nepis.epa.gov/Exe/ZyPDF.cgi/P100A2A8.PDF?Dockey=P100A2A8.PDF.

USEPA. 2008a. *Implementing the Lead Public Education Provisions of the Lead and Copper Rule: A Guide for Community Water Systems*. Office of Water (4606M). EPA 816-R-08-007. June 2008. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=60001I4N.pdf.

USEPA. 2008b. *Implementing the Lead Public Education Provisions of the Lead and Copper Rule: A Guide for Non-Transient Non-Community Water Systems*. Office of Water (4606M). EPA 816-R-08-008. June 2008. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=60001I2F.pdf.

USEPA. 2008c. *Lead and Copper Rule: A Quick Reference Guide*. Office of Water (4606). EPA 816-F-08-018. http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=60001N8P.pdf.

USEPA. 2010a. *Nutrient Control Design Manual*. Office of Research and Development. EPA 600/R-10/100. August 2010. http://nepis.epa.gov/Exe/ZyPDF.cgi/P1008KTD.PDF?Dockey=P1008KTD.PDF.

USEPA. 2010b. *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems*. Office of Water (4606M). EPA 816-R-10-004. March 2010. http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.pdf.

USEPA. 2013. *Summary of the Reduction of Lead in Drinking Water Act and Frequently Asked Questions*. Office of Water (4707M) EPA 815-S-13-003. December 19, 2013. http://nepis.epa.gov/Exe/ZyPDF.cgi/P100M5DB.PDF?Dockey=P100M5DB.PDF.

USEPA. 2015a. *How to Identify Lead-Free Certification Marks for Drinking Water System & Plumbing Materials*. EPA/600/F-13/153c. Revised March 2015. http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.pdf.

USEPA. 2015b. Memorandum from Peter C. Grevatt, Director, Office of Ground Water and Drinking Water, to EPA Regional Water Division Directors, Regions I-X. Lead and Copper Rule Requirements for Optimal Corrosion Control Treatment for Large Drinking Water Systems. November 3, 2015. www.epa.gov/sites/production/files/2015-11/documents/occt_req_memo_signed_pg_2015-11-03-155158_508.pdf.

Vaidya, R.D. 2010. The Impact of Corrosion Inhibitors on Iron, Copper, and Lead Surface Scales in Drinking Water. In *Proceedings of the AWWA Annual Conference*. AWWA. Denver, CO.

Wang, Y., Mehta, V., Welter, G.J., and Giammar, D.E. 2013. Effect of Connection Methods on Lead Release from Galvanic Corrosion. *J. AWWA*, 105(7): E337-E351.

Wachinski, A.M. 2016. Tables and Conversion Factors – Common Water Treatment Chemicals. In: *Environmental Ion Exchange: Principles and Design*. 2nd edition. CRC Press. Boca Raton, FL.

Wasserstrom, L., Miller, S., Triantafyllidou, S., DeSantis, M., and Schock, M. 2017. Scale Formation under Blended Phosphate Treatment for a Utility with Lead Pipes. *J. AWWA*, 109(11): E464-E478.

Wilczak, A.J., Hokanson, D.R., Rhodes Trussel, R., Boozarpour, M., and Degraca, A. 2010. Water Conditioning For LCR Compliance and Control Of Metals Release In San Francisco's Water System. *J. AWWA*, 102(3):52-64.

Xiao, W., Hong, S., Tang, Z., and Taylor, J.S. 2007. Effects of Blending on Total Copper Release in Distribution Systems, *J. AWWA,* 99(1): 78-88.

Zhang, Y., Tseng, T.J., Andrews-Tate, C., Cheng, R.C., and Wattier, K.L. 2012. Pilot-Scale Evaluation of Blending Desalinated Seawater into a Distribution System, *J. AWWA,* 104: E416-E429.

Appendix A – Glossary

Term	Definition
90th Percentile	The concentration of lead or copper in tap water that is exceeded by 10 percent of the sites sampled during a monitoring period. For systems collecting five samples, the 90th percentile is the average of the fourth and fifth highest lead or copper result. For systems that are allowed by their primacy agencies to collect fewer than five samples, this value is the highest lead or copper result. The 90th percentile level is compared to the lead or copper action level (AL) to determine whether an AL has been exceeded.
Action Level (AL)	The concentration of lead or copper in tap water which determines whether a system may be required to install corrosion control treatment (CCT), collect water quality parameter (WQP) samples, collect lead and copper source water samples, replace lead service lines (LSLs), and/or deliver public education materials to consumers about lead. The action level for lead is 0.015 mg/L. The action level for copper is 1.3 mg/L.
Action Level Exceedance	Occurs when the 90th percentile lead or copper sample result is above its respective AL.
Aeration	A non-chemical method used for oxidation or adjusting pH where air is introduced into the water. This removes carbon dioxide, which results in an increase in pH.
Alkalinity	The capacity of water to neutralize acid. It is the sum of carbonate (CO_3^{2-}), bicarbonate (HCO_3^-), and hydroxide (OH^-) anions in the water.
Aluminum Carryover	This may occur when a system uses aluminum-containing compounds in their treatment and the aluminum passes through the treatment plant processes into the distribution system. It may affect hydraulic capacity or tie up orthophosphate needed for effective corrosion control treatment.
Analogous Systems	Water systems with similar water quality, treatment, and distribution systems.
Anion	A negative ion; an atom or group of atoms that has gained one or more electrons.
Anode	The component of an electrochemical cell where oxidation occurs and electrons are generated.
Anodic Inhibitor	A substance which can be used to reduce oxidation reactions at the anode.
Buffer Index	The ability of water to provide buffering against a pH increase or decrease caused by a corrosion process or water treatment chemical addition.
Buffer Intensity	Also called buffer capacity, this is a measure of the resistance of water to changes in pH, either up or down. It is related to alkalinity (sum of bicarbonate, carbonate, and hydroxyl ions) but varies with pH.
Cation	A positive ion; an atom or group of atoms that has lost one or more electrons.

Term	Definition
Chloride-to-Sulfate Mass Ratio (CSMR)	The relative ratio of chloride ions (Cl^-) to sulfate ions (SO_4^{2-}) in the water.
Community Water System (CWS)	A public water system (PWS) that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Corrosion	The physicochemical interaction between a metal and its environment which results in changes in the properties of the metal.
Corrosion Control Treatment (CCT)	A treatment designed to reduce the corrosivity of water toward metal plumbing materials, particularly lead and/or copper.
Corrosion Rate	The rate at which a metal or alloy will deteriorate over time as a result of electrochemical oxidation. The rate will vary according to the specific properties of the metal or alloy and its environmental conditions.
Corrosivity	The ability of a substance to break down (corrode) materials.
Coupon Study	Study that uses metal pieces (i.e., coupons) of lead, copper, iron, or steel to help determine how specific water treatments may help prevent release of metals from these materials.
Cu	The chemical symbol for copper.
Demonstration Study	A study to evaluate alternative treatment approaches for reducing lead and/or copper levels which includes development and implementation of testing protocols. Demonstration testing can incorporate pipe loops, coupon tests, scale analysis, or partial system testing.
Desktop Study	A study to determine appropriate corrosion control treatment for reducing lead and/or copper levels which includes evaluations of literature, historical data and information, theory, and similar system information.
Dissolved Inorganic Carbon (DIC)	An estimate of the amount of total carbonates in the form of carbon dioxide gas (CO_2 or H_2CO_3), bicarbonate ion (HCO_3^-), and carbonate ion (CO_3^{2-}).
E_h Value	The electrical potential as measured by an oxidation-reduction potential (ORP) probe. The higher the E_h value the more oxidizing the conditions.
Electromotive Force (EMF)	Energy supplied by a source divided by the electric charge transported through the source. For a galvanic cell it is equal to the electric potential difference for zero current through the cell.
Entry Point	Refers to points of entry into the drinking water distribution system from which samples will be representative of each source after treatment.
Finished Water	Water that has been treated and is ready to be delivered to customers.
Flushed Sample	A water sample collected after the water has been allowed to run for a specified period of time.
Galvanic Corrosion	Occurs when two different types of metals or alloys physically contact each other. One of the metals serves as the anode, with its corrosion rate accelerated, while the other serves as the cathode, with its corrosion rate reduced.

Term	Definition
Hardness	A measure of the amount of calcium and magnesium in the water. Hardness is typically reported as "mg/L as $CaCO_3$" (calcium carbonate). Hardness must be taken into consideration when corrosion control is selected and implemented because too much hardness can cause unintended side effects such as increased scaling, either within the pump station/treatment plant or out in the service area.
Ionic Strength	A measure of the concentration of ions in solution.
Langelier Saturation Index (LSI)	The comparison between the measured pH of water with the pH that water would have at saturation with $CaCO_3$. The LSI should only be used to predict scaling potential as an adverse secondary impact of pH or alkalinity adjustment and has no value as a corrosivity indicator for lead and copper.
Large Water System	System serving more than 50,000 people.
LCR	An acronym used to describe the Lead and Copper Rule, which was originally published on June 7, 1991 and also includes subsequent revisions to the rule.
Lead-free	The Reduction of Lead in Drinking Water Act was enacted on January 4, 2011 to amend the Safe Drinking Water Act (SDWA) to redefine the definition of “lead-free.” The bill specifies a maximum weighted average of 0.25 percent for wetted surfaces of pipes, fittings, and fixtures and retains the maximum lead content of 0.2 percent for solder and flux. This revised definition became effective on January 4, 2014.
Lead Service Line (LSL)	A service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck, or other fitting which is connected to such lead line (§141.2).
Limestone Contactor	A method for increasing pH, alkalinity, and calcium level by having water flow through a bed of crushed limestone.
Maximum Contaminant Level Goal (MCLG)	The level of a contaminant in drinking water below which there is no known or expected risk to health. It is set at zero for lead and 1.3 mg/L for copper.
Medium Water System	A water system that serves 3,301 to 50,000 people.
Microbial and Disinfection Byproducts Rules (MDBPR)	A series of rules from the Environmental Protection Agency (EPA) designed to protect drinking water supplies from microbial contamination while minimizing health risks from the formation of disinfection byproducts.
Natural Organic Matter (NOM)	Organic material derived from plants and animals in the environment.
Nitrification	Nitrification occurs when nitrifying bacteria convert ammonia (NH_3) into nitrite (NO_2^-) and nitrate (NO_3^-), which may lower the pH and alkalinity of the water, potentially accelerating brass corrosion and causing problems with lead release.

Term	Definition
Non-transient, Non-Community Water System (NTNCWS)	A public water system that is not a community water system and regularly serves at least 25 of the same persons during a minimum of 6 months of each year.
Optimal Corrosion Control Treatment (OCCT)	The corrosion control treatment that minimizes the lead and copper concentrations at users' taps while ensuring that the treatment does not cause the water system to violate any National Primary Drinking Water Regulations (NPDWRs) (§141.2).
Optimal Water Quality Parameters (OWQPs)	Specific ranges or minimums that are determined by the primacy agency for each relevant WQP. OWQPs represent the conditions under which systems must operate their corrosion control treatment to most effectively minimize the lead and copper concentrations at their users' taps while not violating any NPDWRs.
Orthophosphate	The active agent for phosphate-based inhibitor chemicals that, when added to the water, can combine with lead and copper to form several different compounds that have a strong tendency to form a passivating scale, inhibiting lead and copper release into drinking water).
Oxidant	A chemical compound that readily transfers oxygen atoms, or a substance that gains electrons in a redox chemical reaction.
Oxidation-Reduction Potential (ORP)	Also termed redox potential. An electrical measurement that describes the ability of water to oxidize or reduce substances. It affects how the water interacts with solid substances, such as pipe materials in a distribution system, and it affects the thermodynamic stability of minerals.
Partial System Testing	A type of demonstration study in which CCT is evaluated full-scale by applying the treatment to a hydraulically isolated portion of the distribution system.
Passivating Scale	A protective layer comprised of insoluble forms of metals that forms on the pipe surface and helps to prevent the release of lead or copper into drinking water.
Pb	The chemical symbol for lead.
pH	The pH of water is a measure of its acidity, otherwise known as hydrogen ion concentration (H^+ or H_3O^+).
Phosphate Inhibitors	Chemicals used to control lead by forming passivating phosphate-based compounds that help prevent (or inhibit) lead and copper from going into solution. Orthophosphate is the active agent for phosphate-based inhibition.
Pipe Loop Testing	Pipe loops consist of pipes or pipe sections made of a variety of materials, including lead pipe (new or excavated); copper pipe; copper pipe with lead soldered joints; or brass components (faucets or meters). Pipe loop testing is used to evaluate the ability of corrosion control treatments to reduce the presence of metals in drinking water.
Point-of-Use (POU) Treatment Unit	Treatment unit applied to a single tap to reduce contaminants in the drinking water at that tap.

Term	Definition
Polyphosphates	Polymers comprised of linked units of orthophosphate that are used to sequester (or bind) iron, manganese, and other constituents in the water to keep them in solution.
Pourbaix Diagram	Also known as a potential-pH diagram, predicts what aqueous species or corrosion by-product solid phases are thermodynamically stable under different conditions of electrochemical potential and pH.
Premise Plumbing	Premise plumbing includes that portion of the potable water distribution system associated with schools, hospitals, public and private housing, and other buildings.
Profile Testing	A type of demonstration study in which several sequential stagnation samples are collected at the tap and analyzed for lead and/or copper. This protocol for sampling can be used to evaluate lead and/or copper release from specific portions of the service line and premise piping system in a residence, and can help identify both the sources of lead and copper and the impact of replacing plumbing materials containing lead and copper.
Public Water System (PWS)	A system that provides piped water for human consumption, which has at least 15 service connections or regularly serves an average of at least 25 individuals daily for at least 60 days of the year. It includes: 1) the collection, treatment, storage, and distribution facilities operated and used by the system, and 2) any collection or pretreatment storage facilities not under the control of the system, but which it primarily uses.
Redox (Lead) Chart	A chart which shows lead speciation as a function of pH and the oxidizing or reducing environment; can be used to identify the potential for changes in ORP to influence lead or copper levels.
Secondary Standards	Non-enforceable federal guidelines regulating contaminants that may cause cosmetic, aesthetic effects (such as taste, odor, or color), or technical effects (corrosion, staining, scaling, and sedimentation) in drinking water. Iron (Fe) and manganese (Mn) are two contaminants with secondary standards (of 0.3 mg/L and 0.05 mg/L, respectively) based on their aesthetic and technical effects.
Sequestering Agents	Chemicals used to absorb metals such as iron and manganese that may interfere with treatment and/or cause customer complaints such as staining or taste problems. Examples include polyphosphates, sodium hexametaphosphate, and silicates.
Silicate Inhibitors	A mixture of soda ash and silicon dioxide that can form metal silicate compounds that serve as anodic inhibitors (i.e., they inhibit the oxidation and dissolution of the metal). They can passivate the surface of lead and copper based materials and help to reduce lead and copper levels. They can also sequester iron and manganese.
Small Water System	A water system that serves ≤ 3,300 people.
Solder	A metallic compound used to seal joints in plumbing. Until the lead ban took effect in 1988, most solder contained about 50 percent lead.

Term	Definition
Solubility (Lead or Copper) Chart	Used to predict the theoretical amount of lead or copper that may be released into water under specific water quality conditions (pH and DIC levels). They can be used as a general indication of the impact that changing water quality conditions may have on lead and copper release and its control.
Soluble/Insoluble	A substance which dissolves in a liquid is termed soluble. A substance that does not dissolve or has very low solubility is termed insoluble.
Standard 61, Section 9	A standard developed by NSF International for American National Standards Institute (ANSI) that limits the amount of lead that can be leached from endpoint devices for water intended for human consumption.
Water Distribution System	Refers to the piping, devices, and related fittings that are used to carry a system's drinking water to its users.
Water Quality Parameters (WQPs)	Used to help systems and primacy agencies determine what levels of CCT work best for the system and whether this treatment is being properly operated and maintained over time. WQPs include: pH, temperature, conductivity, alkalinity, calcium, orthophosphate, and silica.

Appendix B – Estimated Dissolved Inorganic Carbon (mg/L as C) based on Alkalinity and pH (with water temperature of 25 degrees C and TDS of 200)[1, 2, 3]

Total Alkalinity	pH																				
	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4
0	0																				
2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0					
4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0			
6	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	0	0		
8	4	3	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	0		
10	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	1	1	0	
12	5	4	4	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	1	1	
14	6	5	4	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	1	1	0
16	7	6	5	5	4	4	4	4	4	4	4	4	4	4	3	3	3	2	2	1	0
18	8	7	6	5	5	5	5	4	4	4	4	4	4	4	4	4	3	3	2	2	1
20	9	7	6	6	5	5	5	5	5	5	5	5	5	4	4	4	4	3	3	2	1
22	10	8	7	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	3	2	1
24	11	9	8	7	7	6	6	6	6	6	6	6	5	5	5	5	4	4	3	2	2
26	11	10	8	8	7	7	7	6	6	6	6	6	6	6	6	5	5	4	4	3	2
28	12	10	9	8	8	7	7	7	7	7	7	7	6	6	6	6	5	5	4	3	2
30	13	11	10	9	8	8	8	7	7	7	7	7	7	7	6	6	6	5	4	3	2
35	15	13	11	10	9	9	9	9	9	8	8	8	8	8	8	7	7	6	5	4	3
40	18	15	13	12	11	10	10	10	10	10	10	9	9	9	9	8	8	7	6	5	4
45	20	16	14	13	12	12	11	11	11	11	11	11	10	10	10	9	9	8	7	6	5
50	22	18	16	14	14	13	13	12	12	12	12	12	12	11	11	10	10	9	8	7	5
55	24	20	18	16	15	14	14	14	13	13	13	13	13	12	12	11	11	10	9	8	6
60	26	22	19	17	16	16	15	15	15	14	14	14	14	14	13	12	12	11	10	8	7
65	29	24	21	19	18	17	16	16	16	16	15	15	15	15	14	14	13	12	10	9	8

Total Alkalinity	pH																				
	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4
70	31	26	22	20	19	18	18	17	17	17	17	16	16	16	15	15	14	13	11	10	8
75	33	27	24	22	20	19	19	19	18	18	18	18	17	17	16	16	15	14	12	11	9
80	35	29	26	23	22	21	20	20	19	19	19	19	19	18	18	17	16	14	13	12	10
85	37	31	27	25	23	22	21	21	21	20	20	20	20	19	19	18	17	15	14	12	11
90	40	33	29	26	24	23	23	22	22	22	21	21	21	20	20	19	18	16	15	13	11
95	42	35	30	28	26	25	24	23	23	23	23	22	22	22	21	20	19	17	16	14	12
100	44	37	32	29	27	26	25	25	24	24	24	24	23	23	22	21	20	18	17	15	13
125	55	46	40	36	34	32	31	31	30	30	30	29	29	28	27	26	25	23	21	19	17
150	66	55	48	43	41	39	38	37	37	36	36	35	35	34	33	32	30	28	25	23	20
175	77	64	56	51	47	45	44	43	43	42	42	41	41	40	39	37	35	32	30	27	24
200	88	73	64	58	54	52	50	49	49	48	48	47	46	45	44	42	40	37	34	31	28
225	99	82	72	65	61	58	57	56	55	54	54	53	52	51	50	48	45	42	38	35	32
250	110	91	80	72	68	65	63	62	61	60	60	59	58	57	55	53	50	47	43	39	36
275	121	100	88	80	75	71	69	68	67	66	66	65	64	63	61	58	55	51	47	43	39
300	132	110	96	87	81	78	76	74	73	72	72	71	70	68	66	64	60	56	52	47	43
325	143	119	104	94	88	84	82	80	79	78	77	77	75	74	72	69	65	61	56	51	47
350	154	128	112	101	95	91	88	86	85	84	83	82	81	80	77	74	70	65	60	55	51
375	165	137	120	109	102	97	94	93	91	90	89	88	87	85	83	79	75	70	65	59	54
400	176	146	128	116	108	104	101	99	97	96	95	94	93	91	88	85	80	75	69	63	58

Notes:

[1] This table is meant to help primacy agencies and water systems identify potential carbonate precipitation constraints when evaluating CCT alternatives in Section 3.2. DIC values may be up to 20% higher at temperatures as low as 10 degrees C, and may vary slightly at higher and lower TDS.

[2] Shaded cells indicate chemically impossible conditions. May indicate analytical quality or total dissolved solids (TDS) assumption error.

[3] See USEPA (2003) for information on the formula used to calculate the DIC values provided above. Equilibrium constants are referenced from Butler and Cogley (1998); Plummer and Busenberg (1982); Schock (1980); and USEPA (2003).

Appendix C – Investigative Sampling to Determine the Source of Lead and Copper

Investigative sampling can be used to help identify the sources of lead and copper in tap water samples for a specific building. This type of information can help water systems and building owners determine the most effective lead source replacement strategy.

Systems can take two consecutive, first draw, 125-mL standing samples to identify whether the faucet, the brass underneath the faucet, or both components are contributing to lead in a tap water sample. Another method identified in the literature is collecting samples to develop premise plumbing profiles. This method may be used to determine where metals are being released within the premise plumbing and service line and can provide information on the stability and solubility of pipe scales within lead service lines (LSLs). A typical procedure is as follows:

- The water utility first collects pipe material data and estimates the length and diameter of plumbing in the home from the sample tap to the water main.
- After at least 6 hours of stagnation, water utility staff collect sequential 1-liter bottles of water without turning off the tap, typically from a kitchen sink, until all of the estimated volume in the pipe and service line has been collected (up to the water main, typically 10 to 15 bottles). Smaller volumes (e.g., 125 mL) can be collected for the first several samples to isolate potential sources of lead in the faucet from the underlying plumbing materials (connectors, valves).
- As an option, the utility can filter a small volume of water from specific samples (e.g., approximately 200 mL) on-site using a 0.45 micron filter to determine the particulate vs. dissolved portion of lead. A 'water hammer' sample can also be taken by rapidly opening and closing the tap several times to provide an indication of the amount of 'loose' particulate on the pipe walls.
- Analyzing samples for lead, copper, zinc, and iron can provide useful co-occurrence information that can be used to identify potential sources of lead in the plumbing network (Del Toral et al., 2013).

Exhibit C.1 provides an example of a lead profile at a residential home with a LSL, and identifies which portions of the premise plumbing are contributing to elevated lead levels. The home had 8 ft of copper pipe from the kitchen tap to the meter/LSL and 89 ft of LSL following that (Del Toral et al., 2013).

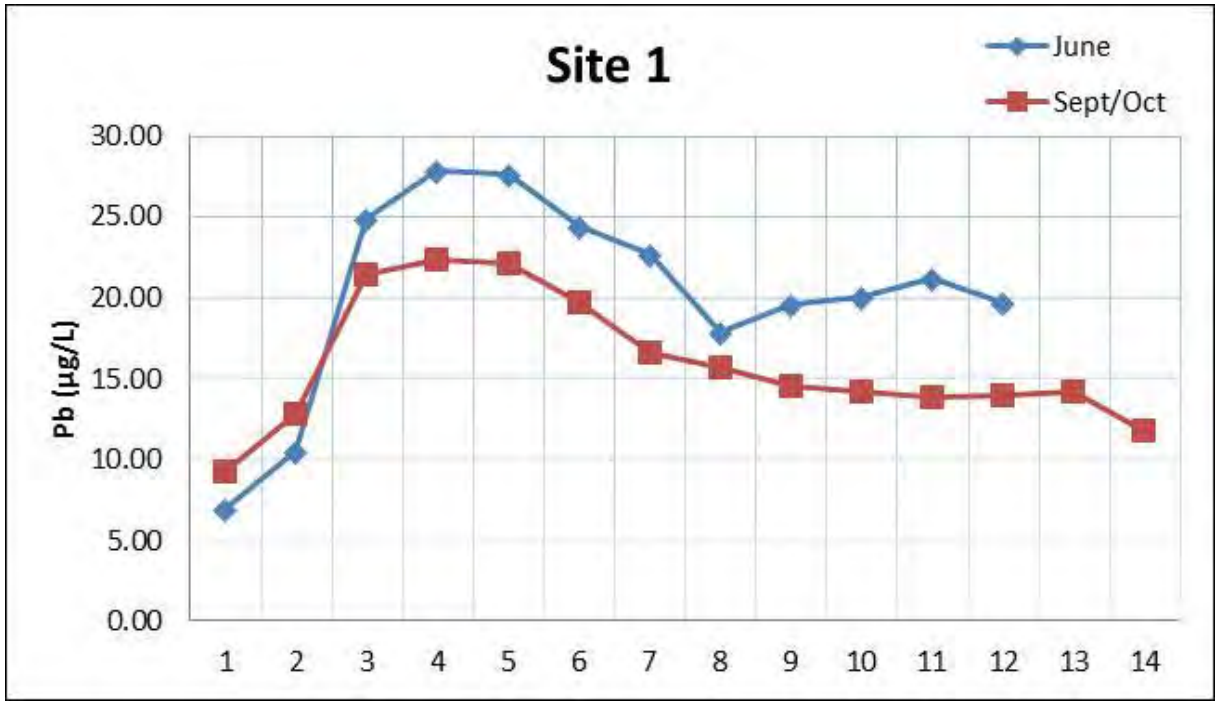


Exhibit C.1: Example of a Lead Profile (Del Toral et al., 2013)

Note: the x-axis represents sequential samples (typically liters)

Appendix D – Water Quality Data and Information Collection Forms

This appendix contains the following forms:

D.1 Water Quality Data – Raw Water
D.2 Water Quality Data – Entry Point
D.3 Water Quality Data – Distribution System
D.4 LCR Data Summary
D.5 Treatment Process Information
D.6 Lead Service Line (LSL) Information
D.7 Distribution System Materials and Operation

These forms and recommended procedures are also available electronically in the ***OCCT Evaluation Templates***.

Important notes about these forms are below.

1) These are technical recommendations only, and can be changed by the primacy agency to reflect system-specific conditions and/or primacy agency needs.

2) These tables can be included in the system's corrosion control treatment (CCT) study report or submitted separately to the primacy agency.

3) Environmental Protection Agency (EPA)-approved analytical methods must be used for regulatory sample analyses (§141.89(a)). Primacy agency approved analytical methods may be used for analysis of additional samples. In some cases, this may include use of field test kits.

Exhibit D.1: Water Quality Data – Raw Water

Exhibit D.1 Water Quality Data - Raw Water [1]													
Source Name (if more than one source, copy this section and complete for each source)													
Source ID													
Source Type													
Parameter	**Required Monitoring**			**Recommended Monitoring**			**System Data**						
	No. of Samples	**Frequency**	**Duration of Sampling**	**No. of Samples**	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
									Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
Lead (mg/L)				2	2x/year	1 year							
Copper (mg/L)				2	2x/year	1 year							
pH				6	every other month	1 year							
Alkalinity (mg/L as $CaCO_3$)				4	quarterly	1 year							
Hardness (mg/L as $CaCO_3$)				4	quarterly	1 year							
Temperature (°C)				6	every other month	1 year							
Calcium (mg/L as Ca)				4	quarterly	1 year							
Total Dissolved Solids (mg/L)[2]				4	quarterly	1 year							
Conductivity (as µmho/cm @ 25 °C)[2]				6	every other month	1 year							
Total Chlorine (mg/L as Cl_2)				NA	NA	NA							
Free Chlorine (mg/L as Cl_2)				NA	NA	NA							
Chloride (mg/L)				2	2x/year	1 year							
Sulfate (mg/L)				2	2x/year	1 year							
Iron (mg/L)				4	quarterly	1 year							
Manganese (mg/L)				4	quarterly	1 year							
Silica (mg/L as SiO_2)				4	quarterly	1 year							

[1] Under the Lead and Copper Rule, no raw water monitoring is required. However, if raw water monitoring data are available, this may assist the system in selecting the corrosion control treatment that will work best with the system's water quality.

[2] Either total dissolved solids or conductivity can be measured.

NA = not applicable

Exhibit D.2: Water Quality Data – Entry Point

Exhibit D.2 Water Quality Data - Entry Point[1]													
Source Name (If more than one source, copy this section and complete for each source)													
Source ID													
Source Type													
Parameters	**Entry Point[4]**												
	Required Monitoring under LCR			**Recommended Monitoring**			**System Data**						
	No. of Samples	**Frequency**	**Duration of Sampling**	**No. of Samples**	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
									Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
Lead (mg/L)[1]				1	1x/year	1 year							
Copper (mg/L)[1]				1	1x/year	1 year							
pH				12[5]	monthly	1 year							
Alkalinity (mg/L as $CaCO_3$)				12[5]	monthly	1 year							
Orthophosphate (mg/L as P)				12	monthly	1 year							
Hardness (mg/L as $CaCO_3$)				12	monthly	1 year							
Temperature (°C)				12	monthly	1 year							
Calcium (mg/L as Ca)				12	monthly	1 year							
Total Dissolved Solids (mg/L)[2]				6	every other month	1 year							
Conductivity (as µmho/cm @ 25 °C)[2]				12	monthly	1 year							
Disinfectant Residual[3]													
Total Chlorine (mg/L as Cl_2)				12[5]	monthly	2 year							
Free Chlorine (mg/L as Cl_2)				12[5]	monthly	3 year							
Chloride (mg/L)				6	every other month	1 year							
Sulfate (mg/L)				6	every other month	1 year							
Iron (mg/L)				4	quarterly	1 year							
Manganese (mg/L)				4	quarterly	1 year							
Silica (mg/L as SiO_2)				4	quarterly	1 year							

[1] Enter data for each entry point. Copy sheet for multiple entry points.
[2] Either total dissolved solids or conductivity can be measured.
[3] Both total and free chlorine should be measured.
[4] If there is no treatment, then system is only required to sample at the entry point, unless water is piped a significant distance, or stored, between the raw water point and the entry point.
[5] Additional data may be available from the system depending on process control data collection schedules.

Exhibit D.3: Water Quality Data – Distribution System

Exhibit D.3 Water Quality Data - Distribution System													
Source Name (if more than one source, copy this section and complete for each source)													
Source ID													
Source Type													
Parameter	**Required Monitoring under LCR**			**Recommended Data Collection**			**System Data**						
	No. of Samples	**Frequency**	**Duration of Sampling**	**No. of Sites**	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
									Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
pH				12[3]	monthly	1 year							
Alkalinity (mg/L as $CaCO_3$)				6	monthly	1 year							
Orthophosphate (mg/L as P)				12[3]	monthly	1 year							
Hardness (mg/L as $CaCO_3$)				6	monthly	1 year							
Temperature (°C)				12[3]	monthly	1 year							
Calcium (mg/L as Ca)				6	monthly	1 year							
Total Dissolved Solids (mg/L)[1]				6	monthly	1 year							
Conductivity (as µmho/cm @ 25 °C)[1]				12	monthly	1 year							
Disinfectant Residual[2]													
Total Chlorine (mg/L as Cl_2)				12[3]	monthly	1 year							
Free Chlorine (mg/L as Cl_2)				12[3]	monthly	1 year							
Chloride (mg/L)				4	quarterly	1 year							
Sulfate (mg/L)				4	quarterly	1 year							
Iron (mg/L)				4	quarterly	1 year							
Manganese (mg/L)				4	quarterly	1 year							
Silica (mg/L as SiO_2)				4	quarterly	1 year							

[1] Either total dissolved solids or conductivity can be measured.
[2] Both total and free chlorine should be measured.
[3] Select a combination of sites at various distances from the entry point.

Exhibit D.4: LCR Data Summary

Exhibit D.4 Lead and Copper Rule (LCR) Data Summary								
Parameters	**First Round of Regulated Tap Samples**							
	No. of Samples	**Minimum Value**	**Maximum Value**	**Average**	**90th Percentile**	**# Samples > 0.015 mg/L for lead or > 1.3 mg/L for copper**	**Sample Period Start Date (dd/mm/yyyy)**	**Sample Period End Date (dd/mm/yyyy)**
Lead (mg/L)								
Copper (mg/L)								

Parameters	**Second Round of Regulated Tap Samples**							
	No. of Samples	**Minimum Value**	**Maximum Value**	**Average**	**90th Percentile**	**# Samples > 0.015 mg/L for lead or > 1.3 mg/L for copper**	**Sample Period Start Date (dd/mm/yyyy)**	**Sample Period End Date (dd/mm/yyyy)**
Lead (mg/L)								
Copper (mg/L)								

In the Last 10 Years	**How Many Times Has the 90th Percentile of Sampling Results Exceeded the Action Level[1] (indicate the year in which these occurred in parentheses)**
Lead (mg/L)	
Copper (mg/L)	

1. Action Levels are 0.015 mg/L for lead and 1.3 mg/L for copper.

Exhibit D.5: Treatment Process Information

Exhibit D.5 Treatment Process Information *Note: Indicate current and planned, future drinking water treatment processes.*							
Source Name (if more than one source, copy this section and complete for each source)							
Source ID							
Source Type							
Treatment Process	Current Treatment			Planned Future Treatment			
	Mark an 'X' if applicable	Chemical Used and Dosage (if applicable)	Notes/Comments	Mark an 'X' if applicable	Chemical Planned and Dosage (if applicable)	Estimated Implementation Date (mm/yyyy)	Notes/Comments
Primary Disinfection							
Secondary Disinfection							
Conventional Filtration							
Membrane Filtration							
Ion Exchange							
Aeration							
Lime Softening							
Fluoride Addition							
Orthophosphate (concentration mg/L as P)							
Blended Phosphate[1]							
Silicate							
Other Processes							
Other Processes							
Other Chemical Addition							
Chemical Name #1							
Chemical Name #2							
Chemical Name #3							
Chemical Name #4							
Chemical Name #5							
[1] Include percentage of the blend that is orthophosphate in Notes/Comments field.							

Exhibit D.6: Lead Service Line Information

Exhibit D.6. Lead Service Line Information	
Question	**Response**
Does your system have **ANY** full[1] or partial[2] lead service lines (YES or NO)?	
If **YES**, approximately how many <u>full</u> lead service lines are in place?	
If **YES**, approximately how many <u>partial</u> lead service lines are in place?	
What was the approximate range of years the lead service lines were installed (YYYY to YYYY)?	

[1] A <u>full</u> lead service line refers to the pipe from the water main to the residence being lead pipe, see illustration below (Source: Sandvig et al., 2008).

[2] A <u>partial</u> lead service line refers to only a portion of the pipe from the main to the residence being lead pipe. This could be the portion of the pipe that is under the control of the utility or the portion of the pipe that is under the control of the property owner, see illustration below (Source: Sandvig et al., 2008).

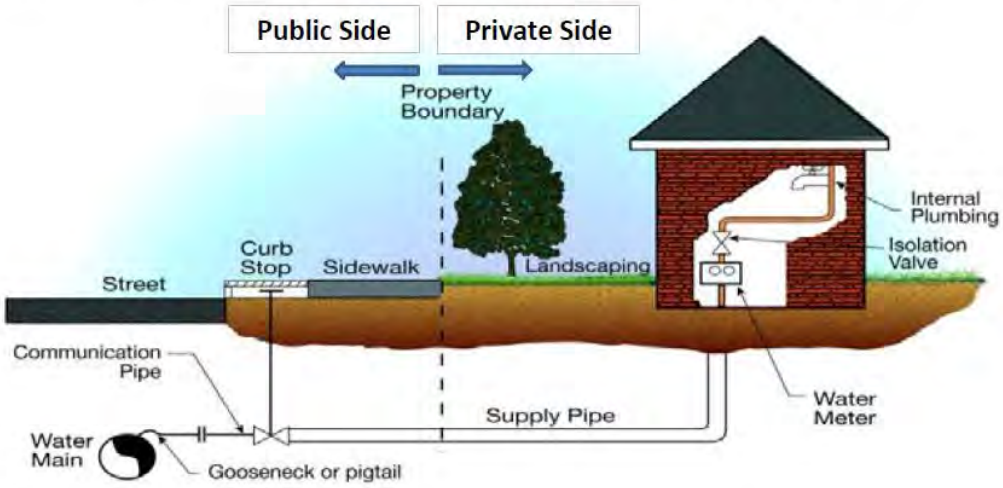


Exhibit D.7: Distribution System Materials and Operation

Exhibit D.7 Distribution System Materials and Operation		
Question	**Response**	
When was your last material survey completed (40 CFR §141.86(a))?		
What percentage of water mains are unlined cast iron? What is the approximate total length of unlined cast iron mains (feet)?		
Provide any additional comments on distribution system materials (e.g., list all types).		
Do you flush your system (YES or NO)?		
If **YES**, how often do you flush your system?		
Do you have dead-ends in your system that have experienced water quality problems (YES or NO)?		
If you chloraminate, do you use free chlorine periodically during the year (YES or NO)?		
If **YES**, approximately how often do you use free chlorine and at what dose?		
If **YES**, approximately how long is free chlorine used? (i.e. one week, one month, etc...)		
Do you have red water complaints?		
If **YES**, how often do they occur? Rarely (a few times a year), Sometimes (monthly), Regularly (weekly)		
Does your system purchase any water (YES or NO)?		
If **YES**, how much? If it varies by month please list an average per month.		
What is the source of the purchased water?		
Do you have plans to change your source water or purchase water from another system (YES or NO)?		
If **YES**, please describe.		
If applicable, do you have plans to change your coagulant in the near future (i.e. in the next 1-3 years) (YES or NO)?		
	Current Coagulant	Future Coagulant
If **YES**, please list your current coagulant and the coagulant you plan to use. Please include the planned implementation date.		

Appendix E – OCCT Recommendation Forms for Systems Serving ≤ 50,000 People

Appendix E supports Chapter 4 by providing forms systems can use to identify corrosion control treatment options, evaluate secondary impacts, and document conclusions and rationale for the optimal corrosion control treatment (OCCT) recommendation.

This appendix contains the following forms:

E.1 Identification of Potential Corrosion Control Treatment Options
E.2 Evaluation of Secondary Impacts
E.3 Documentation of OCCT Recommendation

These forms and recommended procedures are also available electronically in the ***OCCT Evaluation Templates***.

Important notes about these forms are below.

1) The procedures in Exhibits E.1 through E.3 are technical recommendations only, and can be changed by the primacy agency to reflect system-specific considerations and/or primacy agency needs.

2) These tables can be included in the system's corrosion control treatment (CCT) study report or submitted separately to the primacy agency.

Exhibit E.1: Identification of Potential Corrosion Control Treatment Options

Exhibit E.1: Identification of Potential Corrosion Control Treatment Options		
CCT Options	**Put an X next to all that apply**	**Identify possible treatment chemicals or processes for the options identified (chemical formula or common name)**
Raise pH		
Raise DIC (alkalinity)		
Add orthophosphate[1]		
Add silicate		
Add blended phosphate[1]		
[1] For orthophosphate and blended phosphate, provide in mg/L as P. For blended phosphate, include the percent of the blend that is orthophosphate.		

Exhibit E.2: Evaluation of Secondary Impacts

Exhibit E.2: Evaluation of Secondary Impacts[1]					
Source Name (if more than one source, copy this section and complete for each source)					
Source ID					
Source Type					
Questions	**Adjust pH**	**Adjust DIC (Alkalinity)**	**Add Orthophosphate**	**Add Silicate**	**Add Blended Phosphate**
Is the chemical available (YES or NO)?					
Do you feel your current operators will have difficulty using this chemical and operating the treatment?					
What are the relative costs for each treatment option? (High, Medium, Low) (Provide your best estimate, which should include cost for the chemical, any equipment that needs to be purchased, increased operator time, etc...) (Indicate what dosage cost comparisons are based on.)					
Will this treatment change potentially cause excessive scaling (See OCCT Manual Exhibit 3-2)?					
Additional Notes/Comments					

[1] Complete for each corrosion control treatment option identified in Exhibit E.1.

Exhibit E.3: Documentation of OCCT Recommendation

Exhibit E.3: Documentation of OCCT Recommendation					
Source Name (if more than one source, copy this section and complete for each source)					
Source ID					
Source Type					
Identify Recommended Treatment Approach	**Adjust pH**	**Adjust DIC (Alkalinity)**	**Add Orthophosphate**	**Add Silicate**	**Add Blended Phosphate**
Recommended Chemical or Process					
Recommended Dosage					
Recommended Levels at the Entry Point	**pH**	**Alkalinity (mg/L as $CaCO_3$)**	**Inhibitor[1]**		
Minimum					
Maximum					
Average					
Recommended Levels in the Distribution System	**pH**	**Alkalinity (mg/L as $CaCO_3$)**	**Inhibitor[1]**		
Minimum					
Maximum					
Average					
[1] For orthophosphate and blended phosphate, provide in mg/L as P.					

PRINTED NAME and Signature of Responsible Party from Public Water System

Date

Appendix F – Tools for Conducting Corrosion Control Studies

This appendix provides a description of tools that can be used to conduct desktop or demonstration-type corrosion control studies. Note that the Lead and Copper Rule (LCR) requires the use of specific types of studies - see Chapter 4 for regulatory requirements. This appendix describes both the required types of studies and additional study tools that can be used to help identify the best corrosion control treatment.

F.1 Desktop Study Tools

Desktop study tools use analogous systems, charts and other information related to corrosion control theory, and models to select appropriate corrosion control treatment strategies. These tools are described below.

Analogous Systems[34]

Drinking water systems can evaluate and compare data from other systems with similar water quality, treatment, and distribution systems (analogous systems) to help identify corrosion control treatment options. A description of the raw source water, water treatment processes, distribution system, source water usage, and the performance of their corrosion control strategy should be included in the corrosion control study report. Systems may want to start with neighboring water systems using the same aquifer or surface source. Systems can also conduct a survey of similar systems to obtain this information; seek technical assistance from engineering consultants or industry associations; or review literature sources, such as the report by The American Water Works Association's (AWWA's) Water Industry Technical Action Fund which provides information on lead, copper, and other water quality information for 400 US water systems (AWWA, 1993). An additional resource is the Distribution System Optimization Program developed by the Partnership for Safe Water and the Water Research Foundation. Participating systems can benchmark their performance against utilities with similar water quality issues.

Corrosion Control Treatment Theory

Chapter 3 contains significant background information on corrosion control treatment. This information can help systems conduct their study and evaluate different treatment strategies.

Models

Modeling software can be used to evaluate corrosion characteristics of water and to predict changes in those characteristics with changes in treatment. However, systems and primacy

[34] Systems conducting a desktop study (with no demonstration testing) must conduct analyses based on documented analogous treatments with other systems of similar size, water chemistry, and distribution system configuration to meet the requirements of the LCR.

agencies should consider any relevant limitations that may be inherent to the modeled data. Many models are not valid for scaling potential in the presence of phosphates, silicates, or natural organic matter (NOM), and some trace metals that inhibit nucleation and growth of $CaCO_3$. Also, calcite may not be the proper solid phase in some systems. Utilities with corrosion inhibitors or naturally occurring scale-inhibiting factors should consider marble testing or field studies to predict scale potential.

F.2 Demonstration Study Tools

This section describes coupon tests, pipe loop studies, solid and scale analysis, and partial system tests. Several documents can be referenced for more detailed information on the usefulness and relative costs of these tools (USEPA, 2007d; AWWA, 2005; Kirmeyer et al., 2004; USEPA, 1992a; AwwaRF, 1990). A guidance document prepared by the Ontario Ministry of Environment (MOE, 2009) provides a summary of these different tools and recommendations on which to use given a system's size and complexity. This document can be found at https://ia802301.us.archive.org/18/items/guidancedocument00snsn21738/guidancedocument00snsn21738.pdf.

Coupon Studies

Coupon studies use flat metal pieces (i.e., coupons) of lead, copper, iron, or steel to help determine how specific corrosion control treatments (CCTs) may help prevent release of metals from these materials. These coupons can be evaluated using a variety of different protocols (static dump and fill, mounted in a flow-through pipe rig, or mounted in the distribution system) after which they can be taken out and weighed to determine total weight loss. Coupons can also be used to measure the instantaneous corrosion rate of the metal using a variety of electrochemical techniques (ASTM, 2005; AwwaRF, 1990; Schock, 1996; USEPA, 2007d). It is important to note that coupon studies can be useful in determining the corrosion rate, but may have limited use in predicting the concentrations of lead or copper in the water (Schock, 1996).

Pipe Loop Testing

Pipe loops consist of pipes or pipe sections made of a variety of materials, including lead pipe (new or excavated), copper pipe, copper pipe with lead soldered joints, or brass components (faucets or meters). Pipe loop studies can be designed as either flow-through systems (where water flows through the apparatus once and is discharged to waste) or as recirculating systems (where a batch of water is continuously recirculated through the loops for a set period of time). There are several references that provide detailed information on the design and operation of pipe loop systems (Schock and Lytle, 2011; AwwaRF, 1990; and Kirmeyer et al., 1994). Pipe loops may need to be operated for several months or years to develop scales that are similar to what would be found on premise piping in the system, and to measure stable metal levels. One limitation of pipe loops is that they do not provide indication of contribution of lead release

from physical disturbances that occur as part of routine system operations, maintenance and repairs.

Scale and Solids Analysis

The analysis of actual pipe scale, and solids released from pipe scales, can provide an understanding of their composition and role in release of lead and/or copper to the water. These types of analyses may be particularly valuable to larger systems with lead service lines (LSLs) that are contemplating a water quality and/or treatment change (particularly a switch from free chlorine to chloramines for disinfection). Many techniques are available to examine the scale: visual inspection, X-ray emission spectroscopy, X-ray diffraction, X-ray fluorescence, Raman spectroscopy, inductively coupled plasma mass spectroscopy (ICP-MS), and scanning electron microscopy with energy dispersive spectroscopy (EDS). There is currently no standardized approach for evaluating pipe scales and solids, but there are references that provide information on the application of these techniques and typical results (Smith et al., 1997; Sandvig et al., 2008; Rego and Schock, 2007).

Partial System Testing

CCTs can be evaluated full-scale by applying the treatment to a hydraulically isolated portion of the distribution system. Systems can collect samples from residential taps for lead and copper analysis and additional water quality parameters in the distribution system. Partial system testing can be relatively expensive, but it does provide a direct means for examining the potential secondary impacts of implementing a particular CCT and for monitoring the implementation timeframes for installation of CCT (i.e., length of time needed for an inhibitor to be effective).

Appendix G – Forms for Follow-up Monitoring and Setting OWQPs

Appendix G supports Chapter 5 by providing data collection forms for follow-up monitoring and technical recommendations for primacy agencies to consider when designating Optimal Water Quality Parameters (OWQPs) for pH/alkalinity/dissolved inorganic carbon (DIC) adjustment, orthophosphate treatment, blended phosphate treatment, and use of a silicate inhibitor.

This appendix contains the following forms:

G.1 Results of Follow-up Lead and Copper Tap Monitoring
G.2 Results of Follow-up WQP Monitoring – Entry Point
G.3 Results of Follow-up WQP Monitoring – Taps
G.4 Setting OWQPs for pH/Alkalinity/DIC Adjustment
G.5 Setting OWQPs for Orthophosphate Inhibitor Addition
G.6 Setting OWQPs for Blended Phosphate Inhibitor Addition
G.7 Setting OWQPs for Silicate Inhibitor Addition
G.8 OWQPs Designated for the System

These forms and recommended procedures are also available electronically in the ***OCCT Evaluation Templates*****.**

Important notes about these forms are below.

1) Environmental Protection Agency (EPA)-approved analytical methods must be used for regulatory sample analyses (§141.89(a)). Primacy agency approved analytical methods may be used for analysis of additional samples. In some cases, this may include use of field test kits.

2) The procedures in Exhibits G.4 through G.7 are technical recommendations only; see Chapter 5 for requirements for primacy agencies in setting OWQPs. Note that the water quality ranges in these exhibits are intended as general guidelines included for the reader's reference. As discussed in Section 3.3, these values may not apply to every situation; therefore, they should not be interpreted or universally prescribed as default minimums and/or maximums.

Exhibit G.1: Results of Follow-up Lead and Copper Tap Monitoring

Exhibit G.1 Results of Follow-up Lead and Copper Tap Monitoring										
Parameter	First Round of Follow-Up Monitoring									
	Required by the Primacy Agency			PWS Data						
	No. of Tap Sites	Frequency	Duration of Sampling	No. of Sites	No. of Samples	Date Range When Samples Were Collected		Minimum Value	Maximum Value	Average Value
						Start (dd/mm/yyyy)	End (dd/mm/yyyy)			
Lead (mg/L)								mg/L	mg/L	mg/L
Copper (mg/L)								mg/L	mg/L	mg/L

Parameter	Second Round of Follow-Up Monitoring									
	Required by the Primacy Agency			PWS Data						
	No. of Tap Sites	Frequency	Duration of Sampling	No. of Sites	No. of Samples	Date Range When Samples Were Collected		Minimum Value	Maximum Value	Average Value
						Start (dd/mm/yyyy)	End (dd/mm/yyyy)			
Lead (mg/L)								mg/L	mg/L	mg/L
Copper (mg/L)								mg/L	mg/L	mg/L

Exhibit G.2: Results of Follow-up WQP Monitoring – Entry Point

Exhibit G.2 Results of Follow-up WQP Monitoring - Entry Point[1]								
Source Name (if more than one source or multiple entry points/source, copy this section and complete for each source/entry point combination)								
Source ID								
Source Type								
Parameter	**Required by the Primacy Agency**		**PWS Data**					
	Frequency	**Duration of Sampling**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
				Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
pH								
Alkalinity (mg/L as $CaCO_3$)								
Inhibitor Concentration (phosphate inhibitor in mg/L as P (not as orthophosphate); silicate inhibitor in mg/L as SiO_2)								
Hardness (mg/L as $CaCO_3$)								
Temperature (°C)								
Calcium (mg/L as Ca)								
Total Dissolved Solids (mg/L)[2]								
Disinfectant Residual Total Chlorine (mg/L as Cl_2)								
Free Chlorine (mg/L as Cl_2)								
Chloride (mg/L)								
Sulfate (mg/L)								
Iron (mg/L)								
Manganese (mg/L)								

[1] Enter data for each entry point. Copy sheet for multiple entry points.
[2] Either Total Dissolved Solids or Conductivity (as µmhos/cm @ 25C or µS/cm)

Exhibit G.3: Results of Follow-up WQP Monitoring – Taps

Exhibit G.3 Results of Follow-up WQP Monitoring - Tap Samples[1]										
Source Name Associated with tap samples (if there are additional tap samples associated with a different source, copy this section and complete for each source/tap sample set. If multiple sources are associated with the tap samples listed below, list all sources here)										
Source ID(s)										
Source Type										
Parameter	**Required by the Primacy Agency**			**PWS Data**						
	No. of Tap Sites	**Frequency**	**Duration of Sampling**	**No. of Sites**	**No. of Samples**	**Date Range When Samples Were Collected**		**Minimum Value**	**Maximum Value**	**Average Value**
						Start (dd/mm/yyyy)	**End (dd/mm/yyyy)**			
pH										
Alkalinity (mg/L as $CaCO_3$)										
Inhibitor Concentration (phosphate inhibitor in mg/L as P (not as orthophosphate); silicate inhibitor in mg/L as SiO_2)										
Hardness (mg/L as $CaCO_3$)										
Temperature (°C)										
Calcium (mg/L as Ca)										
Total Dissolved Solids (mg/L)[2]										
Disinfectant Residual										
Total Chlorine (mg/L as Cl_2)										
Free Chlorine (mg/L as Cl_2)										
Chloride (mg/L)										
Sulfate (mg/L)										
Iron (mg/L)										
Manganese (mg/L)										

[1] Tap should be flushed prior to collecting samples for all parameters except lead and copper which are standing samples.

[2] Either Total Dissolved Solids or Conductivity (as µmhos/cm @ 25 C or µS/cm)

Exhibit G.4: Setting OWQPs for pH/Alkalinity/DIC Adjustment

Exhibit G.4 Setting OWQPs for pH/Alkalinity/DIC Adjustment		
Step 1: Are the recommended minimums or ranges for pH and/or alkalinity met at the Entry Point and in the Distribution System? [1]	YES	Go to Step 2.
	NO	Work with system to re-evaluate pH and/or alkalinity adjustment process.
Step 2: Is the range of pH values measured at the Entry Point < 0.4 pH units (Range = Max entry point pH - Min entry point pH)?[1]	YES	Go to Step 3.
	NO	The pH range may be too wide for effective control of lead and/or copper levels at the tap. Work with system to re-evaluate pH adjustment process. Review process control charts for pH chemical dosages and resultant pH levels. Evaluate seasonal changes in raw source water quality and impacts on maintenance of pH at the entry point. Also go to Step 3.
Step 3: Is the range of pH values measured in the Distribution System < 0.6 pH units (Range = Max distribution pH - Min distribution pH)?[1]	YES	Identify WQP minimums and ranges based on existing system information (both regulatory WQP monitoring data and additional diagnostic monitoring data if available).
	NO	The pH may be too variable for effective corrosion control. Re-evaluate pH adjustment process and reasons for variability in pH in the distribution system (evaluate buffer intensity, distribution system materials, distribution system operations). If low alkalinity water (< 20 mg $CaCO_3$/L), may need to increase DIC.
[1] The standard deviation is another tool that can be used to evaluate variability of pH measurements, in addition to the minimum, maximum, and range.		

Exhibit G.5: Setting OWQPs for Orthophosphate Inhibitor Addition

Exhibit G.5 Setting OWQPs for Orthophosphate Inhibitor Addition		
Step 1: Is the residual orthophosphate level in the distribution system ≥ 1.0 mg P/L (> 3.0 mg/L PO_4)?	YES	Go to Step 2.
	NO	If system has recommended an orthophosphate residual in the distribution system that is < 1.0 mg P/L, then determine if inhibitor chemical dosage needs to be increased to provide optimal reduction in lead and/or copper levels. If system has recommended an orthophosphate residual in the distribution system that is ≥ 1.0 mg P/L, then evaluate orthophosphate demand in the system (difference between entry point orthophosphate versus residual orthophosphate in the distribution system) and potential for adjusting required dosage to meet recommended residual in the distribution system. Go to Step 2.
Step 2: Are the minimum pH values measured at the Entry Point > 7.2 pH units?	YES	Go to Step 3.
	NO	Minimum pH should be higher for orthophosphate use. Have system re-evaluate pH adjustment process, or raise pH if 7.2 or below.
Step 3: Is the distribution system pH between 7.2 and 7.8 pH units?	YES	Go to Step 4.
	NO	The pH is not in the optimal range for use of orthophosphate inhibitors. Have system re-evaluate the pH control treatment process, pH variability in the distribution system, and adequacy of recommended orthophosphate dosage and residual in the distribution system.
Step 4: Is the range of pH values measured at the entry point < 0.4 pH units (Range = max entry point pH - min entry point pH)?	YES	Go to Step 5.
	NO	The pH may be too variable for effective corrosion control. System should re-evaluate the pH adjustment process (i.e., review process control charts and operations).
Step 5: Is the range of pH values measured in the distribution system < 0.6 pH units (Range = Max distribution pH - Min distribution pH)?	YES	Identify OWQP minimums and ranges based on existing information (both regulatory WQP monitoring data and additional diagnostic monitoring data if available).
	NO	Evaluate causes for pH variability in the system. Evaluate buffer intensity, distribution system materials, and distribution system operations, and adjust treatment and operations to achieve a narrower range of pH and alkalinity.

Exhibit G.6: Setting OWQPs for Blended Phosphate Inhibitor Addition

Exhibit G.6 Setting OWQPs for Blended Phosphate Inhibitor Addition		
Step 1: Is the residual orthophosphate level in the distribution system ≥ 0.5 mg P/L?	YES	Go to Step 2.
	NO	If system has recommended a blended phosphate product dose that results in an orthophosphate residual of < 0.5 mg P/L in the distribution system, then determine if inhibitor chemical dosage needs to be increased to provide optimal reduction in lead and/or copper levels. If system has recommended an orthophosphate residual in the distribution system that is ≥ 0.5 mg P/L, then evaluate orthophosphate demand in the system (difference between entry point orthophosphate versus residual orthophosphate in the distribution system) and potential for adjusting required dosage to meet recommended residual in the distribution system. Go to Step 2.
Step 2: Are the minimum pH values measured at the entry point > 7.2 pH units?	YES	Go to Step 3.
	NO	Minimum pH should be higher for orthophosphate use. Have system re-evaluate pH adjustment process, or raise pH if 7.2 or below.
Step 3: Is the distribution system pH between 7.2 and 7.8 pH units?	YES	Go to Step 4.
	NO	The pH may not be in the optimal range when using blended phosphate inhibitors, check with the chemical supplier for optimal pH range. Have system re-evaluate the pH control treatment process, pH variability in the distribution system, and adequacy of recommended orthophosphate dosage and residual in the distribution system.
Step 4: Is the range of pH values measured at the entry point < 0.4 pH units (Range = max entry point pH - min entry point pH)?	YES	Go to Step 5.
	NO	The pH may be too variable for effective corrosion control, check with the chemical supplier to verify quality of the product used to adjust pH. System should re-evaluate its pH adjustment process (process control charts and operations).
Step 5: Is the range of pH values measured in the distribution system < 0.6 pH units (Range = max distribution pH - min distribution pH)?	YES	Identify OWQP minimums and ranges based on existing information (both WQP monitoring data and additional diagnostic monitoring data if available).
	NO	Evaluate causes for pH variability in the system. Evaluate buffer intensity, distribution system materials, distribution system operations and adjust treatment and operations accordingly.

Exhibit G.7: Setting OWQPs for Silicate Inhibitor Addition

Exhibit G.7 Setting Optimal WQPs for Silicate Inhibitor Addition		
Step 1: Is the silicate level at the entry point approximately 20 mg/L as SiO_2?	YES	Go to Step 2.
	NO	Silicate addition process should be re-evaluated. Relatively high dosages may be required (in excess of 20 mg/L as SiO_2, depending on the system) for adequate corrosion control.
Step 2: Is the pH at the entry point less than the pH measured in the distribution system?	YES	Go to Step 3.
	NO	Silicate addition process should be re-evaluated. Silicate addition should increase pH in the distribution system, so recommended dosage may not be high enough for adequate corrosion control.
Step 3: Is the range of silicate levels measured in the distribution system from 10 to 20 mg/L as SiO_2?	YES	Identify OWQP minimums and ranges based on existing information (both regulatory WQP monitoring data and additional diagnostic monitoring data if available).
	NO	Re-evaluation of silicate treatment should be completed. Relatively higher dosages may be required (in excess of 20 mg/L) in order to maintain adequate levels in the distribution system for effective corrosion control.

Exhibit G.8: OWQPs Designated for the System

Exhibit G.8 OWQPs Designated for the System				
Parameter[1]	Entry Point		Distribution System	
	Minimum	Maximum	Minimum	Maximum
pH[2]				
Alkalinity[3] (mg/L as $CaCO_3$)				
Inhibitor Concentration (mg/L as P or SiO_2)[4]				

Notes:

[1] In addition to pH, alkalinity, or corrosion inhibitor concentrations, primacy agencies have the authority to designate values for other additional water quality parameters determined by the primacy agency to reflect optimal corrosion control treatment for the system.

[2] Under the Lead and Copper Rule, the minimum pH value measured in all tap samples must be equal to or greater than 7.0, unless the primacy agency determines that meeting a pH of 7.0 is not technologically feasible or is not necessary for the system to optimize corrosion control.

[3] Under the Lead and Copper Rule, primacy agencies must designate a minimum or a range of alkalinity concentrations if it is adjusted as part of the system's optimal corrosion control treatment.

[4] For systems using a corrosion inhibitor as part of the optimal corrosion control treatment.

Region 5 Suggested Reading for 2020 Workshop:

1. USEPA (US Environmental Protection Agency). (2016). Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems. EPA 816-B-16-003. USEPA Office of Water (4606M). https://www.epa.gov/sites/production/files/2019-07/documents/occtmarch2016updated.pdf
2. Tully J, DeSantis MK, Schock MR. Water quality–pipe deposit relationships in Midwestern lead pipes. AWWA Wat Sci. 2019;e1127. https://doi.org/10.1002/aws2.1127
3. Del Toral, M. A., Porter, A., & Schock, M. R. (2013). Detection and evaluation of elevated lead release from service lines: a field study. *Environmental science & technology*, *47*(16), 9300-9307. https://www.epa.gov/sites/production/files/2015-10/documents/lead-service-lines-study-20130723.pdf
5. Schock, Michael. (1996). Corrosion Inhibitor Applications in Drinking Water Treatment: Conforming to the Lead and Copper Rule. https://www.researchgate.net/publication/254547727_Corrosion_Inhibitor_Applications_in_Drinking_Water_Treatment_Conforming_to_the_Lead_and_Copper_Rule
6. Lytle, D. A., Schock, M. R., Wait, K., Cahalan, K., Bosscher, V., Porter, A., & Del Toral, M. (2019). Sequential drinking water sampling as a tool for evaluating lead in flint, Michigan. *Water Research*, *157*, 40-54. https://www.sciencedirect.com/science/article/abs/pii/S0043135419302647
7. Williams, Daniel & Parrett, Christopher & Schock, Michael & Muhlen, Christy & Donnelly, Peg & Lytle, Darren. (2018). Peer Reviewed Design and Testing of USEPA'S Flint Pipe Rig for Corrosion Control Evaluation. Journal - American Water Works Association. 109. 1. https://www.researchgate.net/publication/327605254_Peer_Reviewed_Design_and_Testing_of_USEPA'S_Flint_Pipe_Rig_for_Corrosion_Control_Evaluation
8. Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R. R., ... & Prescott, A. (2009). *Contribution of service line and plumbing fixtures to lead and copper rule compliance issues*. Water Environment Research Foundation. https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf
9. EPA. Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems (2010). Link: https://nepis.epa.gov/Exe/ZyNET.exe/P100DP2P.TXT

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc:	Sylvester, Matthew (EGLE)
Subject:	FW: BH Corrosion Study
Date:	Friday, March 5, 2021 7:34:00 AM
Attachments:	image001.png image002.png image003.png image004.png Reading List (EPA).docx 2021-03-03 BH Corrosion RFP.docx

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I have made changes based on our conversation with Eric and George and Jeni at the weekly BH call (attached).

From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, March 3, 2021 4:30 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Subject: FW: BH Corrosion Study
Attached is the near-final RFP for BH corrosion study. Abonmarche has two questions, here's my proposed reply.

1. I don't think the EPA's OCCT technical rec document is appropriate to reference in this effort. I could send abonmarche the attached list of reading from EPA, which was provided in relationship to the August 2020 OCCT study workshop w/ Arcadis?
2. I think Abonmarche is feeling this open-ended type of RFP will result in an influx of miss-the-mark proposals. He may be right, though I think it would be easy to sort through those efficiently if that's the case.

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 3, 2021 3:47 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,
Please find attached, a draft version of the Corrosion Study RFP. I had a few additional comments listed below.

1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 25, 2021 10:36 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

Jason,

Our approach would probably be to allow the qualified consultant to propose the timeline, as it will depend on what methodologies they are proposing. If we give a bookend of 12 months, that will likely constrain their options. Can we extend that out to at least 18 months, but also indicate periodic check-ins?

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, February 24, 2021 1:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: BH Corrosion Study

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Ernie,

What would be a realistic timeframe to expect this type of corrosion study to be completed? Does it tie into any requirements from EGLE to the city in terms of hard deadlines? We had mentioned 12 months on the EPA application (expected to be completed by March 2022), which was on our EPA application from the fall.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager
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O 269.927.2295 ext. 171
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abonmarche.com
ABONMARCHE

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CONFIDENTIALITY NOTICE: This e-mail and any attachments are for the exclusive and confidential use of the intended recipient. If you are not the intended recipient, please do not read, distribute or take action in reliance upon this message. If you have received this e-mail in error, please notify us immediately and promptly delete this message and its attachments from your computer system. We do not waive any work product privilege by the transmission of this message.

Region 5 Suggested Reading for 2020 Workshop:

1. USEPA (US Environmental Protection Agency). (2016). Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems. EPA 816-B-16-003. USEPA Office of Water (4606M). https://www.epa.gov/sites/production/files/2019-07/documents/occtmarch2016updated.pdf
2. Tully J, DeSantis MK, Schock MR. Water quality–pipe deposit relationships in Midwestern lead pipes. AWWA Wat Sci. 2019;e1127. https://doi.org/10.1002/aws2.1127
3. Del Toral, M. A., Porter, A., & Schock, M. R. (2013). Detection and evaluation of elevated lead release from service lines: a field study. *Environmental science & technology*, *47*(16), 9300-9307. https://www.epa.gov/sites/production/files/2015-10/documents/lead-service-lines-study-20130723.pdf
5. Schock, Michael. (1996). Corrosion Inhibitor Applications in Drinking Water Treatment: Conforming to the Lead and Copper Rule. https://www.researchgate.net/publication/254547727_Corrosion_Inhibitor_Applications_in_Drinking_Water_Treatment_Conforming_to_the_Lead_and_Copper_Rule
6. Lytle, D. A., Schock, M. R., Wait, K., Cahalan, K., Bosscher, V., Porter, A., & Del Toral, M. (2019). Sequential drinking water sampling as a tool for evaluating lead in flint, Michigan. *Water Research*, *157*, 40-54. https://www.sciencedirect.com/science/article/abs/pii/S0043135419302647
7. Williams, Daniel & Parrett, Christopher & Schock, Michael & Muhlen, Christy & Donnelly, Peg & Lytle, Darren. (2018). Peer Reviewed Design and Testing of USEPA'S Flint Pipe Rig for Corrosion Control Evaluation. Journal - American Water Works Association. 109. 1. https://www.researchgate.net/publication/327605254_Peer_Reviewed_Design_and_Testing_of_USEPA'S_Flint_Pipe_Rig_for_Corrosion_Control_Evaluation
8. Sandvig, A., Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R. R., ... & Prescott, A. (2009). *Contribution of service line and plumbing fixtures to lead and copper rule compliance issues*. Water Environment Research Foundation. https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf
9. EPA. Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems (2010). Link: https://nepis.epa.gov/Exe/ZyNET.exe/P100DP2P.TXT

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT

City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be fully completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in the previous October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, further study is required to identify the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items shall be described and addressed in the Corrosion Study report to be provided to the City upon completion.

Commented [SE(1)]: Considered?

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (this will require an assessment of previous sample site codes to allow for data comparison)
3. Analyze key water quality parameters (WQPs):
    a. Phosphate (PO_4) dose and distribution concentration variability
    b. Chlorine (Cl) dose and residual variability
    c. pH and impacts on corrosion indices
4. Analysis of distribution system pipe scales on various materials
5. Solubility tests for a comparative study of treatment methods
6. Pipe loop testing and the effectiveness of corrosion treatment
7. Comparison with analogous water system water quality and corrosion control strategies
8. Evaluate single family home water use trends

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For additional technical references, please refer to Attachment A

Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – March TBD
Consultant Award – April 2021
Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Terms and Conditions of this RFP:

1. Proposals must be submitted by 10:00 am on March TBD. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

3. The City Reserves the Right to accept or reject any or all proposals and award the contract in the best interest of the City.

4. Proposals, once opened, become public documents and may be subject to disclosure under the Freedom of Information Act.

5. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, "Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

6. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

City of Benton Harbor
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Benton Harbor, MI 49022
Phone: (269) 927-8400

Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

From: Sarkipato, Ernest (EGLE)
To: Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Subject: FW: Benton Harbor - Corrosion Control
Date: Wednesday, March 24, 2021 4:44:00 PM

Mr. Koch brings up some interesting points below. Perhaps we could discuss at the weekly meeting in the AM?

From: Koch, David S. <KochDS@bv.com>
Sent: Wednesday, March 24, 2021 4:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: We've been talking about this, and since the RFP not yet issued (or at least we haven't seen it yet), wanted to put a bug in your ear on a concern we have. It's around what can be done, and what value can be gained from that, for a budget of $50k.

This stems from the EPA's final Lead and Copper Rule Revisions (LCRR), and even though the new administration plans a review of what was promulgated in January, I don't believe there's any expectation of significant changes. And though Michigan's recent LCR has its own requirements too, the Federal still apply. And the key part of that is the LCCR requirement that systems with 90th percentile lead levels greater than the new lead trigger level of 10 ppb (ug/L) conduct a corrosion control study to optimize corrosion control treatment. The LCRR further details that corrosion control studies for systems with lead service lines MUST involve pipe loop testing with harvested lead service lines. Benton Harbor would fall in this category with the known presence of lead service lines and recent LCR 90th percentile lead levels exceeding the action level of 15 ppb (ug/L). There are a host of conditions that must be tested including, increasing the pH/alkalinity of the finished water, testing orthophosphate addition at differing feed dosages.

This pipe loop testing will be significantly in excess of $50k. And it is valuable and needed, not only per the LCRR, but also in the best means of addressing the issues at Benton Harbor. Pipe loop testing will provide concrete data to make decisions on how to optimize corrosion control treatment, where as a desktop study (what could be done within $50k) would only be useful in identifying alternative water chemistries to test and predicting theoretical metal solubilities. A plan of starting with a desktop study would only prolong the time before an alternative "optimized" corrosion control treatment could be installed because pipe loop testing would still be required. Since lead is a health risk, any delay in getting the optimal corrosion control treatment installed is putting the community at risk. We strongly believe that Benton Harbor start pipe loop testing as soon as possible based on the EPA's final LCRR requirements to deliver the fastest and most accurate approach to optimized corrosion control treatment. It will take time to get their LSLs replaced, and optimized corrosion control is needed until they can get to that milestone of all LSLs replaced.

If you'd like to talk further about this, and/or have any questions on need, how to, etc., for these pipe loop studies, I can get our corrosion control practice leader on a call.

David S. Koch, P.E.*
Associate Vice President
*Licensed in IL, MI, WI
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2 N. Riverside Plaza, Suite 2050, Chicago, IL 60606
D +1 312-683-7829 **M** +1 616-308-7165
E KochDS@bv.com

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From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, March 19, 2021 11:40 AM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

Ah ha! The internet, indeed. I can confirm, the ballpark for the BH study based on documents submitted to the EPA for the grant is also $50k (coincidentally the same as the other contract, which I'm not very familiar with).

From: Koch, David S. <KochDS@bv.com>
Sent: Friday, March 19, 2021 11:52 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: One quick question hoping you can answer related to our brief discussion the other day – I was trying to recall a specific. You had mentioned $50K as a budget when we were talking, and I thought you meant that as the budget for BH's corrosion control study. But later, found something publicly available that says Cornwell's budget for the State contract for overall support (so although you didn't want to say who was selected – the internet comes thru!) is $50k. So make me question if I had heard correctly of not – i.e., maybe you had been referring to the Cornwell contract and not the BH budget amount? Are you able to confirm?

(And although not multi-tasking as I write this email, I am going into a series of meetings/calls starting at the top of the hour…)

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>

Sent: Thursday, March 18, 2021 3:28 PM
To: Koch, David S. <KochDS@bv.com>
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Heehee I understand. Updates would be easier on the phone, that's all. We do hope you will consider putting in a bid for a corrosion optimization study on the BH water system!

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Thanks Ernie – I assume that was your call I just missed! I'm tied up in another call (multi-tasking with some emails…don't tell anyone…).

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 18, 2021 3:25 PM
To: Koch, David S. <KochDS@bv.com>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

I'll call.

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 18, 2021 4:23 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Benton Harbor - Corrosion Control

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Ernie/Mike: Benton Harbor and their challenges with their water system seem to have dropped a bit off our radar since we were discussing capacity assessment needs late last year, but I had heard some recent rumors, and just trying to determine what the situation might be, and if any opportunity for BV to help. In general, the rumors I've heard were that an RFP is imminent for a corrosion control study for them, funding from the grant that they received last year. I had tried connecting with Mike O'Malley late last year as well (specific to LCR, LSLR, etc.), but he seemed to drop into incommunicado, and I just recently heard he may no longer be with the City and that the State may have had to step in to get someone (private company) in responsible charge for their water system.

So wondering if you might be able to offer any insight? Much appreciated, in advance. Thanks.

David S. Koch, P.E.*
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D +1 312-683-7829 **M** +1 616-308-7165
E KochDS@bv.com

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From: Sarkipato, Ernest (EGLE)
To: Jason Marquardt
Subject: FW: Benton Harbor - Corrosion Control
Date: Thursday, March 25, 2021 1:36:00 PM

FYI – potential pre-RFP discussion w/ B&V?

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 25, 2021 1:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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I'll check availability, and get back to you. When you say addendum, does that suggest the RFP has been issued? I have not seen it, but it seems this is important enough to hold off on issuing an RFP until settled?

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 25, 2021 12:30 PM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

I'd like to set up a call with you, Jason M from Abonmarche, and our Corrosion specialist Brandon Onan. Would you be open to that? I would assume that any findings/decisions would then be codified into the RFP as an addendum or similar.

Ernie

From: Koch, David S. <KochDS@bv.com>
Sent: Wednesday, March 24, 2021 4:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
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expectation of significant changes. And though Michigan's recent LCR has its own requirements too, the Federal still apply. And the key part of that is the LCCR requirement that systems with 90th percentile lead levels greater than the new lead trigger level of 10 ppb (ug/L) conduct a corrosion control study to optimize corrosion control treatment. The LCRR further details that corrosion control studies for systems with lead service lines MUST involve pipe loop testing with harvested lead service lines. Benton Harbor would fall in this category with the known presence of lead service lines and recent LCR 90th percentile lead levels exceeding the action level of 15 ppb (ug/L). There are a host of conditions that must be tested including, increasing the pH/alkalinity of the finished water, testing orthophosphate addition at differing feed dosages.

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D +1 312-683-7829 **M** +1 616-308-7165
E KochDS@bv.com

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From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Thurston, Brian (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE); Philip, Kris (EGLE)
Subject:	FW: Benton Harbor EGLE ACO time line proposal
Date:	Tuesday, June 23, 2020 8:50:03 AM
Attachments:	MI 0600 Benton Harbor Water ACO Reply 06 17 2020.pdf BH ACO RESPONSE egle summary and comments.docx 00600 City of Benton Harbor First Amended ACO-399-07-2019-final.pdf

Attached is the City's response to our draft ACO. To save time, I'd suggest reviewing my bulleted summary of the city's response and some initial comments.
We can discuss at Thursday's 11AM weekly call.
Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, June 18, 2020 9:41 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; emitchell <emitchell@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; Darel Rice <drice@cityofbentonharbormi.gov>
Subject: Benton Harbor EGLE ACO time line proposal

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,
As requested, I have not shared this with the EGLG Grand Jury.
Attached please find: *MI 0600 Benton Harbor Water ACO Reply 06 17 2020.pdf*
Mike O'Malley
Benton Harbor Community Water Supply Operator IN Charge on Record

6/17/20

MI 0600 Benton Harbor Water Reply to Items in the new Administrative Consent Order after June 11, 2020

This document is intended to supply the necessary tools to drive the conversation with EGLE and BHWW during conference discussions, prior to fully agreeing to the New 2020 ACO:

Time frames in this document are set by the water department. If these time frames do not coincide with the City Manager & City Commission (Mayor) ; the water department reserves the right to extend the dates of the deadlines, to meet their respective time frames.

(The following paragraphs shall be added to Section II, Compliance Schedule :)

2.14 Not later than September 30, 2020, the City shall submit to EGLE, for review and approval, a complete technical, managerial, and financial (TMF) capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City's water system. In compliance with Act 399. The City shall contract with a qualified consultant to complete the TMF study. The TMF study scope shall include identification of the necessary staffing structure, and the required funding, to operate the system in compliance with Act 399. The TMF study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments.

To address any gaps in the necessary staffing levels identified by the TMF study and the current staffing levels, the TMF study shall include an implementation plan to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and enforcement of the City's water system. Beginning every six (6) months from the date EGLE approves the TMF, the City shall submit a signed statement describing the City's progress toward completing its plan to achieve TMF capacity.

The City of Benton Harbor will proceed with a Request for Proposals (RFP) for a TMF Study; by July 31, 2020. Review and acceptance should be given 60 days. The ACO will available **October 1, 2020.****

Paragraphs 2.1(a), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from AACO-399-07-2019: MO reply: moved to end for record.

Paragraphs 2.1(b), 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.1 (b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system in compliance with Act 399.

- As many others, setting water rates require much study. The TMF is intended to be the study done by the water department and passed along to City Management and Commission.
- If additional water revenue is needed; beyond the recent increases, it would best be left out to **June 30, 2021.****

2.7 Not later than May 1, 2020, the City shall submit to EGLE an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

New updates have been provided. The ACO Reply will be ready **July 31, 2020.**

2.8 Not later than March 31, 2020, the City shall submit to EGLE, for review and approval, Of an updated cross-connection program. The updated cross-connection program shall incorporate the City's plan to include residential accounts in the program, and a notification schedule to EGLE of the City obtaining adequate personnel to implement the City's cross-connection control program.

The ACO reply will be available October **31, 2020.****

2.10 Not later than July 31, 2020, the City shall submit to EGLE, for review and approval, a plan for inventorying and ongoing maintenance of distribution valves and hydrants. The plan must address fixing known broken valves and hydrants, as well as preventative maintenance of valves and hydrants.

MO Reply: This ACO item has 2 parts to it, Hydrants & System and hydrant isolation valves.

Both components are heavily dependent on the completion of the TMF requirement.

- The ACO reply will be available **December 30, 2020****

2.11 Not later than December 31, 2020, the City shall conduct professional inspections of the City's water system's elevated tank, or complete the repairs and upgrades recommended during the 2008 Dixon inspection as included in the City's asset management program dated December 2017.

MO Reply:

- The ACO reply is based upon the Dixon Project Award. The contractor can start anytime **from September 8, 2020 and has 7 weeks to complete. It must be done August 2021.**

2.12 Not later than August 1, 2020, the City shall complete installation of a working mussel feed control system at the intake.

- This ACO requirement should be completed by **November 1, 2020.**

2.13 Not later than December 31, 2020, the City shall repair filter to waste valves at the water plant, and train operators on their use

MO Reply:

- This ACO Item will be complete by **December 31, 2020**

The following paragraphs shall be added to Section II, Compliance Schedule:

2.15 Not later than June 1, 2020, the City shall post a position to hire a Utility Services Director for the City. The City shall notify EGLE of the posting within forty-eight (48) hours of it being posted.

2.16 Not later than August 3, 2020, the City shall fill the position of Utility Services Director, either by hiring a contractor or an employee of the City.

MO Reply:

- Since this TMF needs to be fully understood in all its aspects, particularly Financial,
- The time frame for these ACOs be during budget time, **June 30, 2021.****

2.17 Not later than December 31, 2020, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory, or a laboratory certified by EGLE, or by the United States Environmental Protection Agency for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to EGLE in a timely manner. MCL §325.1007 also authorizes EGLE to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

- The **December 31, 2020** deadline will be met without error.

2.18 Not later than September 30, 2020, the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

MO Reply: Reply to this ACO was sent to EGLE on **May 29, 2020**.

This date matches closely with the CM CC approval of funds to engage Elhorn Engineering.

The actual program details are not available at this writing. The water department can make this actual program available to EGLE 10-days after receipt and confirmation by the Department.

Those items deemed completed and removed are not a part of this notification.

The City has them for record.

Paragraphs 2.1(a), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from AACO-399-07-2019:

Note: All parties agreed in the June 4, 2020 call that this portion of the ACO needs to be at the end for record only.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the submittal of the Asset Management Plan, dated December 2017; however, the second portion of Paragraph 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

MO Reply: Same Item repeated in 2.1(b) of the new adjusted ACO below.

The revised Baird Bonding Study completed by Rhonda Hildebrand of Plante Moran should be the reply to this ACO.

2.2 Upgrade the water plant supervisory control and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

MO Reply: This project is complete and has been used by operators.

2.3 Install metering capabilities on the finished water. (This requirement was completed as part of the corrosion control treatment project).

MO Reply: This project is complete and has been used by Operators.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

MO Reply: All aspects of this ACO were completed very early on.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

MO Reply: That was completed by entering into a contract with F&V Contract Operations at an annual fee around $130,000, starting May 6, 2019.

However, the compensation for F&V will be repurposed in New ACO sent to the City in March of 20220.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 31, 2019. See altered item below # 2.18 EGLE altered this requirement when it sent the letter demanding that the City change corrosion treatment chemical and feed.

MO Reply: Submitted May 29, 2020

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

MO Reply: This item was completed in mid-2019 and has cost a great deal of money and continues to give us unexpected issues. These are being dealt with as soon as possible.

BH ACO Response Summary & Review (6/23/2020)

(a) Request a separate section be placed at the back of the ACO to document completed items. EGLE discussion is this could be done by using a referenced attachment that can be more easily updated (rather than the signed ACO)

(b) 2.14 – "*conduct a TMF study*". City suggests they move TMF study up in timeline due to "domino effect" on other items.
   i. RFP by July 31, 2020
   ii. completion date to September 30, 2020
   - ✓COMMENTS: Agree on domino effect for some other ACO items. Not sure this timeline allows for an effective study. Also doesn't indicate any detail on the RFP

(c) 2.1b – "*implement rate increase plan according to AMP/rate study*". City response references the TMF study, and recent rate increases passed by commission. Proposes new date of June 30, 2021.
   - ✓COMMENT: we feel the intent of the ACO item was met by recent commission approval of 5-year annual increases of 10% per year. Only remaining concerns are (a) future actions negating the increases, and (b) water system costs not accounted for, such as COVID-19 and LSL removal

(d) 2.7 – "*submit rate collections plan*". City response refers to updated city protocol, indicates ACO reply will be ready July 31, 2020.
   - ✓COMMENT: we agree, and have asked the city to formally adopt the new program according to it's internal procedures and practices.

(e) 2.8 – "*submit updated cross connection control program*". City response simply indicates will be available October 31, 2020.
   - ✓COMMENT: we feel this is unacceptable, as the city has indicated they have an updated program but have only submitted the first page.

(f) 2.10 – "*submit a plan for inventorying and maintaining distribution valves and hydrants*". City response refers to the TMF study and interrelatedness of this ACO item. It also identifies two parts, suggesting it should be split.
   - ✓COMMENT: agree it can be split, and agree with dependence on TMF. Request the city also acknowledge the recent contract with Wachs Water to inventory the hydrants.

(g) 2.11 – "*water tower inspection or upgrades*". City response refers to current work with Dixon, hopefully underway summer of 2020. Permit issued, part of larger DWRF project. Project must be completed by August, 2021.
   - ✓COMMENT: this is acceptable.

(h) 2.12 – "*complete installation of working mussel control system*". City response requests date of November 1, 2020.
   - ✓COMMENT: per conversations, this is due to availability of contractor. The response is acceptable.

(i) 2.13 – "*repair filter to waste valves".* City response requests date of December 31, 2020.
   - ✓COMMENT: This is acceptable.

(j) 2.15 & 2.16 – "*post utility services director position*" and "*hire (same)*". City response references need to complete the TMF study first. Requests extended date of June 30, 2021.

- ✓COMMENT: consider combining into one, and re-wording to refer generally to filling staffing needs identified in the TMF study. Date is reasonable.

(k) 2.17 – "*comply with monitoring requirements*". City response agrees to comply by suggested date of December 31, 2020.

(l) 2.18 – "*submit corrosion control study proposal*". City response refers to submittal to city on May 29, 2020.

- ✓COMMENT: EGLE responded to the city's May 29 letter, the proposal lacked detail and was not acceptable. NEED TO GIVE HARD DEADLINE (letter referred to 6 months from start of new treatment).

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8408		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
FACILITY OWNER IF NOT IDENTIFIED ABOVE Ellis Mitchell, City Manager			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
COUNTY Berrien			
CONTACT NAME Ellis Mitchell, City Manager	PHONE # 269-927-8408		

Executive Order 2019-06, signed by Governor Gretchen Whitmer on February 20, 2019, renamed the Michigan Department of Environmental Quality (MDEQ) as the Department of Environment, Great Lakes, and Energy (EGLE). Effective April 22, 2019, a reference to the MDEQ will be deemed a reference to EGLE. After April 22, 2019, a reference to the Director of the MDEQ will be deemed to be a reference to the Director of EGLE. The Drinking Water and Municipal Assistance Division (DWMAD) was renamed the Drinking Water and Environmental Health Division (DWEHD). A reference to the DWMAD will be deemed a reference to the DWEHD and a reference to the Director of the DWMAD will be deemed to be a reference to the Director of the DWEHD.

Administrative Consent Order (ACO) ACO-399-07-2019, entered on March 5, 2019, between EGLE, the DWEHD, and the city of Benton Harbor (City), is hereby amended as follows. Upon the consent of the parties and by the authority granted to EGLE by the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder it is hereby agreed and ordered:

COMPLIANCE SCHEDULE

Paragraphs 2.1(a), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from AACO-399-07-2019:

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the submittal of the Asset Management Plan, dated December 2017; however, the second portion of Paragraph 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

2.2 Upgrade the water plant supervisory control and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water. (This requirement was completed as part of the corrosion control treatment project).

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 31, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

Paragraphs 2.1(b), 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.1 (b) **Not later than December 31, 2020**, the City shall **begin** implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system in compliance with Act 399.

2.7 **Not later than May 1, 2020**, the City shall submit to EGLE an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.8 **Not later than March 31, 2020,** the City shall submit to EGLE, for review and approval, an updated cross-connection program. The updated cross-connection program shall incorporate the City's plan to include residential accounts in the program, and a notification schedule to EGLE of the City obtaining adequate personnel to implement the City's cross-connection control program.

2.10 **Not later than July 31, 2020**, the City shall submit to EGLE, for review and approval, a plan for inventorying and ongoing maintenance of distribution valves and hydrants. The plan must address fixing known broken valves and hydrants, as well as preventative maintenance of valves and hydrants.

2.11 **Not later than December 31, 2020**, the City shall conduct professional inspections of the City's water system's elevated tank, or complete the repairs and upgrades recommended during the 2008 Dixon inspection as included in the City's asset management program dated December 2017.

2.12 **Not later than August 1, 2020**, the City shall complete installation of a working mussel feed control system at the intake.

2.13 **Not later than December 31, 2020**, the City shall repair filter to waste valves at the water plant, and train operators on their use.

The following paragraphs shall be added to Section II, Compliance Schedule:

2.14 **Not later than September 30, 2020**, the City shall submit to EGLE, for review and approval, a complete technical, managerial, and financial (TMF) capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City's water system. In compliance with Act 399. the City shall contract with a qualified consultant to complete the TMF study. The TMF study scope shall include identification of the necessary staffing structure, and the required funding, to operate the system in compliance with Act 399. The TMF study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments.

To address any gaps in the necessary staffing levels identified by the TMF study and the current staffing levels, the TMF study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and enforcement of the City's water system. **Beginning every six (6) months from the date EGLE approves the TMF, the City shall submit a signed statement describing the City's progress** toward completing its plan to achieve TMF capacity.

2.15 **Not later than June 1, 2020,** the City shall post a position to hire a Utility Services Director for the City. The City shall notify EGLE of the posting within forty-eight (48) hours of it being posted.

2.16 **Not later than August 3, 2020**, the City shall fill the position of Utility Services Director, either by hiring a contractor or an employee of the City.

2.17 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory, or a laboratory certified by EGLE, or by the United States Environmental

Protection Agency for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to EGLE in a timely manner. MCL §325.1007 also authorizes EGLE to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.18 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this First Amended Administrative Consent Order, except as specifically prescribed in this document. The effective date of this First Amended Administrative Consent Order shall be the date upon which the DWEHD Division Director of EGLE signs this document.

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

_____
Eric J. Oswald, Director
Drinking Water and Environmental Health Division

_____
Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

_____
Marcus Muhammad, Mayor

_____
Date

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer
Date:	Monday, June 14, 2021 10:51:00 PM
Attachments:	Benton Harbor Pilot Drinking Water Grant No. 1901-01 2ND Project Time EXTENSION.doc image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Thursday, September 12, 2019 7:55 AM
To: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

Ellis-

Please print out a copy of the city of Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer. After your review, please sign and date the document and send an original hard copy of it to me by mail at the following address:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy

Finance Division – Water Infrastructure Financing Section
P. O. Box 30457
Lansing, MI 48909-7957

Please contact me if you have questions.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Tuesday, September 10, 2019 2:50 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

Hi Clarence – thanks for reaching out again about this! I just spoke with the City Manager and he would like an extension for the Lead Pilot Grant. Let me know if there is anything else that needs to be done to get this project extended.

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Tuesday, September 10, 2019 12:57 PM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>

Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Mike O'Malley <momalley@cityofbentonharbormi.gov>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

Rhonda-

We would like to know if the city of Benton Harbor would like a Lead Pilot Grant No. 1901-01 Project Time Extension until March 2020? I have not heard back from the city on this. No problem if the city if on schedule to be done by the current end date of Septembe2 30, 2019.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Tuesday, June 25, 2019 8:52 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

Hi Clarence – the FedEx package should arrive this morning before 10:30 a.m. Let me know when it is received.

Thanks,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Monday, June 24, 2019 10:46 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

Rhonda-

Here is the mailing address information you requested:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy
Finance Division – Water Infrastructure Financing Section
Constitution Hall – 4th Floor South
525 West Allegan Street
Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, June 24, 2019 10:31 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Lead Pilot Grant Reimbursement Request #1
Importance: High

Hi Clarence – attached is the Request for Disbursement of Funds and all the related documentation for the costs incurred to date for the City of Benton Harbor. I have also included a summary schedule (2nd page) that lists all the invoices/cleared checks that are included for this Request. Please send me the address that you would like these documents mailed to as I will get them sent

via FedEx today. The address on your form is a PO address and FedEx will need a street address to deliver the package.

Thanks for your help!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions
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GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

LIESL EICHLER CLARK
DIRECTOR

September 11, 2019

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Ellis Mitchell:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control Project
Grant Project Number 1901-01

This letter is notification that you can receive an extension to your PDW Grant end date, which would revise the grant budget period from September 30, 2019 to March 31, 2020.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the address below within two weeks. Upon receipt, the Department of Environment, Great Lakes, and Energy (EGLE) will sign and send you a fully-executed copy of the amendment, and it will become effective.

Reminder that your PDW Grant requires the following "deliverable" be provided to EGLE within 30 days from the end date of the grant agreement:

- Certificate of Project Completeness

Should you have any questions, please contact me at the phone number listed below, e-mail at Jonesc13@michigan.gov, or by mail at EGLE, P.O. Box 30457, Lansing, Michigan 48909-7957.

Sincerely,

Clarence Jones, Project Manager
Water Infrastructure Financing Section
Finance Division
517-284-5410

Enclosures

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, EGLE-DWEHD, Kalamazoo District Office
cc/enc: Mr. Jonathan Doyle, EGLE-FD

EGLE

EGLE Tracking Code/Project Number **1901-01**
Division/Office **Finance**
Amendment Number **002**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY
AND
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environment, Great Lakes and Energy (hereafter "State"), formerly the Michigan Department of Environmental Quality, the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 18, 2018** for the **Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrision Control Project.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.

There are no Project Scope changes.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **September 30, 2019** to **March 31, 2020.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Signature	Date
Ellis Mitchell, City Manager	
Name/Title	

FOR THE STATE:

Signature	Date
Kelly Green, Administrator	
Name/Title	

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer
Date:	Monday, June 14, 2021 10:52:00 PM
Attachments:	Benton Harbor Pilot Drinking Water Grant No. 1901-01 2ND AMENDMENT EXTENSION 9-15-2019.pdf image002.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Monday, September 16, 2019 4:00 PM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Chris J Cook <cjcook@abonmarche.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

All-

I have attached a copy of the signed dated Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer until March 2020 to this email for your records. I also included a copy of the signed dated first extension as well if anyone needs a copy for their records.

Please contact me if you have questions.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, September 16, 2019 9:14 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Jones, Clarence (EGLE) <JONESC13@michigan.gov>; Chris J Cook <cjcook@abonmarche.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

Hi Ernest – The City signed the extension and the original was mailed to Clarence on Friday. Thanks for following up on this!

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions
Celebrating our 21st year as one of FORTUNE's "100 Best Companies to Work For®"

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, September 16, 2019 9:09 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>; Chris J Cook <cjcook@abonmarche.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

If you haven't already, I would strongly encourage the city's approval of this extension. As Mike O knows, the time frames for this pilot grant were very, very short to begin with.

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Thursday, September 12, 2019 8:03 AM
To: Chris J Cook <cjcook@abonmarche.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

Chris-

You are correct. Immediately after I sent, I reviewed the attachment and there is something wrong. I could not open it either. For some strange reason it was saved in Word. Sorry for the confusion. Please review the attached PDF copy and notify me if this one will work with no issues.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes, and Energy
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Chris J Cook <cjcook@abonmarche.com>
Sent: Thursday, September 12, 2019 8:00 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

The document is not legible to me.

Christopher J. Cook, PE
President/CEO
Abonmarche
D 269.926.4548
C 269.876.9290
O 269.927.2295 ext 132
W www.abonmarche.com

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Thursday, September 12, 2019 7:55 AM
To: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

Ellis-

Please print out a copy of the city of Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer. After your review, please sign and date the document and send an original hard copy of it to me by mail at the following address:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy
Finance Division – Water Infrastructure Financing Section
P. O. Box 30457
Lansing, MI 48909-7957

Please contact me if you have questions.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov

Follow us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Tuesday, September 10, 2019 2:50 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

Hi Clarence – thanks for reaching out again about this! I just spoke with the City Manager and he would like an extension for the Lead Pilot Grant. Let me know if there is anything else that needs to be done to get this project extended.

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Tuesday, September 10, 2019 12:57 PM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Mike O'Malley <momalley@cityofbentonharbormi.gov>
Subject: RE: Benton Harbor Lead Pilot Grant No. 1901-01 Project Time Extension Offer

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Rhonda-

We would like to know if the city of Benton Harbor would like a Lead Pilot Grant No. 1901-01 Project Time Extension until March 2020? I have not heard back from the city on this. No problem if the city if on schedule to be done by the current end date of Septembe2 30, 2019.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Tuesday, June 25, 2019 8:52 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

Hi Clarence – the FedEx package should arrive this morning before 10:30 a.m. Let me know when it is received.

Thanks,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Monday, June 24, 2019 10:46 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

Rhonda-

Here is the mailing address information you requested:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy

Finance Division – Water Infrastructure Financing Section
Constitution Hall – 4th Floor South
525 West Allegan Street
Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, June 24, 2019 10:31 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Lead Pilot Grant Reimbursement Request #1
Importance: High

Hi Clarence – attached is the Request for Disbursement of Funds and all the related documentation for the costs incurred to date for the City of Benton Harbor. I have also included a summary schedule (2nd page) that lists all the invoices/cleared checks that are included for this Request. Please send me the address that you would like these documents mailed to as I will get them sent via FedEx today. The address on your form is a PO address and FedEx will need a street address to deliver the package.

Thanks for your help!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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EGLE

EGLE Tracking Code/Project Number **1901-01**
Division/Office **Finance**
Amendment Number **002**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY
AND
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environment, Great Lakes and Energy (hereafter "State"), formerly the Michigan Department of Environmental Quality, the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 18, 2018** for the **Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrision Control Project.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.

There are no Project Scope changes.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **September 30, 2019** to **March 31, 2020.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Ellis E. Mitchell — 9/13/2019

Signature — Date

Ellis Mitchell, City Manager

Name/Title

FOR THE STATE:

Kelly M C — 9.16.19

Signature — Date

Kelly Green, Administrator

Name/Title

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environmental Quality (hereafter "State"), and the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 20, 2018** for the **Material Inventory, Asset Management Plan, Lead Service Line Replacement and Corrosion Control.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.
Installation of corrosion control system at the Benton Harbor Wastewater Treatment Plant.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **May 31, 2019** to **September 30, 2019.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Darwin Watson — 5/3/19

Signature — Date

Darwin Watson, Interim City Manager

Name/Title

FOR THE STATE:

Karol Patton — 5/17/2019

Signature — Date

Karol Patton, Acting Section Manager

Name/Title

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1
Date:	Monday, June 14, 2021 10:47:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Thursday, June 27, 2019 3:08 PM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Subject: RE: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1

Rhonda-

1. Please forward PDF copies of all the Change Orders related to the Benton Harbor Lead Pilot Grant Project No. 1901-01 Disbursement Request No. 1.
2. I am having a difficult time trying to match the Pilot Grant incurred costs on the summary sheet with the invoice that have been submitted as backup documentation.

Please contact me if you have questions.

Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Tuesday, June 25, 2019 8:52 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

Hi Clarence – the FedEx package should arrive this morning before 10:30 a.m. Let me know when it is received.

Thanks,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Monday, June 24, 2019 10:46 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

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Rhonda-

Here is the mailing address information you requested:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy
Finance Division – Water Infrastructure Financing Section

Constitution Hall – 4th Floor South
525 West Allegan Street
Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
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Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Lead Pilot Grant Reimbursement Request #1
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Thanks for your help!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1
Date:	Monday, June 14, 2021 10:46:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

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Please contact me if you have questions.

Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

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Sent: Tuesday, June 25, 2019 8:52 AM
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Subject: RE: Lead Pilot Grant Reimbursement Request #1

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Thanks,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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Celebrating our 21st year as one of FORTUNE's "100 Best Companies to Work For®"

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Monday, June 24, 2019 10:46 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

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Rhonda-

Here is the mailing address information you requested:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy
Finance Division – Water Infrastructure Financing Section

Constitution Hall – 4th Floor South
525 West Allegan Street
Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

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Sent: Monday, June 24, 2019 10:31 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Lead Pilot Grant Reimbursement Request #1
Importance: High

Hi Clarence – attached is the Request for Disbursement of Funds and all the related documentation for the costs incurred to date for the City of Benton Harbor. I have also included a summary schedule (2nd page) that lists all the invoices/cleared checks that are included for this Request. Please send me the address that you would like these documents mailed to as I will get them sent via FedEx today. The address on your form is a PO address and FedEx will need a street address to deliver the package.

Thanks for your help!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions
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From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1
Date:	Monday, June 14, 2021 10:47:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Friday, June 28, 2019 8:42 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Subject: RE: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1

Rhonda-

Very good and thank you. We do NOT need copies of the Change Orders.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410

Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Friday, June 28, 2019 8:33 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1

Hi Clarence – I have a meeting this morning. So…let me know when you are available after lunch. I will send you something before then so we can discuss.

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Thursday, June 27, 2019 3:57 PM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Subject: RE: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1

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Rhoda-

Yes I will be in the office. I have an appointment from 10 until 11? After that I am in the office until 4:30. Anytime before 10 will be good.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410

Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Thursday, June 27, 2019 3:49 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1

Hi Clarence – Sorry I missed your call! I am in a meeting this afternoon. Are you in tomorrow? I can prepare a schedule that will display what is paid as compared to the invoices that will be easier to follow. Payments to B&Z and Meeks had retainage withheld (10%) and the Pay Request schedule prepared by Abonmarche is the amount the City paid. For instance if the invoice amount was for $10,000--City would only pay $9,000 and pay the balance at the end when the work was completed. Let me know if tomorrow works for you!

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Thursday, June 27, 2019 3:08 PM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Subject: RE: Benton Harbor Lead Pilot Grant Project No. 1901-01 Reimbursement Request #1

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Rhonda-

1. Please forward PDF copies of all the Change Orders related to the Benton Harbor Lead Pilot Grant Project No. 1901-01 Disbursement Request No. 1.
2. I am having a difficult time trying to match the Pilot Grant incurred costs on the summary sheet with the invoice that have been submitted as backup documentation.

Please contact me if you have questions.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Tuesday, June 25, 2019 8:52 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

Hi Clarence – the FedEx package should arrive this morning before 10:30 a.m. Let me know when it is received.

Thanks,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Monday, June 24, 2019 10:46 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: Lead Pilot Grant Reimbursement Request #1

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

Rhonda-

Here is the mailing address information you requested:

Clarence Jones
Michigan Department of Environment, Great Lakes and Energy
Finance Division – Water Infrastructure Financing Section
Constitution Hall – 4th Floor South
525 West Allegan Street
Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Water Infrastrucure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow us: Michigan.gov/EGLE

New Departmental Name: Michigan Department of Environment, Great Lakes, and Energy (EGLE).
Water Infrastructure Financing Section

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, June 24, 2019 10:31 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Lead Pilot Grant Reimbursement Request #1
Importance: High

Hi Clarence – attached is the Request for Disbursement of Funds and all the related documentation for the costs incurred to date for the City of Benton Harbor. I have also included a summary schedule (2nd page) that lists all the invoices/cleared checks that are included for this Request. Please send me the address that you would like these documents mailed to as I will get them sent via FedEx today. The address on your form is a PO address and FedEx will need a street address to deliver the package.

Thanks for your help!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From:	Sarkipato, Ernest (DEQ)
To:	momalley@cityofbentonharbormi.gov; "DARWIN WATSON"
Cc:	jmommersmmiinc@gmail.com; Ron Oudbier; "Curtis Brzyski"; Onan, Brandon (DEQ); "Todd Luks"; mike@michonline.net
Subject:	FW: Benton Harbor job
Date:	Tuesday, February 5, 2019 10:18:36 AM
Attachments:	0219bentonharboroud.doc benton30120-54_FPI_spec_data_sheet_Rev_1.pdf

Mike: here's a bump on this email quote from Curtis at MMI. All they need is an indication from you to get the meter on order. I spoke with Darwin who understands the need for a more expensive model (accuracy, NSF approval).
Also, they confirmed this would also include the processing unit to send the signal to the Stenner phosphate pump.
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** Sarkipato, Ernest (DEQ)
> **To:** Curtis Brzyski ; James Mommers
> **Cc:** momalley@cityofbentonharbormi.gov
> **Sent:** Monday, February 4, 2019 10:29 AM
> **Subject:** RE: Benton Harbor job
>
> City is going to have a local contractor tap the main and install the meter.
> Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
> We probably need 40' of cable.
> Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
> Ernie
>
> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
> **Sent:** Tuesday, January 29, 2019 9:36 AM

To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.
Ernie
From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>

Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

Midwest
Municipal
Instrumentation Inc.

McCROMETER
The Flow Measurement Specialists

Customer: City of Benton Harbor Water Treatment Plant

Reference: Insertion Meters
Date: 02/4/19

Attention: Mr. Mike O'Malley

We are pleased to offer our proposal for furnishing and delivering McCrometer Inc. equipment for the above referenced project. Equipment is specifically listed in the attached "Proposed Equipment List." Items required, but not listed, are to be furnished by others. **Make all Purchase Orders out to McCrometer, Inc.; c/o: Midwest Municipal Instrumentation**

PROPOSED EQUIPMENT LIST

Freight Included
Does not include taxes

30 Inch INSERTION Meters with AC Power

Quantity	Model	Unit Cost
1	FPI MAG 395L McCrometer, FPI Flow Meter. Multi-Mag Insertion Type Multiple sets of 316 Stainless Steel Electrodes as Specified **Forward Flow ONLY** **Probe Insertion: 30 Inches in Length** 2 Inch Stainless Steel Diameter Probe as Specified NSF Fusion Bonded liner Sliding Joint: (Hot Tap) 2 Inch NPT 1% Accuracy from 0.3 Feet/second to 20 Feet/second (0 to 33,000 GPM) 110 VAC Power / Dual 4-20mA output for flow / Low Flow Contact NEMA 4X Transmitter with 6 Digit totalizer as Specified **40 Feet of cable of dual submersible cable** 2 Inch Stainless Steel Valve and 316 Stainless Steel Nipple P#43059-1 Included / Saddle not included Tag FE/FIT Advise	$13,995.00.
1	Ship Insertion measuring Tool	Included
	Startup by Oudbier Instruments NOT INCUDED	

Curtis Brzyski
MMI Inc.

Prepared by: Richard W Mommers
4391 Bonnymede Court
Jackson, MI 49201
Per McCrometer Terms & Conditions

Telephone: 419-936-4369
Fax: 419-754-2100
Cell: 419-419-9733
E-mail: rmommersmmi@msn.com

Validity of Proposal: 90 Days FOB: Factory
Payment Terms: 100% Net 30 Days from shipment
Taxes: Excluded and are the responsibility of the Buyer
Installation and all on-site services: Not Included

McCrometer, INC. - PROVISIONS & CONDITIONS

Acceptance: All orders subject to acceptance by Marsh-McBirney, Inc., hereinafter "Seller". Seller sells only pursuant to the provisions and conditions in this Order Acknowledgment. If Buyer's order contains written, printed, or stamped conditions inconsistent with the written, printed, or stamped provisions contained in this Order Acknowledgment, then the provisions of this Order Acknowledgment shall prevail.

Payment Terms: Invoices for material delivered under this order are payable only in United States dollars. All payments are due from date of invoice or shipment, whichever is sooner. These terms of payment are subject, nevertheless, at all times to the approval of Seller's Credit Department and in case of doubt arising as to Buyer's financial responsibility, shipment may be suspended until satisfactory assurances of Buyer's responsibility is received. **In the event that payment is received in excess of thirty (30) days from date of invoice, a Service Fee of 1.5% per month (18% per annum) shall be assessed. In the event that collection procedures are required by reasonable attorney fees, court costs, other litigation-related expenses, and interest at 1.5% per month from thirty days after date of invoice until receipt of payment.** Each shipment shall be considered a separate and independent transaction, and payment therefore shall be made accordingly. In the event the Buyer delays shipments, payments shall become due on the date when the Seller is prepared to make shipment. In the event the Buyer delays the work covered by the purchase order, payments shall be based on the purchase price and the percentage of completion. Products held for the Buyer shall be at the risk of the Buyer. The Seller reserves the right to ship to its order and make collection by sight draft with bill of lading attached.

Assignment: All accounts receivable balances due are assignable at the discretion of the Seller.

Delivery Dates: The estimated shipping capability stated on this order acknowledgment is given solely for the Buyer's information and does not constitute a commitment to deliver products in accordance herewith. Buyer may request a specific shipping date or shipping schedule; however, Buyer may not request that a shipment be scheduled beyond one year from the issuance of its purchase order. Seller will schedule shipments based upon Buyer's request and Seller's shipping capabilities at the time Buyer's purchase order is processed, at which time Seller will issue to Buyer a formal acknowledgment that will indicate the estimated shipping date(s). After the shipments have been scheduled, Buyer may not cancel or postpone a scheduled shipment unless Buyer submits its request in writing and Seller consents by issuing a new acknowledgment. Any request to reschedule the shipment that is received less than thirty (30) days from the date scheduled for the shipment of the products covered by the request may be rejected as untimely, or may be accepted upon payment of a rescheduling charge of 10% of the sales price shown on this acknowledgment, at Seller's option. Seller will use its best efforts to ship on or before the estimated shipping dates indicated, but will not be liable for any delay or failure to deliver resulting from circumstances which are beyond the reasonable control of the Seller or which would cause Seller to incur unreasonable expense in order to effect such delivery. Seller shall not be liable for any special incidental or consequential damages resulting from delivery delays or inability to deliver.

Cancellations: In the event Buyer cancels the contract embodied in Buyer's order and this acceptance thereof in whole or in part, or such contract is canceled by Seller because of default by the Buyer, then Buyer shall pay Seller by reason of such cancellation or default for all damages sustained, and shall pay for units in process and completed units, shipped or unshipped, at current price applicable to the total quantity completed at time of default.

Shipping: All items are shipped FOB Frederick, Maryland with freight charges prepaid and added to the invoice. Title and risk of loss shall pass to Buyer upon tender of the products by Seller to a common carrier. In absence of specific written instruction from Buyer, Seller will select the common carrier, but Seller shall not thereby incur any liability in connection with shipment. Buyer

shall be responsible for any freight charge.

Returns/Exchanges: Only instrumentation manufactured by Marsh-McBirney, Inc. will be accepted for return/exchange. An instrument can only be returned or exchanged after first; notifying the factory of the reason for return/exchange, and secondly, receiving authorization from a Marsh-McBirney, Inc. factory representative. Computers and other peripheral devices supplied by Marsh-McBirney, Inc. with a customer's order will not be exchanged or accepted for return after shipment. For all returns of instrumentation and accessories, there is a 25% restocking charge.

Start-up Service: It is the customer's responsibility to notify Marsh-McBirney, Inc. to schedule on-site start-up service. Marsh-McBirney, Inc. will make every effort to schedule the start-up service as soon as possible after receipt of notification.

Warranty: The one-year warranty period starts from date of shipment from the factory. This warranty covers only instrumentation manufactured by Marsh-McBirney, Inc. See complete warranty statement enclosed. For extended maintenance agreements, please contact our Customer Service Department.

Seller and Buyer agree that the laws of Maryland shall govern their agreement.

ABB INC.
GENERAL TERMS AND CONDITIONS OF SALE

1. General. The terms and conditions contained herein, together with any additional or different terms contained in ABB's Proposal, if any, submitted to Purchaser (which Proposal shall control over any conflicting terms), constitute the entire agreement (the "Agreement") between the parties with respect to the order and supersede all prior communications and agreements regarding the order. Acceptance by ABB of the order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. These terms and conditions may not be changed or superseded by any different or additional terms and conditions proposed by Purchaser to which terms ABB hereby objects. Unless the context otherwise requires, the term "Equipment" as used herein means all of the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the order. Unless the context otherwise requires, the term "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the order. As used herein, the term "Purchaser" shall include the initial end use of the Equipment and/or services; provided, however, that Paragraph 13(a) shall apply exclusively to the initial end user.

2. Prices.
(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof.
(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.
(c) The price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, or other like taxes which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such taxes which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any tax or holds a direct payment permit, Purchaser shall, upon order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.
(d) The price includes customs duties and other importation or exportation fees, if any, at the rates in effect on the date of ABB's Proposal. Any change after that date in such duties, fees, or rates, shall increase the price by ABB's additional cost.

3. Payment.
(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal.
(b) If in the judgment of ABB the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB, or may terminate the order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.
(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection.

4. Changes.
(a) Any changes requested by Purchaser affecting the ordered scope of work must be accepted by ABB and resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.
(b) ABB may, at its expense, make such changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications. If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection.

5. Delivery.
(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered F.O.B. point of shipment. Equipment shipped from outside the continental United States is delivered F.O.B. United States port of entry. Purchaser shall be responsible for any and all demurrage or detention charges.
(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.
(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.
(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier

6. Title & Risk of Loss. Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall remain in ABB until fully paid for. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage shall pass to Purchaser upon delivery.

7. Inspection, Testing and Acceptance.
(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours.
(b) If the order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.
(c) If the order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.
(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software, Spare Parts and Refurbished or Repaired Parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. The Warranty Remedy Period for refurbished or repaired parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.
(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or 30 days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.
(c) Exceptions. ABB shall not be responsible for providing working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.
(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".
(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Patent Indemnity.
(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB (a "Process") directly infringes any claim of a patent of the United States

of America and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.
(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any patent issued after the date hereof; or (v) any action settled or otherwise terminated without the prior written consent of ABB.
(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY PATENT INFRINGEMENT.
(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Patent Indemnity" provision.

10. Limitation of Liability.
(a) In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages. ABB's liability for any claim whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Patent Indemnity") exceed one-half (1/2) of the purchase price allocable to the Equipment or part thereof or Services which gives rise to the claim.
(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.
(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

11. Laws and Regulations. ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth herein, and compliance with any laws and regulations relating to the operation or use of the Equipment or Software is the sole responsibility of the Purchaser. All laws and regulations referenced herein shall be those in effect as of the Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall be governed by the laws of the State of New York, but excluding the provisions of the United Nations Convention on Contracts for the International Sale of Goods and excluding New York law with respect to conflicts of law. Purchaser agrees that all causes of action against ABB under this Agreement shall be brought in the State Courts of the State of New York, or the U.S. District Court for the Southern District of New York. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

12. OSHA. ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

13. Software License.
(a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) The Software may be used only in conjunction with equipment specified by ABB; (ii) The Software shall be kept strictly confidential; (iii) The Software shall not be copied, reverse engineered, or modified; (iv) The Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.
(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine readable Software from all of Purchaser's storage media.

14. Inventions and Information. Unless otherwise agreed in writing by ABB and Purchaser, all right, title and interest in any inventions, developments, improvements or modifications of or for Equipment and Services shall remain with ABB. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

15. Force Majeure. ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

16. Cancellation. Any order may be cancelled by Purchaser only upon prior written notice and payment of termination charges, including but not limited to, all costs identified to the order incurred prior to the effective date of notice of termination and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

17. Termination. No termination by Purchaser for default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

18. Export Control.
(a) Purchaser represents and warrants that the Equipment and Services provided hereunder and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use. Purchaser agrees not to disclose, use, export or re-export, directly or indirectly, any information provided by ABB or the "direct product" thereof as defined in the Export Control Regulations of the United States Department of Commerce, except in compliance with such Regulations.
(b) If applicable, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

19. Assignment. Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

20. Nuclear Insurance – Indemnity. For applications in nuclear projects, the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage resulting from a nuclear incident to and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident.

21. Resale. If Purchaser resells any of the Equipment, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder.

22. Entire Agreement. This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided.

McCROMETER

FPI Mag®

SPECIFICATION DATA SHEET

Models 394L and 395L

NOTE: All Blue Fields are Mandatory. Custom sensors cannot be manufactured without this information.

End User Name	**Benton Harbor**
End User Email	
End User Phone	
FPI Site Address	
Site Name *(Ex. Well #1)*	
Application *(Ex. Well Output)*	
Meter Fluid *(Ex. Raw Water)*	
Direction	◉ 395L Forward ○ 394L Bidirectional
Electrodes	Stainless Steel (Default)
Converter Power	90-265 VAC
Converter Options*	Standard
Datalogger	No Datalogger
Cathodic Protection	Yes (Consult Factory)
Sensor Cable Connection	**Click Here**
Sensor Cable Length in Feet	**40**

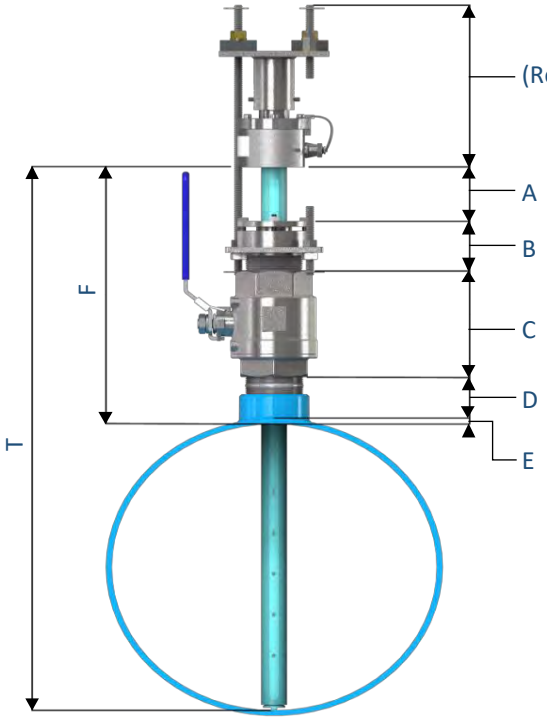
**See Configuration Sheet (Lit# 30121-75) for converter information.*

Date received by McCrometer	

Maximum Flow *(Ex. 2500 GPM)*	
Minimum Flow *(Ex. 100 GPM)*	
Average Flow *(Ex. 1500 GPM)*	
Full Scale *(Ex. 2500 GPM)*	
Maximum Line Pressure *(PSI or kPA)*	
Maximum Temperature *(°C or °F)*	
Authorized Customer Signature:	

The above signature authorizes McCrometer to rely upon the provided specifications.

Units of Measure: **Click Here**

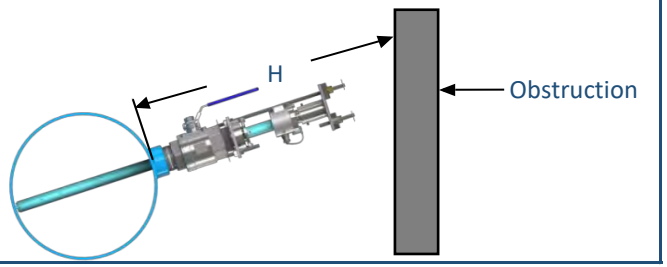


ID		Inside Pipe Diameter (Not Nominal Pipe size)
A		Critical Spacing
B		Compression Seal Height (1.5" for ≤24.99", 3.5" for ≥25.00")
C		Valve Height (McCrometer supplied valve = 5.0" or specify)
D		Close Nipple and Coupling/Saddle Height (*McCrometer Supplied Close Nipple is 1.0" + Industry Standard Coupling or Saddle Default = 1.5"), OR Customer Supplied Dimension
E		Pipe Wall Thickness - Default 1.0" OR Customer Supplied Dimension
F		F = A + B + C + D + E
T		**T = Total Sensor Length (F + ID)**
H		Calculated Distance When Close to an Obstruction (T + C + D + 18")

Model:

***Verify Clearance**

****Consult Factory if **Obstruction** is closer to pipe than **Distance "H".***



*IMPORTANT: The MINIMUM inside diameter (ID) for the installation valve and pipe cut-out to avoid damage to the sensor is 1-7/8".

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Contact your McCrometer representative for current technical data and instructions.

From:	Sarkipato, Ernest (DEQ)
To:	momalley@cityofbentonharbormi.gov
Subject:	FW: Benton Harbor job
Date:	Thursday, February 14, 2019 10:36:17 AM
Attachments:	0219bentonharboroud.doc benton30120-54_FPI_spec_data_sheet_Rev_1.pdf

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Can you give me an update on where you are at with moving the phosphate project forward?

From: Sarkipato, Ernest (DEQ)
Sent: Tuesday, February 5, 2019 10:19 AM
To: momalley@cityofbentonharbormi.gov; 'DARWIN WATSON' <dwatson@cityofbentonharbormi.gov>
Cc: jmommersmmiinc@gmail.com; 'Ron Oudbier' <ron@oudbierinst.com>; 'Curtis Brzyski' <cbrzyskimmi@msn.com>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net
Subject: FW: Benton Harbor job

Mike: here's a bump on this email quote from Curtis at MMI. All they need is an indication from you to get the meter on order. I spoke with Darwin who understands the need for a more expensive model (accuracy, NSF approval).
Also, they confirmed this would also include the processing unit to send the signal to the Stenner phosphate pump.
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production. If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** Sarkipato, Ernest (DEQ)
> **To:** Curtis Brzyski ; James Mommers
> **Cc:** momalley@cityofbentonharbormi.gov
> **Sent:** Monday, February 4, 2019 10:29 AM
> **Subject:** RE: Benton Harbor job

City is going to have a local contractor tap the main and install the meter.
Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
We probably need 40' of cable.
Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Tuesday, January 29, 2019 9:36 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM

Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.
Ernie
From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

Midwest
Municipal
Instrumentation Inc.

McCROMETER
The Flow Measurement Specialists

Customer: City of Benton Harbor Water Treatment Plant

Reference: Insertion Meters
Date: 02/4/19

Attention: Mr. Mike O'Malley

We are pleased to offer our proposal for furnishing and delivering McCrometer Inc. equipment for the above referenced project. Equipment is specifically listed in the attached "Proposed Equipment List." Items required, but not listed, are to be furnished by others. **Make all Purchase Orders out to McCrometer, Inc.; c/o: Midwest Municipal Instrumentation**

PROPOSED EQUIPMENT LIST

Freight Included
Does not include taxes

30 Inch INSERTION Meters with AC Power

Quantity	Model	Unit Cost
1	FPI MAG 395L McCrometer, FPI Flow Meter. Multi-Mag Insertion Type Multiple sets of 316 Stainless Steel Electrodes as Specified **Forward Flow ONLY** **Probe Insertion: 30 Inches in Length** 2 Inch Stainless Steel Diameter Probe as Specified NSF Fusion Bonded liner Sliding Joint: (Hot Tap) 2 Inch NPT 1% Accuracy from 0.3 Feet/second to 20 Feet/second (0 to 33,000 GPM) 110 VAC Power / Dual 4-20mA output for flow / Low Flow Contact NEMA 4X Transmitter with 6 Digit totalizer as Specified **40 Feet of cable of dual submersible cable** 2 Inch Stainless Steel Valve and 316 Stainless Steel Nipple P#43059-1 Included / Saddle not included Tag FE/FIT Advise	$13,995.00.
1	Ship Insertion measuring Tool	Included
	Startup by Oudbier Instruments NOT INCUDED	

Curtis Brzyski
MMI Inc.

Prepared by: Richard W Mommers
4391 Bonnymede Court
Jackson, MI 49201
Per McCrometer Terms & Conditions

Telephone: 419-936-4369
Fax: 419-754-2100
Cell: 419-419-9733
E-mail: rmommersmmi@msn.com

Validity of Proposal: 90 Days FOB: Factory
Payment Terms: 100% Net 30 Days from shipment
Taxes: Excluded and are the responsibility of the Buyer
Installation and all on-site services: Not Included

McCrometer, INC. - PROVISIONS & CONDITIONS

Acceptance: All orders subject to acceptance by Marsh-McBirney, Inc., hereinafter "Seller". Seller sells only pursuant to the provisions and conditions in this Order Acknowledgment. If Buyer's order contains written, printed, or stamped conditions inconsistent with the written, printed, or stamped provisions contained in this Order Acknowledgment, then the provisions of this Order Acknowledgment shall prevail.

Payment Terms: Invoices for material delivered under this order are payable only in United States dollars. All payments are due from date of invoice or shipment, whichever is sooner. These terms of payment are subject, nevertheless, at all times to the approval of Seller's Credit Department and in case of doubt arising as to Buyer's financial responsibility, shipment may be suspended until satisfactory assurances of Buyer's responsibility is received. **In the event that payment is received in excess of thirty (30) days from date of invoice, a Service Fee of 1.5% per month (18% per annum) shall be assessed. In the event that collection procedures are required by reasonable attorney fees, court costs, other litigation-related expenses, and interest at 1.5% per month from thirty days after date of invoice until receipt of payment.** Each shipment shall be considered a separate and independent transaction, and payment therefore shall be made accordingly. In the event the Buyer delays shipments, payments shall become due on the date when the Seller is prepared to make shipment. In the event the Buyer delays the work covered by the purchase order, payments shall be based on the purchase price and the percentage of completion. Products held for the Buyer shall be at the risk of the Buyer. The Seller reserves the right to ship to its order and make collection by sight draft with bill of lading attached.

Assignment: All accounts receivable balances due are assignable at the discretion of the Seller.

Delivery Dates: The estimated shipping capability stated on this order acknowledgment is given solely for the Buyer's information and does not constitute a commitment to deliver products in accordance herewith. Buyer may request a specific shipping date or shipping schedule; however, Buyer may not request that a shipment be scheduled beyond one year from the issuance of its purchase order. Seller will schedule shipments based upon Buyer's request and Seller's shipping capabilities at the time Buyer's purchase order is processed, at which time Seller will issue to Buyer a formal acknowledgment that will indicate the estimated shipping date(s). After the shipments have been scheduled, Buyer may not cancel or postpone a scheduled shipment unless Buyer submits its request in writing and Seller consents by issuing a new acknowledgment. Any request to reschedule the shipment that is received less than thirty (30) days from the date scheduled for the shipment of the products covered by the request may be rejected as untimely, or may be accepted upon payment of a rescheduling charge of 10% of the sales price shown on this acknowledgment, at Seller's option. Seller will use its best efforts to ship on or before the estimated shipping dates indicated, but will not be liable for any delay or failure to deliver resulting from circumstances which are beyond the reasonable control of the Seller or which would cause Seller to incur unreasonable expense in order to effect such delivery. Seller shall not be liable for any special incidental or consequential damages resulting from delivery delays or inability to deliver.

Cancellations: In the event Buyer cancels the contract embodied in Buyer's order and this acceptance thereof in whole or in part, or such contract is canceled by Seller because of default by the Buyer, then Buyer shall pay Seller by reason of such cancellation or default for all damages sustained, and shall pay for units in process and completed units, shipped or unshipped, at current price applicable to the total quantity completed at time of default.

Shipping: All items are shipped FOB Frederick, Maryland with freight charges prepaid and added to the invoice. Title and risk of loss shall pass to Buyer upon tender of the products by Seller to a common carrier. In absence of specific written instruction from Buyer, Seller will select the common carrier, but Seller shall not thereby incur any liability in connection with shipment. Buyer

shall be responsible for any freight charge.

Returns/Exchanges: Only instrumentation manufactured by Marsh-McBirney, Inc. will be accepted for return/exchange. An instrument can only be returned or exchanged after first; notifying the factory of the reason for return/exchange, and secondly, receiving authorization from a Marsh-McBirney, Inc. factory representative. Computers and other peripheral devices supplied by Marsh-McBirney, Inc. with a customer's order will not be exchanged or accepted for return after shipment. For all returns of instrumentation and accessories, there is a 25% restocking charge.

Start-up Service: It is the customer's responsibility to notify Marsh-McBirney, Inc. to schedule on-site start-up service. Marsh-McBirney, Inc. will make every effort to schedule the start-up service as soon as possible after receipt of notification.

Warranty: The one-year warranty period starts from date of shipment from the factory. This warranty covers only instrumentation manufactured by Marsh-McBirney, Inc. See complete warranty statement enclosed. For extended maintenance agreements, please contact our Customer Service Department.

Seller and Buyer agree that the laws of Maryland shall govern their agreement.

ABB INC.
GENERAL TERMS AND CONDITIONS OF SALE

1. General. The terms and conditions contained herein, together with any additional or different terms contained in ABB's Proposal, if any, submitted to Purchaser (which Proposal shall control over any conflicting terms), constitute the entire agreement (the "Agreement") between the parties with respect to the order and supersede all prior communications and agreements regarding the order. Acceptance by ABB of the order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. These terms and conditions may not be changed or superseded by any different or additional terms and conditions proposed by Purchaser to which terms ABB hereby objects. Unless the context otherwise requires, the term "Equipment" as used herein means all of the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the order. Unless the context otherwise requires, the term "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the order. As used herein, the term "Purchaser" shall include the initial end use of the Equipment and/or services; provided, however, that Paragraph 13(a) shall apply exclusively to the initial end user.

2. Prices.
(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof.
(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.
(c) The price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, or other like taxes which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such taxes which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any tax or holds a direct payment permit, Purchaser shall, upon order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.
(d) The price includes customs duties and other importation or exportation fees, if any, at the rates in effect on the date of ABB's Proposal. Any change after that date in such duties, fees, or rates, shall increase the price by ABB's additional cost.

3. Payment.
(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal.
(b) If in the judgment of ABB the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB, or may terminate the order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.
(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection.

4. Changes.
(a) Any changes requested by Purchaser affecting the ordered scope of work must be accepted by ABB and resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.
(b) ABB may, at its expense, make such changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications. If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection.

5. Delivery.
(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered F.O.B. point of shipment. Equipment shipped from outside the continental United States is delivered F.O.B. United States port of entry. Purchaser shall be responsible for any and all demurrage or detention charges.
(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.
(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.
(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier

6. Title & Risk of Loss. Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall remain in ABB until fully paid for. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage shall pass to Purchaser upon delivery.

7. Inspection, Testing and Acceptance.
(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours.
(b) If the order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.
(c) If the order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.
(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software, Spare Parts and Refurbished or Repaired Parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. The Warranty Remedy Period for refurbished or repaired parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.
(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or 30 days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.
(c) Exceptions. ABB shall not be responsible for providing working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.
(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".
(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Patent Indemnity.
(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB (a "Process") directly infringes any claim of a patent of the United States

of America and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.
(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any patent issued after the date hereof; or (v) any action settled or otherwise terminated without the prior written consent of ABB.
(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY PATENT INFRINGEMENT.
(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Patent Indemnity" provision.

10. Limitation of Liability.
(a) In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages. ABB's liability for any claim whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Patent Indemnity") exceed one-half (1/2) of the purchase price allocable to the Equipment or part thereof or Services which gives rise to the claim.
(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.
(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

11. Laws and Regulations. ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth herein, and compliance with any laws and regulations relating to the operation or use of the Equipment or Software is the sole responsibility of the Purchaser. All laws and regulations referenced herein shall be those in effect as of the Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall be governed by the laws of the State of New York, but excluding the provisions of the United Nations Convention on Contracts for the International Sale of Goods and excluding New York law with respect to conflicts of law. Purchaser agrees that all causes of action against ABB under this Agreement shall be brought in the State Courts of the State of New York, or the U.S. District Court for the Southern District of New York. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

12. OSHA. ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

13. Software License.
(a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) The Software may be used only in conjunction with equipment specified by ABB; (ii) The Software shall be kept strictly confidential; (iii) The Software shall not be copied, reverse engineered, or modified; (iv) The Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.
(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine readable Software from all of Purchaser's storage media.

14. Inventions and Information. Unless otherwise agreed in writing by ABB and Purchaser, all right, title and interest in any inventions, developments, improvements or modifications of or for Equipment and Services shall remain with ABB. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

15. Force Majeure. ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

16. Cancellation. Any order may be cancelled by Purchaser only upon prior written notice and payment of termination charges, including but not limited to, all costs identified to the order incurred prior to the effective date of notice of termination and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

17. Termination. No termination by Purchaser for default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

18. Export Control.
(a) Purchaser represents and warrants that the Equipment and Services provided hereunder and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use. Purchaser agrees not to disclose, use, export or re-export, directly or indirectly, any information provided by ABB or the "direct product" thereof as defined in the Export Control Regulations of the United States Department of Commerce, except in compliance with such Regulations.
(b) If applicable, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

19. Assignment. Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

20. Nuclear Insurance – Indemnity. For applications in nuclear projects, the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage resulting from a nuclear incident to and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident.

21. Resale. If Purchaser resells any of the Equipment, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder.

22. Entire Agreement. This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided.

McCROMETER

FPI Mag®

SPECIFICATION DATA SHEET

Models 394L and 395L

NOTE: All Blue Fields are Mandatory. Custom sensors cannot be manufactured without this information.

End User Name	**Benton Harbor**
End User Email	
End User Phone	
FPI Site Address	
Site Name *(Ex. Well #1)*	
Application *(Ex. Well Output)*	
Meter Fluid *(Ex. Raw Water)*	
Direction	◉ 395L Forward ○ 394L Bidirectional
Electrodes	Stainless Steel (Default)
Converter Power	90-265 VAC
Converter Options*	Standard
Datalogger	No Datalogger
Cathodic Protection	Yes (Consult Factory)
Sensor Cable Connection	**Click Here**
Sensor Cable Length in Feet	**40**

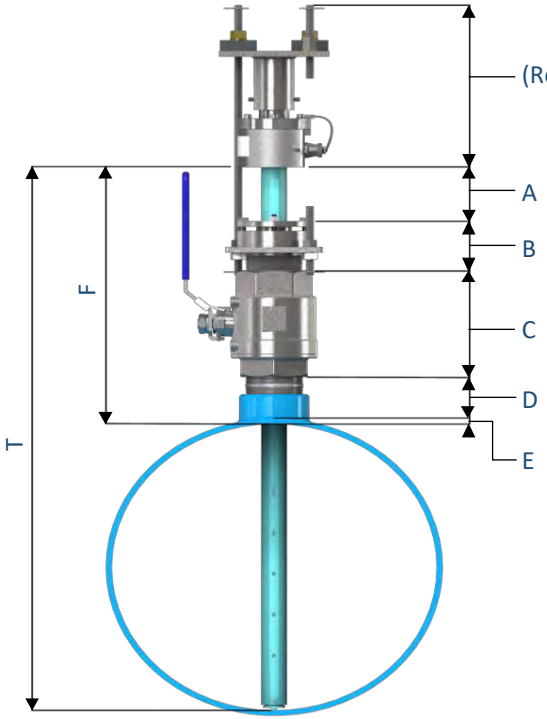
**See Configuration Sheet (Lit# 30121-75) for converter information.*

Date received by McCrometer	

Maximum Flow *(Ex. 2500 GPM)*	
Minimum Flow *(Ex. 100 GPM)*	
Average Flow *(Ex. 1500 GPM)*	
Full Scale *(Ex. 2500 GPM)*	
Maximum Line Pressure *(PSI or kPA)*	
Maximum Temperature *(°C or °F)*	
Authorized Customer Signature:	

The above signature authorizes McCrometer to rely upon the provided specifications.

Units of Measure: **Click Here**

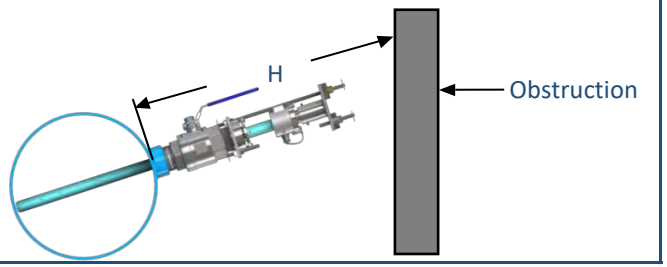


ID		Inside Pipe Diameter (Not Nominal Pipe size)
A		Critical Spacing
B		Compression Seal Height (1.5" for ≤24.99", 3.5" for ≥25.00")
C		Valve Height (McCrometer supplied valve = 5.0" or specify)
D		Close Nipple and Coupling/Saddle Height (*McCrometer Supplied Close Nipple is 1.0" + Industry Standard Coupling or Saddle Default = 1.5"), OR Customer Supplied Dimension
E		Pipe Wall Thickness - Default 1.0" OR Customer Supplied Dimension
F		F = A + B + C + D + E
T		**T = Total Sensor Length (F + ID)**
H		Calculated Distance When Close to an Obstruction (T + C + D + 18")

Model:

***Verify Clearance**

****Consult Factory if **Obstruction** is closer to pipe than **Distance "H".***



*IMPORTANT: The MINIMUM inside diameter (ID) for the installation valve and pipe cut-out to avoid damage to the sensor is 1-7/8".

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Contact your McCrometer representative for current technical data and instructions.

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Benton Harbor
Date:	Monday, June 14, 2021 9:52:00 PM
Attachments:	1901-01 Benton Harbor DW Pilot Grant Letter wattachment 3-29-19.pdf image001.png
Importance:	High

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Arntz, Renee (EGLE) <ARNTZR@michigan.gov>
Sent: Friday, May 3, 2019 9:48 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: Benton Harbor
Importance: High

Here it is.

Renee' M. Arntz, Secretary
Department of Environment, Great Lakes, and Energy
Water Infrastructure Financing Section
P.O. Box 30817
Lansing, Michigan 48909-8311
Email: arntzr@michigan.gov
Phone: 517-284-5433 – Main Phone Line
Phone: 517-284-5419 – Direct Phone Line

Phone: 517-241-1328 – Fax Line

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

March 29, 2019

Mr. Darwin Watson, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Watson:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control
Grant Project Number 1901-01

We are extending the city of Benton Harbor's PDW grant end date. The revised end date is September 30, 2019.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the below address within two weeks. Upon receipt, the DEQ will sign the document and send you a fully executed copy, whereupon it will become effective.

The city's PDW grant requires the following "deliverable" be provided to the DEQ within 30 days from the end date of the grant agreement.

- Certificate of Completeness

Should you have any question, please contact me at the phone number below, by email at Jonesc13@michigan.gov, or by mail at DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Clarence Jones, Project Manager
Revolving Loan Section
Drinking Water and Muncipal Assistance Division
517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environmental Quality (hereafter "State"), and the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 20, 2018** for the **Material Inventory, Asset Management Plan, Lead Service Line Replacement and Corrosion Control.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.
Installation of corrosion control system at the Benton Harbor Wastewater Treatment Plant.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **May 31, 2019** to **September 30, 2019.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Signature	Date
Darwin Watson, Interim City Manager	
Name/Title	

FOR THE STATE:

Signature	Date
Karol Patton, Acting Section Manager	
Name/Title	

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019
Date:	Monday, June 14, 2021 10:43:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Wednesday, May 15, 2019 8:56 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

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Thank you,

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Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

From: Jones, Clarence (EGLE)
Sent: Monday, May 06, 2019 7:43 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
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From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, May 03, 2019 5:34 PM
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Please Remove My St. Joe City email and replace it with

momalley@cityofbentonharbormi.gov

This way I can be of service to Darwin though this Pilot grant. And, assist you in getting the information you request.

Attached: *Extend MDEQ Pilot Grant letter Signed.pdf*

Thanks, and have a nice weekend,

Mike O'Malley
Benton Harbor Water Superintendent

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019
Date:	Monday, June 14, 2021 9:57:00 PM
Attachments:	Benton Harbor Pilot Drinking Water Grant No. 1901-01 Extension Letter.pdf image001.png

BH emails

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For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Friday, May 17, 2019 3:24 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Cc: Patton, Karol (EGLE) <PATTONK@michigan.gov>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Darwin-

I have attached a copy of the signed City of Benton Harbor Pilot Drinking Water Grant No. 1901 Grant Period Extension letter for your records.

Please contact me if you have questions.

Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
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From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
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Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
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Subject: City Accepts Amendment to Pilot DW CS Grant Extention to September 30 2019

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Attached: *Extend MDEQ Pilot Grant letter Signed.pdf*

Thanks, and have a nice weekend,

Mike O'Malley
Benton Harbor Water Superintendent

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

LIESL EICHLER CLARK
DIRECTOR

March 29, 2019

Mr. Darwin Watson, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Watson:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control
Grant Project Number 1901-01

We are extending the city of Benton Harbor's PDW grant end date. The revised end date is September 30, 2019.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the below address within two weeks. Upon receipt, the DEQ will sign the document and send you a fully executed copy, whereupon it will become effective.

The city's PDW grant requires the following "deliverable" be provided to the DEQ within 30 days from the end date of the grant agreement.

- Certificate of Completeness

Should you have any question, please contact me at the phone number below, by email at Jonesc13@michigan.gov, or by mail at DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Clarence Jones, Project Manager
Revolving Loan Section
Drinking Water and Muncipal Assistance Division
517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

RECEIVED
MAY 17 2019
MDEQ-ODWMA
RLS

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environmental Quality (hereafter "State"), and the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 20, 2018** for the **Material Inventory, Asset Management Plan, Lead Service Line Replacement and Corrosion Control.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.
Installation of corrosion control system at the Benton Harbor Wastewater Treatment Plant.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **May 31, 2019** to **September 30, 2019.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE: Darwin Watson — 5/3/19

Signature — Date

Darwin Watson, Interim City Manager

Name/Title

FOR THE STATE: Karol Patton — 5/17/2019

Signature — Date

Karol Patton, Acting Section Manager

Name/Title

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019
Date:	Monday, June 14, 2021 9:56:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
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Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, May 15, 2019 1:52 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Jones, Clarence (EGLE) <JONESC13@michigan.gov>; Mike O'Malley <momalley@cityofbentonharbormi.gov>
Subject: Re: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

And I mailed another copy just now; to the address you gave me in your reply email.

Mike O'Malley

On Wed, May 15, 2019 at 1:38 PM Darwin Watson <dwatson@cityofbentonharbormi.gov> wrote:

> Clarence,
>
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Thanks

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Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Darwin-

Perhaps it is just slow getting here? I just left the mailroom and it was not there. I would recommend using FEDEX since it is a very important time sensitive document?

Thank you,

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> **From:** Jones, Clarence (EGLE)
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> **To:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
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Sent: Monday, May 06, 2019 7:43 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Mike-

Mike sorry for any confusion, but program emails are always sent to the authorized representative for any program we have. In this case it is Darwin Watson who is the authorized representative for the Pilot Drinking Water Grant, and he is the one who must sign the extension letter. Also we must have the original signed HARD COPY of this document sent to our office. We cannot use a PDF. Please do this as soon as possible.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

Please note the changes in my signature block, that the MDEQ no longer exists . Instead, we are now the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, May 03, 2019 5:34 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: City Accepts Amendment to Pilot DW CS Grant Extention to September 30 2019

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Attached: *Extend MDEQ Pilot Grant letter Signed.pdf*

Thanks, and have a nice weekend,

Mike O'Malley
Benton Harbor Water Superintendent

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019
Date:	Monday, June 14, 2021 9:54:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

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Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
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From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extention to September 30 2019
Date:	Monday, June 14, 2021 9:53:00 PM
Attachments:	Extend MDEQ Pilot Grant letter Signed.pdf image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
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Benton Harbor Water Superintendent

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

March 29, 2019

Mr. Darwin Watson, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Watson:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control
Grant Project Number 1901-01

We are extending the city of Benton Harbor's PDW grant end date. The revised end date is September 30, 2019.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the below address within two weeks. Upon receipt, the DEQ will sign the document and send you a fully executed copy, whereupon it will become effective.

The city's PDW grant requires the following "deliverable" be provided to the DEQ within 30 days from the end date of the grant agreement.

- Certificate of Completeness

Should you have any question, please contact me at the phone number below, by email at Jonesc13@michigan.gov, or by mail at DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Clarence Jones, Project Manager
Revolving Loan Section
Drinking Water and Muncipal Assistance Division
517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
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(Authorized by 1994 PA 451)

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Installation of corrosion control system at the Benton Harbor Wastewater Treatment Plant.

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The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

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The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Darwin Watson — 5/3/19

Signature — Date

Darwin Watson, Interim City Manager

Name/Title

FOR THE STATE:

Signature — Date

Karol Patton, Acting Section Manager

Name/Title

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extention to September 30 2019
Date:	Monday, June 14, 2021 9:50:00 PM
Attachments:	Extend MDEQ Pilot Grant letter Signed.pdf image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

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City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

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City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control
Grant Project Number 1901-01

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Sincerely,

Clarence Jones, Project Manager
Revolving Loan Section
Drinking Water and Muncipal Assistance Division
517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
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Signature — Date

Darwin Watson, Interim City Manager

Name/Title

FOR THE STATE:

Signature — Date

Karol Patton, Acting Section Manager

Name/Title

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019
Date:	Monday, June 14, 2021 10:45:00 PM
Attachments:	Benton Harbor Pilot Drinking Water Grant No. 1901-01 Extension Letter.pdf image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Friday, May 17, 2019 3:24 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Cc: Patton, Karol (EGLE) <PATTONK@michigan.gov>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Darwin-

I have attached a copy of the signed City of Benton Harbor Pilot Drinking Water Grant No. 1901 Grant Period Extension letter for your records.

Please contact me if you have questions.

Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Wednesday, May 15, 2019 1:39 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: Re: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Clarence,

The original hard copy was signed and mailed last week. The document should be in your possession or should soon be in your possession.

Thanks

On Wed, May 15, 2019 at 8:56 AM Jones, Clarence (EGLE) <JONESC13@michigan.gov> wrote:

> All-
>
> We are still waiting for the hard copy of the Benton Harbor Amendment to Pilot DW CS Grant Extension to September 30 2019 which we have been requesting since March. A PDF copy will not due since we must sign the hard copy and return it to the city in order for it to become effective. If you do not return the extension form and have our signature, on May 31, 2019, the project deliverables will be due, and the Benton Harbor Pilot Grant period will end.
>
> Thank you,
>
> Clarence Jones
> Project Manager/Environmental Quality Analyst
> Michigan Department of Environment, Great
> Lakes, and Energy
> Phone: 517-284-8410
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GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

LIESL EICHLER CLARK
DIRECTOR

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Benton Harbor, Michigan 49022

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517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

RECEIVED
MAY 17 2019
MDEQ-ODWMA
RLS

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
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Signature — Date

Darwin Watson, Interim City Manager

Name/Title

FOR THE STATE: Karol Patton — 5/17/2019

Signature — Date

Karol Patton, Acting Section Manager

Name/Title

From:	Jason Marquardt
To:	Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject:	FW: City of Benton Harbor Corrosion Study
Date:	Wednesday, March 31, 2021 10:29:19 AM
Attachments:	image001.png image002.png image003.png image004.png image006.png 2021-03-29 BH Corrosion RFP_DRAFT.docx

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie/Brandon,
Following up on this RFP. I have the BH Clerk ready to proceed.
Yesterday, a pre proposal discussion was discussed. It would be easy for me to set that up easily with a goto meeting as non-mandatory if you think that is helpful. Let me know if you have any thoughts as I try and get this out before tomorrow. If not tomorrow, then we may have to wait to get it out until after 4/12.
Thanks,

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Jason Marquardt
Sent: Monday, March 29, 2021 1:38 PM
To: Ernie Sarkipato (sarkipatoe@michigan.gov) <sarkipatoe@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: City of Benton Harbor Corrosion Study
Gentlemen,
Attached is the latest Corrosion RFP after last Friday's meeting. Do you have any last comments based on our discussion with B&V?
We'll work on sending this out if no further comments.
Thanks,

Jason W. Marquardt, PE
Senior Project Manager
D 269.926.4565
O 269.927.2295 ext. 171
C 269.876.9304
abonmarche.com
ABONMARCHE

"2021 Firm of the Year"

CONFIDENTIALITY NOTICE: This e-mail and any attachments are for the exclusive and confidential use of the intended recipient. If you are not the intended recipient, please do not read, distribute or take action in reliance upon this message. If you have received this e-mail in error, please notify us immediately and promptly delete this message and its attachments from your computer system. We do not waive any work product privilege by the transmission of this message.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 29, 2021

Proposals Due: April 30, 2021, 3:00 pm

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be substantially completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, further study is required to identify the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items and methodology shall be described in the proposal.

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (this will require an assessment of previous sample site codes to allow for data comparison)
3. Analyze key water quality parameters (WQPs):
    a. Phosphate (PO_4) dose and distribution concentration variability
    b. Chlorine (Cl) dose and residual variability
    c. pH and impacts on corrosion indices
4. Analysis of distribution system pipe scales on various materials
5. Solubility tests for a comparative study of treatment methods
6. Pipe loop testing and the effectiveness of corrosion treatment
7. Comparison with analogous water system water quality and corrosion control strategies
8. Evaluate single family home water use trends

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – April 30 @ 3:00 pm
Consultant Award – May 2021
Kickoff with City and EGLE staff – June 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Note: some study components, such as a pipe loop if included, will likely remain in place for the city's use and continue to provide useful optimization data after this due date. In this case, the report should include recommendations on continued utilization of these components.

Terms and Conditions of this RFP:

1. Proposals must be submitted by 3:00 pm April 30, 2021. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

3. The City Reserves the Right to accept or reject any or all proposals and award the contract in the best interest of the City.

4. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, "Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

5. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

6. The City of Benton Harbor, Benton Harbor Water Team, and EGLE will evaluate submitted proposals for award.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Compliance with Applicable Federal Regulations

Awarded contractor must comply with the following Federal requirements:

1. Contract cannot be awarded to a firm whose Principals are presently excluded or disqualified. Disqualified means that a person is prohibited from participating in specified Federal procurement or nonprocurement transactions as required under a statute, Executive order (other than Executive Orders 12549 and 12689) or other authority.

2. Awarded contractor must have an active DUNS number in the System for Award Management (SAM) for verification of debarment

3. If award is over $100,000, and contractor is aware that any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, or any employee of a Member of Congress in connection with this Federal grant agreement project, the recipient shall complete and submit the Standard Form -- LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

4. Title VI of the Civil Rights Act of 1964, which prohibits discrimination based on race, color, and national origin, including limited English proficiency (LEP), by entities receiving Federal financial assistance. Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination against persons with disabilities by entities receiving Federal financial assistance; and The Age Discrimination Act of 1975, which prohibits age discrimination by entities receiving Federal financial assistance. Section 13 of the Federal Water Pollution Control Act Amendments of 1972, which prohibits discrimination on the basis of sex in CWA-funded programs or activities

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Proposal Form

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter
Date:	Monday, June 14, 2021 10:42:00 PM
Attachments:	1901-01 Benton Harbor DW Pilot Grant Letter wattachment 3-29-19.pdf image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Friday, May 3, 2019 9:54 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

See attachment.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy

Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Clarence,

Do you have a copy of the letter that you can pass along electronically?

Thanks,

Jason W. Marquardt, PE
Senior Project Engineer
Abonmarche
D 269.926.4565
T 269.927.2295 (Ext. 171)
C 269.876.9304
F 269.927.1017
W www.abonmarche.com

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Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
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Please contact me if you have questions.

Clarence Jones
Project Manager/Environmental Quality Analyst
Water Infrastructure Financing Section
Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

March 29, 2019

Mr. Darwin Watson, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Watson:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control
Grant Project Number 1901-01

We are extending the city of Benton Harbor's PDW grant end date. The revised end date is September 30, 2019.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the below address within two weeks. Upon receipt, the DEQ will sign the document and send you a fully executed copy, whereupon it will become effective.

The city's PDW grant requires the following "deliverable" be provided to the DEQ within 30 days from the end date of the grant agreement.

- Certificate of Completeness

Should you have any question, please contact me at the phone number below, by email at Jonesc13@michigan.gov, or by mail at DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Clarence Jones, Project Manager
Revolving Loan Section
Drinking Water and Muncipal Assistance Division
517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environmental Quality (hereafter "State"), and the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 20, 2018** for the **Material Inventory, Asset Management Plan, Lead Service Line Replacement and Corrosion Control.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.
Installation of corrosion control system at the Benton Harbor Wastewater Treatment Plant.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **May 31, 2019** to **September 30, 2019.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Signature	Date
Darwin Watson, Interim City Manager	
Name/Title	

FOR THE STATE:

Signature	Date
Karol Patton, Acting Section Manager	
Name/Title	

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City of Benton Harbor Pilot Drinking Water Grant No. 1901-01 Administrative Completion letter
Date:	Monday, June 14, 2021 10:34:00 PM
Attachments:	Benton Harbor Pilot Drinking Water Grant No. 1901-01 Signed Admin Completetion Letter.pdf image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Wednesday, June 24, 2020 10:11 AM
To: Ellis Mitchel <emitchell@cityofbentonharbormi.gov>; Rhonda Hildebrand <rhonda.hildebrand@plantemoran.com>; rrice <rrice@cityofbentonharbormi.gov>
Cc: Bishop, Heather (EGLE) <BishopH@michigan.gov>; Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>; Arntz, Renee (EGLE) <ARNTZR@michigan.gov>
Subject: City of Benton Harbor Pilot Drinking Water Grant No. 1901-01 Administrative Completion letter

All-

I have attached a copy of the City of Benton Harbor Pilot Drinking Water Grant No. 1901-01 Administrative Completion letter for your review and records.

Please contact me if you have any questions.

Thank you.

Wear a mask, stay safe, and have a good day,

Due to a temporary departmental lay-off, I will not be working on Fridays from May 22, 2020 thru July 24, 2020.

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
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STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 25, 2020

Mr. Ellis Mitchell City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Ellis

SUBJECT: Pilot Drinking Water (PDW) Community Water Supply Grant Program
City of Benton Harbor
Lead Service Line Replacement and Corrosion Control
Grant Project Number 1901-01

We are pleased to inform you that your final disbursement request No. 2, in the amount of $55,030, was paid on May 19, 2020. The Certification of Project Completeness was received on March 20, 2020. The final PDW Grant amount is $284,000. The subject PDW Grant project is now closed.

Please note that the Michigan Department of Environment, Great Lakes, and Energy (EGLE) may conduct an audit or other review of your project to determine whether PDW program requirements have been met. You will be notified in advance of any on-site review. Please retain all project records, whether in written or computerized form, for three years from the date of this letter. If requested, you must provide such records to EGLE or its agents for inspection.

We are pleased that we could assist you in your effort to improve water quality in your community.

If you have any questions, please call the project manager, Mr. Clarence Jones, at 517-284-5410; email at Jonesc13@michigan.gov; or you may contact us by mail at EGLE, P.O. Box 30457, Lansing, Michigan 48909-7957.

Sincerely,

Karol Patton

Karol Patton, Unit Supervisor
Water Infrastructure Financing Section
Finance Division
517-284-5433

cc: Mr. Chris Cook Abonmarche, Benton Harbor
Ms. Heather Bishop, EGLE-DWEHD, Kalamazoo District Office
Mr. Jonathan Doyle, EGLE-FD

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter
Date:	Monday, June 14, 2021 10:15:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Thursday, May 2, 2019 3:23 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>; 'omalley@sjcity.com' <omalley@sjcity.com>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

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Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst

Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
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Subject:	FW: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter
Date:	Monday, June 14, 2021 9:51:00 PM
Attachments:	1901-01 Benton Harbor DW Pilot Grant Letter wattachment 3-29-19.pdf image001.png

BH emails

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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

March 29, 2019

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Benton Harbor, Michigan 49022

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Grant Project Number 1901-01

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Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the below address within two weeks. Upon receipt, the DEQ will sign the document and send you a fully executed copy, whereupon it will become effective.

The city's PDW grant requires the following "deliverable" be provided to the DEQ within 30 days from the end date of the grant agreement.

- Certificate of Completeness

Should you have any question, please contact me at the phone number below, by email at Jonesc13@michigan.gov, or by mail at DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Clarence Jones, Project Manager
Revolving Loan Section
Drinking Water and Muncipal Assistance Division
517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

AMENDMENT TO THE PILOT DRINKING WATER COMMUNITY SUPPLY GRANT AGREEMENT
BETWEEN THE
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
CITY OF BENTON HARBOR
(Authorized by 1994 PA 451)

This Amendment modifies the Grant Agreement between the Michigan Department of Environmental Quality (hereafter "State"), and the **City of Benton Harbor** (hereafter "Grantee"), signed by the State on **June 20, 2018** for the **Material Inventory, Asset Management Plan, Lead Service Line Replacement and Corrosion Control.** This Amendment does not take effect until signed by both parties.

The revisions to the Grant Agreement are limited to those specified below. All other provisions of the Agreement remain in effect.

PROJECT SCOPE (WORK PLAN)

The State and the Grantee agree to the following change in scope of work or work plan.
Installation of corrosion control system at the Benton Harbor Wastewater Treatment Plant.

AGREEMENT END DATE

The State and the Grantee agree to extend the end date of this Grant Agreement from **May 31, 2019** to **September 30, 2019.** The Grantee will complete all obligations under this Agreement no later than the end date, as amended. Costs incurred after the amended end date are not eligible for reimbursement under the Grant Agreement.

COMPENSATION (BUDGET)

The State and the Grantee agree to the budget modifications described below.

There are no Compensation changes.

IV. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including any attached appendices, as set forth herein.

FOR THE GRANTEE:

Signature	Date
Darwin Watson, Interim City Manager	
Name/Title	

FOR THE STATE:

Signature	Date
Karol Patton, Acting Section Manager	
Name/Title	

From:	Jones, Clarence (EGLE)
To:	Clarence Jones
Subject:	FW: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter
Date:	Monday, June 14, 2021 9:44:00 PM
Attachments:	1901-01 Benton Harbor DW Pilot Grant Letter wattachment 3-29-19.pdf image001.png

fyi

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Friday, May 3, 2019 9:54 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

See attachment.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy

Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

Please note the changes in my signature block, that the MDEQ no longer exists . Instead, we are now the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Friday, May 03, 2019 7:37 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Clarence,

Do you have a copy of the letter that you can pass along electronically?

Thanks,

Jason W. Marquardt, PE
Senior Project Engineer
Abonmarche
D 269.926.4565
T 269.927.2295 (Ext. 171)
C 269.876.9304
F 269.927.1017
W www.abonmarche.com

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Thursday, May 2, 2019 3:23 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>; 'omalley@sjcity.com' <omalley@sjcity.com>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Darwin-

We are still waiting. Please sign and return the hard copy of the City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter, we sent to you on March 29, 2019. If we do not receive the form, the Benton Harbor Project No. 1901-01 grant period will end on May 31, 2019. All deliverables will have to be in our office by 5:00 pm on May 31, 2019.

Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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From: Jones, Clarence (EGLE)
Sent: Tuesday, April 23, 2019 2:03 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>; 'omalley@sjcity.com' <omalley@sjcity.com>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>
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Please contact me if you have questions.

Clarence Jones
Project Manager/Environmental Quality Analyst
Water Infrastructure Financing Section
Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

March 29, 2019

Mr. Darwin Watson, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Watson:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control
Grant Project Number 1901-01

We are extending the city of Benton Harbor's PDW grant end date. The revised end date is September 30, 2019.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the below address within two weeks. Upon receipt, the DEQ will sign the document and send you a fully executed copy, whereupon it will become effective.

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517-284-5423

Enclosure

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, DEQ-DWMAD, Kalamazoo District Office
Mr. Jonathan Doyle, DEQ-ADM

DEQ

DEQ Tracking Code/Project Number **1901-01**
Division/Office **DWMAD**
Amendment Number **001**

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FOR THE GRANTEE:

Signature	Date
Darwin Watson, Interim City Manager	
Name/Title	

FOR THE STATE:

Signature	Date
Karol Patton, Acting Section Manager	
Name/Title	

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter
Date:	Monday, June 14, 2021 10:44:00 PM
Attachments:	image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Wednesday, May 15, 2019 10:39 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Mike-

Since for some reason I/we never received the original hard copy, please resend it to the following address:

Michigan Department of Environment, Great Lakes, and Energy - Revolving Loan Section
Clarence Jones
Constitution Hall - 4th Floor South
525 West Allegan Street

Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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See attachment.

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Jason W. Marquardt, PE
Senior Project Engineer
Abonmarche
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Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes, and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
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Please contact me if you have questions.

Clarence Jones
Project Manager/Environmental Quality Analyst
Water Infrastructure Financing Section
Michigan Department of Environment, Great Lakes,
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Phone: 517-284-8410
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From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Date:	Monday, June 14, 2021 10:29:00 PM
Attachments:	Lead Pilot Grant-draw 2 submitted.pdf image002.png
Importance:	High

BH email

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Monday, May 4, 2020 4:55 PM
To: Colesa, Zachary (EGLE) <ColesaZ@michigan.gov>
Subject: FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Importance: High

Zac-

I have completed my initial review of the attached City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2, and approve it for further review pending payment processing.

Since this is a Pilot Drinking Water Project, will you be the one reviewing this one for payment processing.

There are a few comments I have:

1. Total Invoice costs for DR#2 are $55,480.86. Deducting the overage, = $55,029 (rounded up)
2. The total Project cost is $284,441.96 which we have to mention in the pay request. The $451.96 deduct is for project costs that exceeded the Pilot Drinking Water Grant amount?
3. We have to add a comment about the deduct. I cannot do this from home.

Please contact me if you have questions.

Thank you,

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, May 4, 2020 12:40 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; emitchell <emitchell@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: Lead PIlot Grant - Request #2 City of Benton Harbor
Importance: High

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Good Morning Clarence – Hope all is well with you! Attached is the Request for Disbursement #2 for the Lead Pilot Grant for the City of Benton Harbor. Included is the signed Request Form, a summary of expenses for Draw #2 and the project to-date, individual invoices paid that are part of the Request #2. Please let us know if there is any additional information that you need.

Take care and be safe!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION
REVOLVING LOAN SECTION

PILOT DRINKING WATER COMMUNITY WATER SUPPLY GRANT PROGRAM
REQUEST FOR DISBURSEMENT OF FUNDS

THIS INFORMATION IS REQUIRED UNDER AUTHORITY OF PA 201 of 2017.

DOCUMENTATION TO SUPPORT THE INCURRED COSTS MUST BE INCLUDED WITH EACH REQUEST
PLEASE SEE OTHER SIDE FOR INSTRUCTIONS TO COMPLETE REQUEST

A. Project #	B. Request #	C. Period Covered by Request	D. Request Type	E. Grantee's EIN	F. Grant Amount
1901-01 1	2	6-14-2019 (M/D/Y) to 12-31-2019 (M/D/Y)	☐ partial ☒ final	38-6004537	$284,000

G. Grantee Name: City of Benton Harbor	Phone #: 269-927-8457
Address: 200 E. Wall Street , Benton Harbor, MI 49022	Email: emitchell@cityofbentonharbormi.gov
H. Grantee's Bank Name: Fifth Third	Phone #
Address: 1295 East Napier, Benton Harbor, MI 49022	
Account Name: City of Benton Harbor - Utility Services	ABA #: 072400052 / Account #: 7161395665
Special Instructions:	

I. Budget Items (Include Eligible Costs Only Using Dollars and Cents)	Requested Incurred Costs This Period	Cumulative Costs Incurred To Date
1. PLANNING COSTS – DISTRIBUTION SYSTEM MATERIAL INVENTORY	$ 0	$ 35,260
2. DRINKING WATER ASSET MANAGEMENT PLAN COSTS	$ 0	$ 30,000
3. LEAD AND GALVANIZED SERVICE LINE CONSTRUCTION COSTS	$ 55,029	$ 218,740
4. TOTAL CUMULATIVE AMOUNT FOR PERIOD COVERED BY THIS REQUEST (add totals in 1st column)	$ 55,029	
5. TOTAL CUMULATIVE ELIGIBLE COSTS INCURRED TO DATE (add totals in 2nd column)		$ 284,000
6. LESS AMOUNT PREVIOUSLY DISBURSED		($ 228,971)
7. AMOUNT REQUESTED FOR DISBURSEMENT		$ 55,029

J. For each request, describe the scope of work completed to date. Attach separate sheet if more space is needed. Discuss the progress made on the services not yet complete and a schedule for their completion by the grant period end date. The incurred grant expense cannot exceed one (1) year from your grant agreement date.

Request is for reimbursement for retainage released to B&Z and Meeks for construction contracts for service verifications. Also included replacement of 6 additional lead service replacements and purchase of equipment from McCrometer.

I certify that I am an authorized representative of the grantee and am authorized to make the following certifications on behalf of the grantee: (i) there is no pending litigation or event which will materially and adversely affect the project or the prospects for its completion; (ii) the representations, warranties and covenants contained in the grant agreement for the obligations pursuant to which this request for disbursement is submitted continue to be true and accurate in all material respects as of the date hereof; (iii) to the best of my knowledge and belief, the costs above were incurred in accordance with the terms of the grant agreement and the application for assistance for this project; and (iv) the amount requested for disbursement has not previously been requested.

Authorized Representative Name (Print or Type): Ellis Mitchell **Title:** City Manager

Authorized Representative Signature (Original): Ellis E. Mitchell **Date:** 5-4-2020

EMAIL THIS COMPLETED REQUEST TO YOUR DEQ PROJECT MANAGER OR MAIL TO THE ADDRESS SHOWN ON THE REVERSE SIDE

(3/2018)

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01 - DRAW 2 REQUEST
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOIC DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
DRAW 1										
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	35,260.46	30,000.00	10,000.00		75,260.46
										-
B&Z-CONTRACT	HRU 12/31/18	2/14/19	70292	181239	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			9,000.00		9,000.00
	THRU 1/31/19	2/14/19	70292	190149/50/51	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			19,237.50		19,237.50
	THRU 2/28/19	3/14/19	70478	190256/57/58/59	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			21,060.00		21,060.00
	THRU 4/26/2019	5/23/19	70855	190437	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			5,895.00		5,895.00
					TOTAL B&Z CONTRACT	-	-	55,192.50	-	55,192.50
MEEKS-CONTRACT	HRU 12/31/18	2/13/19	70285	2116	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			5,265.00		5,265.00
	THRU 1/31/19	2/13/19	70285	2128	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			9,369.90		9,369.90
	THRU 2/28/19	3/28/19	70577	2131/2137/2138/2139	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			33,165.00		33,165.00
	THRU 3/31/19	4/11/19	70641	2143	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			9,000.10		9,000.10
	THRU 5/9/19	5/30/19	70902	2150/2151/PART RETAIN	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5			16,162.20		16,162.20
					TOTAL MEEKS CONTRACT	-	-	72,962.20	-	72,962.20
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	11,646.00	13,909.34	25,555.34
TOTAL DRAW 1						35,260.46	30,000.00	149,800.70	13,909.34	228,970.50
DRAW 2										
B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	LEAD SERVICE LINE CONSTRUCTION			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	INSTALL & TEST INSERTION MAGNETIC FLOW METER			1,550.00		1,550.00
MCCROMETER	6/20/2019	10/10/2019	71721	526233RI	FULL PRO INSPECTION MAG			13,919.54		13,919.54
MEEKS	8/19/2019	8/22/2019	71457	2173	LEAD SERVICE LINE REPLACEMENT-179 GARFIELD			5,750.00		5,750.00
MEEKS	9/11/2019	9/26/2019	71604	2176	LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP			2,600.00		2,600.00
MEEKS	9/11/2019	9/26/2019	71604	2176	LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP			2,600.00		2,600.00
MEEKS	10/25/2019	11/14/2019	71970	2186	LEAD SERVICE LINE REPLACEMENT- 1110 MILTON TO CURB STOP			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER			3,740.00		3,740.00
MEEKS	12/9/2019	1/3/2020	72215	2196	LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA			2,470.82		2,470.82
										-
					LESS AMOUNT IN EXCESS OF GRANT			(451.96)		(451.96)
TOTAL DRAW 2						-	-	55,029.50	-	55,029.50
TOTAL SPENDING THROUGH 12-31-2019						35,260.46	30,000.00	204,830.20	13,909.34	284,000.00
AMOUNT PER GRANT						35,000.00	30,000.00	199,000.00	20,000.00	284,000.00
REMAINING GRANT FUNDS						(260.46)	-	(5,830.20)	6,090.66	-

ABONMARCHE

Engineering • Architecture • Land Surveying

May 2, 2019

PAYMENT REQUEST NO. 5 - FINAL
For Retainage

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	51,325.00
Current Contract Amount	$	61,325.00
Work Completed	$	61,325.00
Retainage (10%)	$	0.00
Amount Earned	$	55,192.50
Less Previous Payments	$	55,192.50
Amount Due Contractor This Payment	$	6,132.50

541-000-212.000

RECOMMENDED BY: Contractor

Bruce Bingee

Bruce Binger (B & Z)

5-8-2019
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/8/19
Date

ACCEPTED BY: Owner

Darwin Watson

Darwin Watson (Benton Harbor)

5/14/19
Date

ABONMARCHE

Engineering • Architecture • Land Surveying

May 20, 2019

PAYMENT REQUEST NO. 6 & FINAL
For Work Completed Through 05/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$ 6,500.00
Change Orders (#1 - #3)	$ 69,462.20
Current Contract Amount	$ 75,962.20
Work Completed	$ 75,962.20
Retainage	$ -
Amount Earned	$ 75,962.20
Less Previous Payments (PR#1 - #5)	$ 72,962.20
Amount Due Contractor This Payment	$ 3,000.00

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — 5-20-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 5/21/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 5/21/19 Date

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 127669
09/10/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 8/31/19, including construction administration, and obtaining contractor quotes for remaining lead service work.

	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$35,260.46	$0.00	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$30,000.00	$0.00	$0.00
103 Lead Service Line Construction	$15,258.60	$10,000.00	$5,258.60	$0.00
Totals:	$80,519.06	$75,260.46	$5,258.60	$0.00

Invoice Amount **$5,258.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

OUDBIER INSTRUMENT CO.
4136 Ranchero Dr
Dorr MI 49323
(269) 792-4404

Invoice

DATE	INVOICE #
7/15/2019	9204

BILL TO
Benton Harbor Water Billing 200 East Wall St. Benton Harbor MI 49022

P.O. NO.	TERMS	PROJECT
5331419	Net 30	

QUANTITY	DESCRIPTION	RATE	AMOUNT
1.5	Install, wire and test operation of the new insertion magnetic flow meter.	900.00	1,350.00
1	General Hardware, Nuts, Bolts, Conduit fittings and Wire	200.00	200.00
		Total	$1,550.00

McCROMETER

3255 West Stetson Avenue • Hemet, CA 92545-7763 USA
Tel: 951 652-6811 • Fax: 951 652-3078 • payments@mccrometer.com

Page Number -	1
Date -	06/20/19
Customer -	46261
Brn/Plt -	MCI000
Related Ord -	760725
Order Nbr -	326136 SO
Invoice -	626233 RI

SALES INVOICE

571-977-800 (or Equip)
591.~~570.930~~
Charge to MDEQ
Pilot Grant

Sold To: CITY OF BENTON HARBOR
200 E WALL STREET
BENTON HARBOR MI 49022

Ship To: BENTON HARBOR WATER PLANT
601 RIDGEWAY
ATTN: MIKE O'MALLEY - SUPERINTENDENT
CELL 269-363-0575
ST JOSEPH MI 49085

Metering required as part of the MDEQ Corrosion Control system design

Tax ID: 386004537
Tax Cert: MI

002 / 077 / 273

REP: 21763 MIDWEST MUNICIPAL INSTRUMENTAT
RSN:

Request Date	Customer P.O.		Ship : FEDEX FRT/PPC
06/18/19	S332693	EXW Seller's Premises	Inst : 06/19/19

Ln/Rq Dt	Description	Item Number	UM	Ship/Back/Cance	Price	Extended Price	Tax
	Please Note, -All McCrometer facilities will be closed on Thursday July 4th, 2019 in observance of Independence Day. Normal business hours will resume on Friday July 5th, 2019. SN/MARIAV						
1.000	FULL PRO INSERTION (FPI) MAG 395LC MI19-0280 & E19-02960		EA S	1	13,694.4467 Per EA	13,694.45	Y
	Total Sensor Length in Inches: 44 Total Cable Length in Feet: 40 Pipe ID: 28.75 Pipe OD: - Totalizer Unit: 1000 GAL Indicator Unit: 2800 GPM MIN Flow: 0 /AVG Flow: 2000 GPM /MAX Flow: 2800 GPM MAX Pressure PSI: 8 4-20ma=: 2800 GPM Cable Connection Type: Quick-Connect Electrode Type: 316 Stainless Steel Ball Valve Type: Stainless Steel Conductivity: Standard Conductivity Converter: M-Series,AC,CSA Hardware Size Requirement: 2"NPT, 1.25, Heavy, 3/8 TAG: HS SUNCTION LINE						
2.000	Shipping & Handling/NonTaxable 4195148366		EA		225.0900	225.09	N

took a very long time to get this invoice?

Item recieved & installed Earlier this year, June 2019

Okay to pay 10/4/19

$13,919.54

Item 13694.45
ship 225.09
Inv $ ~~[illegible]~~ 13,919.54

Terms	Net 30 Days from Invoice	Net Due Date 07/20/19	Tax Rt	Sales Tax	~~Total Order~~
					13,919.54

This is funny, just recieved Inv

MCCROMETER'S TERMS AND CONDITIONS APPLY UNLESS OTHERWISE STATED IN WRITING BETWEEN THE PARTIES; MCCROMETER'S TERMS AND CONDITIONS CAN BE VIEWED AT THE FOLLOWING URL: WWW.MCCROMETER.COM/TERMS_AND_CONDITIONS.PDF
REMIT TO: McCrometer, Inc. • 96894 Collections Center Drive • Chicago, IL 60693-0329 USA
INTERNATIONAL WIRE TRANSFERS: Bank of America • 231 South LaSalle Street • Chicago, IL 60697 USA
A.B.A. No. 026009593 Swift: BOFAUS3N Acct# 87655-61569

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
8/19/2019	2173

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Full lead service line replacement from the main to the meter		
1	179 Garfield	5,000.00	5,000.00
15	Site restoration pouring road patch topsoil placement. labor hours	50.00	750.00
		Total	$5,750.00

Req ∫332926
8/20/19
#5,750.00

A good price considering the road had to be open cut & restored w/ concrete surface

FYI LSLR cost around #5,000 to 9,000 each house

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
9/11/2019	2176

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Stop service leak and the replacement of Service Line from Main to curb stop at 1063 Superior.	2,600.00	2,600.00
1	Stop Service leak and the replacement of Service line from Main the Curb stop at 711 Buss	2,600.00	2,600.00
1	Repair of Hydrant located on the corner of McAlister and Harrison	450.00	450.00
1	Repair and investigation of service leak located at 1283 Ogden	450.00	450.00
1	Repair of Manhole in the intersection of Lake and Ohio Include concrete patch	975.00	975.00

Leg $ [illegible]
9/11/19
Lead service leak
Partial copper replacement
#2,600.00

	Total	$7,075.00

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
10/25/2019	2186

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
S04675	Due on receipt	

Quantity	Description	Rate	Amount
1	Total Line replacement 1110 Milton Ave	5,000.00	5,000.00
-1	3/4" K Copper Credit	280.00	-280.00

591-571-977.300
MDEQ

Total $4,720.00

ks Contracting Services LLC
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
12/11/2019	2197

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	This Invoice is for 1063 Superior Water line from curb stop to meter Waterline installation	3,740.00	3,740.00

1063 Superior
Lead Service Line Replacement
City supply Copper, curb stop box & valve box
Req. 504252
$3,740.00
Okay to Pay

Total $3,740.00

Invoice

...s Contracting Services LLC
...271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
12/9/2019	2196

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

HAS Not Been Paid.

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	This Invoice is for 711 Buss Water line from curb stop to meter Waterline installation	3,740.00	3,740.00

LSL Replacement
full
711 Buss

Eligible for Grant

Req. 504300
12.30.19

MEEQ

Total	$3,740.00

Invoice

Meeks Contracting Services LLC
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
11/25/2019	2193

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	This invoice is for the repair of a leaking service line located at 876 Wauceda.		
	Replaced old shut off and replace 2' of customers line	125.00	875.00
	extra labor cost billed for stopping leak to repair line	50.00	1,400.00
7	Mini Excavator	98.00	98.00
28	4 Labors	97.82	97.82
1	Pump rental		
1	Parts		

Total $2,470.82

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Date:	Monday, June 14, 2021 10:33:00 PM
Attachments:	image002.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Sent: Tuesday, June 23, 2020 5:02 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.

Clarence,

I have updated database with this latest payment. So, you should be all set.

Regards,

JD

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Tuesday, June 23, 2020 1:41 PM
To: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Subject: FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request

#2.

Jonathan-

I have a question on the City of Benton Harbor Project 1901-01 Lead Pilot Grant.? This email string below is my approval for you to go ahead and complete their final Grant Amount. My question is since treasury does not pay these grants, are you the one to input the information in the database? I cannot? We need to update this project.

Please contact me if you have questions.

Thank you,

Due to a temporary departmental lay-off, I will not be working on Fridays from May 22, 2020 thru July 24, 2020.

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Tuesday, May 5, 2020 10:50 AM
To: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Subject: RE: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.

Oh okay thanks.

From: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Sent: Tuesday, May 5, 2020 10:49 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: RE: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.

Clarence, I just named the file 1901-0**2** because it is the second payment.

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Tuesday, May 5, 2020 10:39 AM

To: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Subject: FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Importance: High

Jonathan-

I have no issues with the City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2 final payout. One small issue I do have it this project **No. is 1901-01.**

Thank you,

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Sent: Tuesday, May 5, 2020 10:19 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Subject: FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Importance: High

Clarence,

Please see attached grant given (GG) for the City of Benton Harbor . Doc is labeled – 1901-02.PDF

This document shows grant award amount, amount that has been paid to date, and remaining balance. The detail is all the individual payment documents.

Their remaining balance is $55,030.00. Please let me know if you approve of this amount to be paid.

Thank you,

JD

From: Colesa, Zachary (EGLE) <ColesaZ@michigan.gov>
Sent: Tuesday, May 5, 2020 7:42 AM
To: Doyle, Jonathan (EGLE) <DoyleJ4@michigan.gov>
Subject: FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Importance: High

Hi Jon,

I received DR #2 for pilot grant 1901-01, just forwarding it on.

Thanks,

Zachary Colesa
Financial Analyst
Michigan Department of Environment, Great Lakes, and Energy
517-284-6909 | **ColesaZ@Michigan.gov**
Follow Us | **Michigan.gov/EGLE**

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Monday, May 4, 2020 4:55 PM
To: Colesa, Zachary (EGLE) <ColesaZ@michigan.gov>
Subject: FW: City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2.
Importance: High

Zac-

I have completed my initial review of the attached City of Benton Harbor Project 1901-01 Lead Pilot Grant -Final Disbursement Request #2, and approve it for further review pending payment processing.

Since this is a Pilot Drinking Water Project, will you be the one reviewing this one for payment processing.

There are a few comments I have:

1. Total Invoice costs for DR#2 are $55,480.86. Deducting the overage, = $55,029 (rounded up)
2. The total Project cost is $284,441.96 which we have to mention in the pay request. The $451.96 deduct is for project costs that exceeded the Pilot Drinking Water Grant amount?

3. We have to add a comment about the deduct. I cannot do this from home.

Please contact me if you have questions.

Thank you,

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, May 4, 2020 12:40 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; emitchell <emitchell@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: Lead PIlot Grant - Request #2 City of Benton Harbor
Importance: High

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Good Morning Clarence – Hope all is well with you! Attached is the Request for Disbursement #2 for the Lead Pilot Grant for the City of Benton Harbor. Included is the signed Request Form, a summary of expenses for Draw #2 and the project to-date, individual invoices paid that are part of the Request #2. Please let us know if there is any additional information that you need.

Take care and be safe!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565

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From:	Sarkipato, Ernest (EGLE)
To:	Sasy, Ninah (EGLE); nbritten@bchdmi.org; Strong, Regina (EGLE); Hernandez, Poppy; Crider, Steven (DHHS)
Cc:	Ellis Mitchell; Bolf, Michael (EGLE)
Subject:	FW: Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)
Date:	Thursday, February 13, 2020 2:00:12 PM
Attachments:	00600_Benton Harbor OCCT update_20200203_FINALIZED.pdf

FYI, for our community outreach folks, the city is being asked to "shift" the corrosion treatment due to lack of response we are seeing in the lead sampling. This is fairly technical in nature, but should have positive public health ramifications.

From: Vincent, Courtney (EGLE) <VincentC4@michigan.gov>
Sent: Thursday, February 13, 2020 1:38 PM
To: emitchell@cityofbentonharbormi.gov
Cc: momalley@cityofbentonharbormi.gov; dharlan@fv-operations.com; 'elhorneng@aol.com' <elhorneng@aol.com>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; nbritten@bchdmi.org; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)

Hi Mr. Mitchell,

Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding water system corrosion treatment for the city of Benton Harbor (WSSN: 00600). A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, Drinking Water and Environmental Health Division, by email at OnanB@Michigan.gov or by phone at 616-307-6736.

Thank you,

Courtney Vincent, Secretary
Technical Support Unit
Community Water Supply Section
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-284-5424 | VincentC4@Michigan.gov
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STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 13, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Water System Corrosion Treatment

On October 22, 2018, the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), issued a letter to the City of Benton Harbor (the City) for a lead action level exceedance (ALE). In response, the City applied for a construction permit for installation of corrosion control treatment, under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). On February 25, 2019, EGLE issued the Act 399 construction permit to the City to address the ALE by means of installing a corrosion control treatment system. The treatment chemical permitted, based on a recommendation by Elhorn Engineering, was Carus 8600 which is comprised of 70% orthophosphate and 30% polyphosphate. The target dose was 1.5 milligrams per liter (mg/L) as orthophosphate, and the City's water operators have consistently reached that treatment goal. This has resulted in a residual of approximately 1.5 mg/L orthophosphate in the distribution system.

A review of the last three lead and copper sampling rounds collected by the City concludes the treatment is not achieving desired results quickly enough. The most recent round of samples was collected approximately eight months after the beginning of corrosion control treatment.

The City met with representatives from EGLE on January 15, 2020, to discuss results from the City's lead and copper sampling as it relates to the City's corrosion control treatment. The purpose of this letter is to provide a summary of that meeting and outline next steps for the City to pursue designation of optimized corrosion control treatment as required by Rule 604f of the administrative rules promulgated under Act 399.

Based on a review of the corrosion control treatment and the last three rounds of tap samples for lead and copper, **the City is hereby directed to change its current blended phosphate chemical from the 70%/30% ortho/poly-phosphate to a product with a minimum of 90% orthophosphate.** The chemical selected must be ANSI/NSF 60 certified for use in drinking water systems. **The City is also hereby directed to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system.** This

designation is being made under R325.10604f(3)(d). The reason for this change is to speed up treatment effectiveness. EGLE's intent is to quickly put into place treatment that will more efficiently lower corrosion rates in the distribution system for greater protection of public health. This decision is based on corrosion control treatment studies and analyses of documented analogous treatment systems with other water supplies of similar source water chemistry.

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system but, without further study, it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third-party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c) of the administrative rules promulgated under Act 399. This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

In addition, the permitted corrosion control treatment scheme requires the high service pump suction header valve that is next to High Service Pump 3 be closed. This is to force the flow of all water from the suction well through the meter and corrosion control treatment. At the onsite meeting referenced above, it was indicated that the valve state is unknown. Please immediately verify in writing to the department the valve has been closed according to the permit.

TRANSITION AND TIMELINE

Prior to changing chemicals, the City must obtain approval of the specific chemical selected by requesting revision of the construction permit under Act 399.

Following approval, the transition to a minimum 90% orthophosphate product must occur as soon as possible, but not later than February 28, 2020.

The City must follow these guidelines during transition to the new chemical:

1. Blending of the two phosphate products must not occur. The transition should be abrupt.
2. Immediately following the transition to the new treatment, gentle flushing of the distribution system will help provide a thorough transition.
3. Increased monitoring of the plant tap and distribution sites will verify when the transition has concluded and the directed residual of a minimum 3.0 mg/L orthophosphate as phosphate is achieved.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me at 616-307-6736 or OnanB@Michigan.gov; or you can contact Mr. Ernie Sarkipato, Surface Water Treatment Specialist, Engineering Unit, Field Operations Section, DWEHD, at 616-307-0261; SarkipatoE@Michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Brandon Onan, Supervisor
Lead & Copper Unit
Community Water Supply Section
Drinking Water and Environmental Health Division

cc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Darold Harlan, Fleis & Vandenbrink
Mr. Todd Luks, Elhorn Engineering
Ms. Nicki Britten, Berrien County Health Department
Mr. Eric Oswald, EGLE
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE

From: Thurston, Brian (EGLE)
To: Sarkipato, Ernest (EGLE)
Cc: Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Subject: FW: Corrosion Study Plan Discussion
Date: Friday, September 11, 2020 4:24:16 PM

Hey Ernie,
What am I missing here, the meeting was for today and Ellis could not attend? So why will Monday not work? This is not a new meeting. You have been trying to schedule this for a while. We need to meet to review our concerns with the information provided and get feedback and clarifications from their consultant on the proposed study. Mike's comments below accent the importance of Ellis attending this meeting.
If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E.
Field Operations Section Manager
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
231-590-3430 | thurstonb@michigan.gov
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From: Mike O'Malley <momalley@bhcity.us>
Sent: Friday, September 11, 2020 3:45 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; emitchell@bhcity.us; elhorneng@aol.com; Darold Harlan <dharlan@fv-operations.com>; Lesia Osler <losler@bhcity.us>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; rrice@bhcity.us; Mike O'Malley <momalley@bhcity.us>
Subject: Re: Corrosion Study Plan Discussion

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Roena (and Ellis)
No. I cannot be ready with only a weekend.
Ellis, as a In house water team, we have NOT had any discussion regarding the Corrossion Study.
We as a City (you and me) have agreed to pay the fee to Elhorn Engineering.
Keep in mind. This was an ORDER sent to the City from EGLE as an additional requirement to change treatment and double the dose.
We changed on February 20, 2020 with only help from Todd at Elhorn Engineering.
The State provided 1 confrence call in Mid March 2020 when I insisted that I did not know what this aggressive dose of OPP at this doubling of the rate would do to our system.
They had David Cromwell PHD chime in that I had no worries. And of of course, he was many "Who Saved Flint".
Since then, EGLE has denied that I have seen dramatic changes in the lead results but more importantly a more significant rise in Copper results that I had never seen before in the past.
Literally a 90% increase in COPPER RESULTS in the 1st half of 2020's 63 lead and copper tests.
Thaw was entirely rejected by EGLE to have nothing to do with corrosion.
I also thouroughly disproved their EGLE study that prompted the Meeting with Ernie, Brandon, you and I about questioning the corrosion protection in the 2019 series of Lead and Copper testing

A paper which I easily showed the the Lead levels at various houses were falling down
On Fri, Sep 11, 2020 at 1:32 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Per the City's request, we agree to cancel this meeting to ensure the city manager can attend. **Roena, please confirm new date of Monday, September 14 at 1:00PM works for the City Manager and water team?**
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Subject:	FW: Coupon Test Report
Date:	Thursday, October 17, 2019 10:42:53 AM

---

1. How are the corrosion rates looking to you?
2. How hard do we push O'Malley to get a pre-phosphate rack installed, given he's concerned about tapping old pipe up near the ceiling?

From: elhorneng@aol.com <elhorneng@aol.com>
Sent: Thursday, October 17, 2019 10:35 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Re: Coupon Test Report
Ernie,

There are new coupons installed in the 2 test racks. No pre-phosphate rack is installed. We tried to get it hooked up but with the condition of the plumbing down there it is not possible at this time. I'm still thinking it can be done but not as simple as first figured. I'm currently looking into another saddle for that pipe with a live tap 3/4". Hoping to get this done within the next month or so. My problem is Mike does not really want me to mess with that pipe at the moment?

Todd

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

-----Original Message-----
From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
To: elhorneng@aol.com <elhorneng@aol.com>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov <momalley@cityofbentonharbormi.gov>
Sent: Thu, Oct 17, 2019 10:24 am
Subject: RE: Coupon Test Report

Thanks Todd.

I assume there are new coupons back in these two racks?

And, did you get a pre-phosphate rack installed?

Ernie

From: elhorneng@aol.com <elhorneng@aol.com>
Sent: Thursday, October 17, 2019 9:41 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov
Subject: Coupon Test Report

Guys,

Please see attached coupon results.

Todd

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Expenditures for Lead Pilot through September 2019
Date:	Monday, June 14, 2021 10:22:00 PM
Attachments:	LEAD PILOT GRANT PROJECT-estimate of spending through 12-31-19.xlsx image001.png

BH email

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Wednesday, February 12, 2020 1:53 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Expenditures for Lead Pilot through September 2019

Hi Clarence – attached is the update spending for the City of Benton Harbor Pilot Drinking Water Grant. I will be compiling a grant Disbursement Request next week for the balance remaining. Let me know if you need anything else.

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002

Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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Celebrating our 21st year as one of FORTUNE's "100 Best Companies to Work For®"

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Friday, February 07, 2020 11:10 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Chris Cook <cjcook@abonmarche.com>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: RE: Expenditures for Lead Pilot through September 2019

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

Rhonda-

Please supply a project update and when the next Disbursement Request will be submitted for the city of Benton Harbor Pilot Drinking Water Grant No. 1901-01. Our last correspondence was early October 2019.

Please contact me if you have questions.

Clarence T. Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, October 07, 2019 11:54 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: Expenditures for Lead Pilot through September 2019

Hi Clarence – Mike and Jason have reviewed the attached schedule of costs through September 30. I am submitting the estimate rather than the draw request. I will prepare the draw request for Ellis to sign this week and will submit all of the paperwork through September 30.

Let me know if there is anything else that you need.

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	**-**	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00
MCCROMETER	6/20/2019			526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
MEEKS	8/19/2019			2173	**LEAD SERVICE LINE REPLACEMENT-179 GARFIELD**			5,750.00		5,750.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	10/25/2019			2186	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	12/9/2019			2196	**LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	**LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA**			2,470.82		2,470.82
										-
									less overage	(451.96)
TOTAL TO DRAW THROUGH 12-31-2019						**-**	**-**	**55,481.46**	**-**	**55,029.50**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**205,282.16**	**13,909.34**	**284,000.00**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**(6,282.16)**	**6,090.66**	**-**

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Expenditures for Lead Pilot through September 2019
Date:	Monday, June 14, 2021 10:19:00 PM
Attachments:	LEAD PILOT GRANT PROJECT-estimate of spending through 9-30-19.xlsx image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, October 7, 2019 11:54 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: Expenditures for Lead Pilot through September 2019

Hi Clarence – Mike and Jason have reviewed the attached schedule of costs through September 30. I am submitting the estimate rather than the draw request. I will prepare the draw request for Ellis to sign this week and will submit all of the paperwork through September 30.

Let me know if there is anything else that you need.

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002

Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH SEPTEMBER 30, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	**-**	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00
MEAD & WHITE	2/28/2019	8/1/2019	71283	B8044-3	**REMOTE PANEL FOR NEW ALUM PUM**				1,709.36	1,709.36
MEAD & WHITE	2/13/2019	8/1/2019	71283	B8044-2	**REMOTE PANEL FOR NEW ALUM PUM**				6,495.41	6,495.41
MCCROMETER	6/20/2019	not pd just rec'd inv		526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
TOTAL TO DRAW THROUGH 9-30-2019						**-**	**-**	**29,860.64**	**8,204.77**	**38,065.41**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**179,661.34**	**22,114.11**	**267,035.91**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**19,338.66**	**(2,114.11)**	**16,964.09**

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Expenditures for Lead Pilot through September 2019
Date:	Monday, June 14, 2021 10:19:00 PM
Attachments:	LEAD PILOT GRANT PROJECT-estimate of spending through 9-30-19.xlsx image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, October 7, 2019 11:54 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: Expenditures for Lead Pilot through September 2019

Hi Clarence – Mike and Jason have reviewed the attached schedule of costs through September 30. I am submitting the estimate rather than the draw request. I will prepare the draw request for Ellis to sign this week and will submit all of the paperwork through September 30.

Let me know if there is anything else that you need.

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002

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CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH SEPTEMBER 30, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	**-**	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00
MEAD & WHITE	2/28/2019	8/1/2019	71283	B8044-3	**REMOTE PANEL FOR NEW ALUM PUM**				1,709.36	1,709.36
MEAD & WHITE	2/13/2019	8/1/2019	71283	B8044-2	**REMOTE PANEL FOR NEW ALUM PUM**				6,495.41	6,495.41
MCCROMETER	6/20/2019	not pd just rec'd inv		526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
TOTAL TO DRAW THROUGH 9-30-2019						**-**	**-**	**29,860.64**	**8,204.77**	**38,065.41**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**179,661.34**	**22,114.11**	**267,035.91**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**19,338.66**	**(2,114.11)**	**16,964.09**

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Expenditures for Lead Pilot through September 2019
Date:	Monday, June 14, 2021 11:00:00 PM
Attachments:	LEAD PILOT GRANT PROJECT-estimate of spending through 12-31-19.xlsx image001.png

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Wednesday, February 12, 2020 1:53 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Expenditures for Lead Pilot through September 2019

Hi Clarence – attached is the update spending for the City of Benton Harbor Pilot Drinking Water Grant. I will be compiling a grant Disbursement Request next week for the balance remaining. Let me know if you need anything else.

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002

Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Friday, February 07, 2020 11:10 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Chris Cook <cjcook@abonmarche.com>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: RE: Expenditures for Lead Pilot through September 2019

ATTENTION: This email was sent to Plante Moran from an ***external source***. Please be extra vigilant when opening attachments or clicking links.

Rhonda-

Please supply a project update and when the next Disbursement Request will be submitted for the city of Benton Harbor Pilot Drinking Water Grant No. 1901-01. Our last correspondence was early October 2019.

Please contact me if you have questions.

Clarence T. Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
Water Infrastructure Financing Section
Phone: 517-284-5410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, October 07, 2019 11:54 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: Expenditures for Lead Pilot through September 2019

Hi Clarence – Mike and Jason have reviewed the attached schedule of costs through September 30. I am submitting the estimate rather than the draw request. I will prepare the draw request for Ellis to sign this week and will submit all of the paperwork through September 30.

Let me know if there is anything else that you need.

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	**-**	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00
MCCROMETER	6/20/2019			526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
MEEKS	8/19/2019			2173	**LEAD SERVICE LINE REPLACEMENT-179 GARFIELD**			5,750.00		5,750.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	10/25/2019			2186	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	12/9/2019			2196	**LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	**LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA**			2,470.82		2,470.82
										-
									less overage	(451.96)
TOTAL TO DRAW THROUGH 12-31-2019						**-**	**-**	**55,481.46**	**-**	**55,029.50**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**205,282.16**	**13,909.34**	**284,000.00**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**(6,282.16)**	**6,090.66**	**-**

From:	Jones, Clarence (EGLE)
To:	Clarence Jones
Subject:	FW: FW: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant
Date:	Monday, June 14, 2021 9:37:00 PM
Attachments:	image001.png

stuff

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, March 27, 2019 9:55 AM
To: Jones, Clarence (DEQ) <JONESC13@michigan.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Timothy R. Drews <tdrews@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Subject: Re: FW: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant

Clarence, as I promised you the other day on the phone,

This should help. The original proposal between Ernie Sarikipato with Brandon Onan is in typical ink, as are my initial table of expenditures. These were also shared with The Abonmarche Group that is handling most all of Benton Harbor's MDEQ Pilot Grant project funding.
Edits and additions from Mike O'Malley are in RED

The MDEQ Ernie and Brandon were very busy designing a Corrosion Control treatment with help from Elhorn Engineering a Chemical Specialties contractor, using an Orthopolyphosphate 70/30 blend in the high lift service lines.
And the idea of using MDEQ Pilot Grant Funding to minimize Lead in the City Water delivery system.

They suggested and are working hard to use a portion of the MDEQ Pilot Grant funds to also pay for this new treatment. They believe that we can use grant money to pay instead of out of pocket money.
I would guess closer estimates at this date March 27, 2019
Contractor: $ 5,000 $5,900 Elhorn Engineering
Pump: included in Contractor Scale: $ 3,000 included in contract
Flow meter and Pump Control: $4,000 Original insertion meter did not meet MDEQ choice. New Price $ 14,000
Miscellaneous fittings: $500
Miscellaneous:

1. 1inch live tap into suction line $600;
2. Tapping Saddle, Corporation Stop and installation $1,000
3. Revised Insertion Meter: and set up: $15,000 not available until 8-weeks after tap installation, (getting close)
4. Revised treatment schedule to get OPP feed on line ASAP by MDEQ *see notes
5. Electrican + 1 tech labor and material to energize based upon "Pump-ON" $2,250 *see notes
6. 4 barrels Carus 8600 $2,110 may not qualify for grant as this is treatment chemical and will never end.
7. Testing equipment and set up $1,300
8. Corrosion Study by Elhorn Engineering, starting with 2 coupon racks, analysis, and possible a 2nd study. may add $2,500

Add up including 1st supply of chemical.: 5900+14000+600+1000+2250+1300+2110= **$27,160.00**
Clarence, Erinie guessed on the conservative side. The figures above however are guestimates; so the new change probably would be okay at $30,000

After Install:
Treatment Effectiveness (coupons) $2,500
Testing equipment and set up for new treatment process: $2,000
Contingencies: ?
Guess Total: $20,000

NOTES:
Clarence and all staff involved in the MDEQ MAD, this was a little difficult working w 4 different groups of people, (my side and your side) but is a **good solution for the water customers of the**

Benton Harbor Water System.
Items 4&5 above were actually a good addition to the project. Benton Harbor now has treatment at least 2 months earlier than it would have.
The dedicated electrical circuit, in item 5; I will keep in use as this way, no other pumping, (particularly 2 backwash pumps) will be involved, only the 5 pumps that deliver water to the system. NO MISTAKES!

Benton Harbor received outstanding service in terms of engineering and Permit to construct, from the MDEQ MAD; and we also have a good partner in Elhorn Engineering.
For everyone in Benton Harbor, I want to extend a Big THANK YOU for all that Municipal Assistance Division! I hope you feel a little less MAD.

Sincerely,

Mike O'Malley
Benton Harbor Water Superintendent

On Wed, Mar 27, 2019 at 7:23 AM Chris J Cook <cjcook@abonmarche.com> wrote:

> -
> And another
> **Christopher J. Cook, PE**
> President/CEO
> **Abonmarche**
> **D** 269.926.4548
> **C** 269.876.9290
> **O** 269.927.2295 ext 132
> **F** 269.927.4639
> **W** www.abonmarche.com
>
> -
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Tuesday, January 15, 2019 7:43 AM
> **To:** Darwin Watson <dwatson@cityofbentonharbormi.gov>; Tim Drews <tdrews@abonmarche.com>; Chris J Cook <cjcook@abonmarche.com>; Sarkipato, Ernest (DEQ) <sarkipatoe@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
> **Subject:** MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant
>
> -
> Darwin, Chris, and Tim,
>
> -
> Today is Tuesday and you all meet at Darwin's office.

-
Jason, sent out a list of 88 Service Line Verifications to Meeks and B&Z.

-
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Jason,

-
I hope that you have been told this and the estimated costs involved. Will there be enough funds left for both 10 SLR + 88 more potholing + Corrosion Treatment + Abonmarche Fees+ and anything I have not thought of + and all work previously done?

-
Ernie,
Now that you and Brandon have gotten underway, Have you had any correspondence with Clarence or whomever, for this addition to our MDEQ Pilot Grant? And, is my estimate above accurate enough?

-
Please, all, let me know,

-
Thank you,

-
Mike O'Malley
Benton Harbor Water Superintendent

-
-
-
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From:	Jones, Clarence (EGLE)
To:	Clarence Jones
Subject:	FW: FW: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant
Date:	Monday, June 14, 2021 9:39:00 PM
Attachments:	image001.png

FYI

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Wednesday, April 17, 2019 8:51 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jones, Clarence (DEQ) <JONESC13@michigan.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Timothy R. Drews <tdrews@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>; Onan, Brandon (DEQ) <OnanB@michigan.gov>
Subject: RE: FW: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant

We determined the use of pilot grant funds is warranted as this is unequivocally the best way to mitigate lead exposure throughout town. Addition of a corrosion inhibitor will help reduce lead exposure in every home and business in BH, which is quite a lot of public health protection for #30k as compared to removing lead service lines.

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, March 27, 2019 9:55 AM

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Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Timothy R. Drews <tdrews@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
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F 269.927.4639
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Sent: Tuesday, January 15, 2019 7:43 AM
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Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant

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Please, all, let me know,

-

Thank you,

-

Mike O'Malley
Benton Harbor Water Superintendent

-

-

-

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From:	Sarkipato, Ernest (DEQ)
To:	Lachance, Amy (DEQ); Onan, Brandon (DEQ); Bolf, Michael (DEQ); Thurston, Brian (DEQ); Bolt, Jennifer (DEQ)
Cc:	Crider, Steven (DHHS); Nicki Britten
Subject:	FW: Getting Closer to feeding OPP at BH Water Plant
Date:	Thursday, March 7, 2019 12:54:33 PM

Folks – an encouraging update from Mr. O'Malley is below. In short, phosphate treatment may begin as early as next week.

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, March 6, 2019 8:28 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Getting Closer to feeding OPP at BH Water Plant

Ernie,
Thanks for sending the approved Permit No. FEB 25 '199015.
Everything attached to the Permit are here except the McCrometer. That is going to take awhile.
I have an order in for a local contractor to put in my 1 inch live tap for the OPP injector, thinking Thursday.
I will soon have an order in to Elhorn Engineering for 4 Barrels of Carus 8600 and a 30 inch tapping saddle for a 2 inch tap.
My same contractor is confident that he can make that tap as well.
I pulled my contractor Mead and White off of the New Alum Supply project and on to a High Service Pump only Activated 110V Recepticle
They did it today. See attached Pump On Light On: *Req S332682 Mead and White HS Pump on Lights are on.jpeg*
I can start feeding soon but only when the pump is in manual with the proper settings.
I checked and I was told, that even when the power goes off, the Pump will resume where it left off when power returns.
That was a big concern of my electrician this morning.
Now, I still need to find the right testing apparatus for Orthopolyphosphate. The price is not that much.
Now the catalog says "Reactive Phosphate Residual" or some so much, is this what I want?
Tell them in Lansing, that this is soon to be running,
Thanks,
Mike O'Malley
Benton Harbor Water Superintendent

From:	Thurston, Brian (EGLE)
To:	Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE)
Subject:	FW: High lead results - Benton Harbor
Date:	Tuesday, December 8, 2020 2:32:24 PM
Attachments:	00600_BentonHarbor_LCR_Results_2020-2.pdf image001.png image002.png

---

FYI – Still looks like we have a CCT issue here.

From: Deely, Aislinn (EGLE) <DeelyA@michigan.gov>
Sent: Tuesday, December 8, 2020 1:28 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Tiernan, Gerald (DHHS) <TIERNANG@michigan.gov>; MDHHS-Env-Health <MDHHS-Env-Health@michigan.gov>
Cc: Jackson, Heather (EGLE) <JacksonH@michigan.gov>
Subject: High lead results - Benton Harbor
High lead results from Benton Harbor
Page 11- 28 ppb, 29 ppb, 62 ppb, 17 ppb
Page 12- 20 ppb, 31 ppb, 20 ppb
Page 13- 21 ppb, 24 ppb, 18 ppb
Page 14- 19 ppb, 27 ppb, 40 ppb
Page 23- 100 ppb, 20 ppb
Page 33- 240 ppb, 50 ppb
Page 25- 25 ppb

Aislinn Deely, M.S.
Environmental Quality Analyst - Lead and Copper Unit
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(517) 388-1816 | DeelyA@michigan.gov

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Michigan.gov/LCR | Michigan.gov/drinkingwater

LET'S STAY SAFE TOGETHER

RECEIVED
Dec 3 2020
EGLE-DWEHD-CWSS-LCU

LABORATORY REPORT

LABORATORY REPORT

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

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RECEIVED
Dec 3 2020
EGLE-DWEHD-CWSS-LCU

STATE CERTIFICATION LIST

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Alaska	IN00035	Montana	CERT0026
Arizona	AZ0432	Nebraska	NE-OS-05-04
Arkansas	IN00035	Nevada	IN00035
California	2920	New Hampshire*	2124
Colorado	IN00035	New Jersey*	IN598
Colorado Radiochemistry	IN00035	New Mexico	IN00035
Connecticut	PH-0132	New York*	11398
Delaware	IN035	North Carolina	18700
Florida*	E87775	North Dakota	R-035
Georgia	929	Ohio	87775
Hawaii	IN035	Oklahoma	D9508
Idaho	IN00035	Oregon (Primary AB)*	4074
Illinois*	200001	Pennsylvania*	68-00466
Illinois Microbiology	17767	Puerto Rico	IN00035
Illinois Radiochemistry	IN00035	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187-18-12
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA014	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
EPA	IN00035		

*NELAP/TNI Recognized Accreditation Bodies

LABORATORY REPORT

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Revision date: 03/14/2019

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South Bend, IN 46617
Tel: (574) 233-4777
Fax: (574) 233-8207
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Laboratory Report

Client: Benton Harbor, City of
LABORATORY REPORT
Attn: Michael O'Malley
200 East Wall Street
Benton Harbor, MI 49002

Report: 491312
Priority: Standard Written
Status: Final
PWS ID: Not Supplied

Sample Information

EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
4672024	Sample #1	200.8	07/08/20 00:00	Client	07/14/20 11:45
4672025	Sample #5	200.8	07/08/20 00:00	Client	07/14/20 11:45

Report Summary

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

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Pat Muff ASM

Authorized Signature | Title | 07/21/2020 Date

Client Name: Benton Harbor, City of
Report #: 491312

Client Name: Benton Harbor, City of

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Report #: 491312

Sampling Point: Sample #1

PWS ID: Not Supplied

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**11**	ug/L	---	07/20/20 12:45	4672024
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	07/20/20 12:45	4672024

LABORATORY REPORT

Sampling Point: Sample #5

PWS ID: Not Supplied

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.7**	ug/L	---	07/20/20 12:47	4672025
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	07/20/20 12:47	4672025

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

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Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

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Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

If applicable, the calculation of the matrix spike (MS) or matrix spike duplicate (MSD) percent recovery is as follows: (MS or MSD value - Sample value) * 100 / spike target / dilution factor = **Recovery %**

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Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

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Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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F: 1.574.233.8207

Order # 402906
Batch # ~~491233~~ 491312 KB 11/5/2020

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CHAIN OF CUSTODY RECORD

Page ___ of ___

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Benton Harbor					SO4367

BILL TO:	COMPLIANCE MONITORING	Yes	No	POPULATION SERVED	SOURCE WATER	Preservative Checks

LAB Number	COLLECTION DATE	COLLECTION TIME	AM	PM	SAMPLING SITE	TEST NAME	pH accep-table? √	Residual Chlorine (P/A)	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1 46720324 ↓ 25	7/14/2020	0:00			Simple #1 3 per bottles KB 11/5/2020	Pb/Cu							
2	7/14/2020	0:00			Simple #5	"							
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													

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RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
		AM PM		11/4/2020	1145 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

Fresh draw

CONDITIONS UPON RECEIPT (check one):
___ Iced: Wet/Blue ____ Ambient _____ °C Upon Receipt____ N/A

LABORATORY REPORT

MATRIX CODES:

DW-DRINKING WATER RW-REAGENT WATER GW-GROUND WATER EW-EXPOSURE WATER SW-SURFACE WATER PW-POOL WATER WW-WASTE WATER

TURNAROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0% RV* = Rush Verbal: (5 working days)
50% RW* = Rush Written: (5 working days) 75%
* Please call, expedited service not available for all testing

IV* = Immediate Verbal: (3 working days) 100%
=Immediate Written: (3 working days) 125%
Weekend, Holiday CALL
STAT* = Less than 48 hours CALL

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 8.0 Effective Date: 2020-05-15

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Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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STATE CERTIFICATION LIST

State	Certification	State	Certification
Alabama	40700	Missouri	880
Alaska	IN00035	Montana	CERT0026
Arizona	AZ0432	Nebraska	NE-OS-05-04
Arkansas	IN00035	Nevada	IN00035
California	2920	New Hampshire*	2124
Colorado	IN00035	New Jersey*	IN598
Colorado Radiochemistry	IN00035	New Mexico	IN00035
Connecticut	PH-0132	New York*	11398
Delaware	IN035	North Carolina	18700
Florida(Primary AB)*	E87775	North Dakota	R-035
Georgia	929	Ohio	87775
Hawaii	IN035	Oklahoma	D9508
Idaho	IN00035	Oregon*	4156
Illinois*	200001	Pennsylvania*	68-00466
Illinois Microbiology	17767	Puerto Rico	IN00035
Illinois Radiochemistry	IN00035	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA014	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
EPA	IN00035		

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Revision date: 09/29/2020

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Laboratory Report

Client: City of Benton Harbor
LABORATORY REPORT
Attn: Michael O'Malley
200 East Wall Street
Benton Harbor, MI 49002

Report: 500948
Priority: Standard Written
Status: Final
PWS ID: MI600

Sample Information

EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
4749586	RP10 BHFree 102 1st Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749587	RP10 BHFree 102 5th Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749588	RP10 BHFEA 41 1st Draw	200.8	10/07/20 07:00	Client	10/14/20 10:25
4749589	RP10 BHFEA 41 5th Draw	200.8	10/07/20 07:00	Client	10/14/20 10:25
4749590	RP10 BHFEA 52 1st Draw	200.8	10/07/20 07:00	Client	10/14/20 10:25
4749591	RP10 BHFEA 52 5th Draw	200.8	10/07/20 07:00	Client	10/14/20 10:25
4749592	RP10 BHFEA 7 1st Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749593	RP10 BHFEA 7 5th Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749594	RP10 BHFree 99 1st Draw	200.8	10/07/20 07:30	Client	10/14/20 10:25
4749595	RP10 BHFree 99 5th Draw	200.8	10/07/20 07:30	Client	10/14/20 10:25
4749596	RP10 BHFEA 20 1st Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749597	RP10 BHFEA 20 5th Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749598	RP10 BHFree 23 1st Draw	200.8	10/07/20 04:00	Client	10/14/20 10:25
4749599	RP10 BHFree 23 5th Draw	200.8	10/07/20 04:00	Client	10/14/20 10:25
4749600	RP10 BHFEA 45 1st Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749601	RP10 BHFEA 45 5th Draw	200.8	10/07/20 08:00	Client	10/14/20 10:25
4749602	RP10 BHFEA 6 1st Draw	200.8	10/07/20 06:00	Client	10/14/20 10:25
4749603	RP10 BHFEA 6 5th Draw	200.8	10/07/20 06:00	Client	10/14/20 10:25
4749604	RP10 BHFree 41 1st Draw	200.8	10/06/20 23:00	Client	10/14/20 10:25
4749605	RP10 BHFree 41 5th Draw	200.8	10/06/20 23:00	Client	10/14/20 10:25

Report Summary

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

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Pat Muff ASM 10/21/2020

Authorized Signature Title Date

Client Name: City of Benton Harbor
Report #: 500948

Client Name: City of Benton Harbor

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Report #: 500948

Sampling Point: RP10 BHFree 102 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**7.3**	ug/L	---	10/20/20 11:30	4749586
7439-92-1	Lead	200.8	15 !	1.0	**9.8**	ug/L	---	10/20/20 11:30	4749586

LABORATORY REPORT

Sampling Point: RP10 BHFree 102 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**16**	ug/L	---	10/20/20 11:38	4749587
7439-92-1	Lead	200.8	15 !	1.0	**28**	ug/L	---	10/20/20 11:38	4749587

Sampling Point: RP10 BHFEA 41 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**13**	ug/L	---	10/20/20 11:40	4749588
7439-92-1	Lead	200.8	15 !	1.0	**29**	ug/L	---	10/20/20 11:40	4749588

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Sampling Point: RP10 BHFEA 41 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**6.3**	ug/L	---	10/20/20 11:43	4749589
7439-92-1	Lead	200.8	15 !	1.0	**62**	ug/L	---	10/20/20 11:43	4749589

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Sampling Point: RP10 BHFEA 52 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.0**	ug/L	---	10/20/20 11:46	4749590
7439-92-1	Lead	200.8	15 !	1.0	**17**	ug/L	---	10/20/20 11:46	4749590

Client Name: City of Benton Harbor

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Report #: 500948

Sampling Point: RP10 BHFEA 52 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.3**	ug/L	---	10/20/20 11:48	4749591
7439-92-1	Lead	200.8	15 !	1.0	**20**	ug/L	---	10/20/20 11:48	4749591

LABORATORY REPORT

Sampling Point: RP10 BHFEA 7 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.0**	ug/L	---	10/20/20 11:51	4749592
7439-92-1	Lead	200.8	15 !	1.0	**4.6**	ug/L	---	10/20/20 11:51	4749592

Sampling Point: RP10 BHFEA 7 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.8**	ug/L	---	10/20/20 11:53	4749593
7439-92-1	Lead	200.8	15 !	1.0	**9.2**	ug/L	---	10/20/20 11:53	4749593

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Sampling Point: RP10 BHFree 99 1st Draw PWS ID: MI600

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Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**5.7**	ug/L	---	10/20/20 11:56	4749594
7439-92-1	Lead	200.8	15 !	1.0	**31**	ug/L	---	10/20/20 11:56	4749594

Sampling Point: RP10 BHFree 99 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**14**	ug/L	---	10/20/20 11:58	4749595
7439-92-1	Lead	200.8	15 !	1.0	**20**	ug/L	---	10/20/20 11:58	4749595

Client Name: City of Benton Harbor

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Report #: 500948

Sampling Point: RP10 BHFEA 20 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/20/20 12:06	4749596
7439-92-1	Lead	200.8	15 !	1.0	**21**	ug/L	---	10/20/20 12:06	4749596

LABORATORY REPORT

Sampling Point: RP10 BHFEA 20 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/20/20 12:13	4749597
7439-92-1	Lead	200.8	15 !	1.0	**24**	ug/L	---	10/20/20 12:13	4749597

Sampling Point: RP10 BHFree 23 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.1**	ug/L	---	10/20/20 12:16	4749598
7439-92-1	Lead	200.8	15 !	1.0	**12**	ug/L	---	10/20/20 12:16	4749598

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Sampling Point: RP10 BHFree 23 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.0**	ug/L	---	10/20/20 12:18	4749599
7439-92-1	Lead	200.8	15 !	1.0	**13**	ug/L	---	10/20/20 12:18	4749599

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Sampling Point: RP10 BHFEA 45 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.6**	ug/L	---	10/20/20 12:21	4749600
7439-92-1	Lead	200.8	15 !	1.0	**18**	ug/L	---	10/20/20 12:21	4749600

Sampling Point: RP10 BHFEA 45 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.9**	ug/L	---	10/20/20 12:23	4749601
7439-92-1	Lead	200.8	15 !	1.0	**19**	ug/L	---	10/20/20 12:23	4749601

LABORATORY REPORT

Sampling Point: RP10 BHFEA 6 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.1**	ug/L	---	10/20/20 12:26	4749602
7439-92-1	Lead	200.8	15 !	1.0	**3.4**	ug/L	---	10/20/20 12:26	4749602

Sampling Point: RP10 BHFEA 6 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.2**	ug/L	---	10/20/20 12:28	4749603
7439-92-1	Lead	200.8	15 !	1.0	**4.4**	ug/L	---	10/20/20 12:28	4749603

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Sampling Point: RP10 BHFree 41 1st Draw PWS ID: MI600

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Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**3.4**	ug/L	---	10/20/20 12:31	4749604
7439-92-1	Lead	200.8	15 !	1.0	**27**	ug/L	---	10/20/20 12:31	4749604

Sampling Point: RP10 BHFree 41 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**3.7**	ug/L	---	10/20/20 12:33	4749605
7439-92-1	Lead	200.8	15 !	1.0	**40**	ug/L	---	10/20/20 12:33	4749605

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

LABORATORY REPORT

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

If applicable, the calculation of the matrix spike (MS) or matrix spike duplicate (MSD) percent recovery is as follows: (MS or MSD value - Sample value) * 100 / spike target / dilution factor = **Recovery %**

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00) 332-4345 or (574) 233-4777.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

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Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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eurofins | Eaton Analytical
110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order # 409369 (pm 10/14/2020)
Batch # 500948

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Mike O'Malley, momalley@cityofbentonharbormi.gov	Mike O'Malley (Residents Sample)	600	MI	Lead and Copper 2nd half 2020 Compliance Monitoring 1st set	Req S05230
BILL TO: awade@cityofbentonharbormi.gov	COMPLIANCE MONITORING: Yes = x; No =	POPULATION SERVED: 9,639	SOURCE WATER: Lake Michigan		

LABORATORY REPORT

	LAB Number	COLLECTION DATE	COLLECTION TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	4749 586	10/7/2020	8:00 AM			RP10 BHFree 102	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
2	587	10/7/2020	8:00 AM			RP10 BHFree 102	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
3	588	10/7/2020	7:00am			RP10 BHFEA 41	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
4	589	10/7/2020	7:00am			RP10 BHFEA 41	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
5	590	10/7/2020	7:00am			RP10 BHFEA 52	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
6	591	10/7/2020	7:00am			RP10 BHFEA 52	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
7	592	10/7/2020	8:00 AM			RP10 BHFEA 7	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
8	593	10/7/2020	8:00 AM			RP10 BHFEA 7	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
9	594	10/7/2020	7:30am			RP10 BHFree 99	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
10	595	10/7/2020	7:30am			RP10 BHFree 99	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
11	596	10/7/2020	8:00 AM			RP10 BHFEA 20	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
12	597	10/7/2020	8:00 AM			RP10 BHFEA 20	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
13	598	10/7/2020	4:00am			RP10 BHFree 23	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
14	599	10/7/2020	4:00am			RP10 BHFree 23	Lead and Copper 5th Draw	5th draw	x		1	SW	SW

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
	10/14/20	1050 AM PM		10/14/20	10:00 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
	10/14/20	10:25 AM PM		10-14-2020	1025 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one):
___ Iced: Wet/Blue X Ambient ___ °C Upon Receipt X N/A

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MATRIX CODES:
DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days)	0%	IV* = Immediate Verbal: (3 working days)	100%
RV* = Rush Verbal: (5 working days)	50%	IW* =Immediate Written: (3 working days)	125%
RW* = Rush Written: (5 working days)	75%	SP* = Weekend, Holiday	CALL
		STAT* = Less than 48 hours	CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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CHAIN OF CUSTODY RECORD

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REPORT TO:

Mike O'Malley, momalley@cityofbentonharbormi.gov

BILL TO:

awade@cityofbentonharbormi.gov

SAMPLER (Signature): Mike O'Malley — Residents Sample

PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
600	MI	Lead and Copper 2nd half 2020 Compliance Monitoring 1st set	Req S05230

COMPLIANCE MONITORING	Yes	No	POPULATION SERVED	SOURCE WATER
	x		9,639	Lake Michigan

LABORATORY REPORT

	LAB Number	COLLECTION DATE	COLLECTION TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	4749 600	10/7/2020	8:00 AM			RP10 BHFEA 45	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
2	601	10/7/2020	8:00 AM			RP10 BHFEA 45	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
3	602	10/7/2020	6:00am			RP10 BHFEA 6	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
4	603	10/7/2020	6:00am			RP10 BHFEA 6	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
5	604	10//6/2020	11:00		x	RP10 BHFree 41	Lead and Copper 1st Draw	1st draw	x		1	SW	SW
6	605	10//6/2020	11:00		x	RP10 BHFree 41	Lead and Copper 5th Draw	5th draw	x		1	SW	SW
7													
8													
9													
10													
11													
12													
13													
14													

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
	10/14/20	10 AM PM		10/14/20	10 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
	10/14/20	10:25 AM PM		10-14-2020	1025 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one):

___ Iced: Wet/Blue __X__ Ambient ___ °C Upon Receipt __X__ N/A

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MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days)	0%	IV* = Immediate Verbal: (3 working days)	100%
RV* = Rush Verbal: (5 working days)	50%	IW* =Immediate Written: (3 working days)	125%
RW* = Rush Written: (5 working days)	75%	SP* = Weekend, Holiday	CALL
		STAT* = Less than 48 hours	CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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PURCHASE REQUISITION

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PURCHASE ORDER: _____
_____ 20 _____

REQUISITION #: S 05230

DATE: 10/14/20

Water Dist Testing
591.570.740 _____ DEPARTMENT

PURCHASING AGENT: _____

VENDOR: Eurofins Eaton Analytical
110 S. Hill St, South Bend IN 46617

CONTACT NAME: _____

ACCOUNT	WHERE USED	QUANTITY	DESCRIPTION	UNIT PRICE ESTIMATE	UNIT PRICE QUOTED	EXTENSION	TRADE DISCOUNT	NET PRICE
		10	lead & Copper tests					
			12 PD 10/6 & 10/7 2020					
			2 each					
		20	lead & Copper tests					

LABORATORY REPORT

TERM: _____ APPROVAL SIGNATURE: _____

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STATE CERTIFICATION LIST

State	Certification	State	Certification
Alabama	40700	Missouri	880
Alaska	IN00035	Montana	CERT0026
Arizona	AZ0432	Nebraska	NE-OS-05-04
Arkansas	IN00035	Nevada	IN00035
California	2920	New Hampshire*	2124
Colorado	IN00035	New Jersey*	IN598
Colorado Radiochemistry	IN00035	New Mexico	IN00035
Connecticut	PH-0132	New York*	11398
Delaware	IN035	North Carolina	18700
Florida(Primary AB)*	E87775	North Dakota	R-035
Georgia	929	Ohio	87775
Hawaii	IN035	Oklahoma	D9508
Idaho	IN00035	Oregon*	4156
Illinois*	200001	Pennsylvania*	68-00466
Illinois Microbiology	17767	Puerto Rico	IN00035
Illinois Radiochemistry	IN00035	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA014	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
EPA	IN00035		

*NELAP/TNI Recognized Accreditation Bodies

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Revision date: 09/29/2020

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South Bend, IN 46617
Tel: (574) 233-4777
Fax: (574) 233-8207
1 800 332 4345

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Laboratory Report

Client: City of Benton Harbor
LABORATORY REPORT
Attn: Michael O'Malley
200 East Wall Street
Benton Harbor, MI 49002

Report: 501568
Priority: Standard Written
Status: Final
PWS ID: MI600

Sample Information					
EEA ID #	**Client ID**	**Method**	**Collected Date / Time**	**Collected By:**	**Received Date / Time**
4755145	RP10a BHFEA 130 1st Draw	200.8	10/14/20 06:00	Client	10/16/20 15:38
4755146	RP10a BHFEA 130 5th Draw	200.8	10/14/20 06:00	Client	10/16/20 15:38
4755147	RP10a BHFEA 16 1st Draw	200.8	10/14/20 08:30	Client	10/16/20 15:38
4755148	RP10a BHFEA 16 5th Draw	200.8	10/14/20 08:30	Client	10/16/20 15:38
4755149	RP10a BHFree 4 1st Draw	200.8	10/14/20 08:20	Client	10/16/20 15:38
4755150	RP10a BHFree 4 5th Draw	200.8	10/14/20 08:20	Client	10/16/20 15:38
4755151	RP10a BHFEA 18 1st Draw	200.8	10/14/20 07:23	Client	10/16/20 15:38
4755152	RP10a BHFEA 18 5th Draw	200.8	10/14/20 07:23	Client	10/16/20 15:38
4755153	RP10a BHFree 84 1st Draw	200.8	10/14/20 07:00	Client	10/16/20 15:38
4755154	RP10a BHFree 84 5th Draw	200.8	10/14/20 07:00	Client	10/16/20 15:38
4755155	RP10a BHFree 22 1st Draw	200.8	10/14/20 08:00	Client	10/16/20 15:38
4755156	RP10a BHFree 22 5th Draw	200.8	10/14/20 08:00	Client	10/16/20 15:38
4755157	RP10a BHFEA 50 1st Draw	200.8	10/14/20 08:00	Client	10/16/20 15:38
4755158	RP10a BHFEA 50 5th Draw	200.8	10/14/20 08:00	Client	10/16/20 15:38
4755159	RP10a BHFree 33 1st Draw	200.8	10/14/20 08:30	Client	10/16/20 15:38
4755160	RP10a BHFree 33 5th Draw	200.8	10/14/20 08:30	Client	10/16/20 15:38
4755161	RP10a BHFEA 22 1st Draw	200.8	10/14/20 06:10	Client	10/16/20 15:38
4755162	RP10a BHFEA 22 5th Draw	200.8	10/14/20 06:10	Client	10/16/20 15:38
4755163	RP10a BHFEA 37 1st Draw	200.8	10/14/20 05:10	Client	10/16/20 15:38
4755164	RP10a BHFEA 37 5th Draw	200.8	10/14/20 05:10	Client	10/16/20 15:38

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

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Report Summary

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Pat Muff at (574) 233-4777.

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Pat Mueller ASM — 10/29/2020

Authorized Signature | Title | Date

Client Name: City of Benton Harbor
Report #: 501568

Sampling Point: RP10a BHFEA 130 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**3.9**	ug/L	---	10/26/20 12:01	4755145
7439-92-1	Lead	200.8	15 !	1.0	**100**	ug/L	---	10/26/20 12:01	4755145

LABORATORY REPORT

Sampling Point: RP10a BHFEA 130 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 12:10	4755146
7439-92-1	Lead	200.8	15 !	1.0	**1.6**	ug/L	---	10/26/20 12:10	4755146

Sampling Point: RP10a BHFEA 16 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.9**	ug/L	---	10/26/20 12:13	4755147
7439-92-1	Lead	200.8	15 !	1.0	**20**	ug/L	---	10/26/20 12:13	4755147

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: RP10a BHFEA 16 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.6**	ug/L	---	10/26/20 12:15	4755148
7439-92-1	Lead	200.8	15 !	1.0	**1.1**	ug/L	---	10/26/20 12:15	4755148

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Sampling Point: RP10a BHFree 4 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**37**	ug/L	---	10/26/20 12:18	4755149
7439-92-1	Lead	200.8	15 !	1.0	**5.2**	ug/L	---	10/26/20 12:18	4755149

City of Benton Harbor

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Report #: 501568

Sampling Point: RP10a BHFree 4 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**3.1**	ug/L	---	10/26/20 12:21	4755150
7439-92-1	Lead	200.8	15 !	1.0	**3.0**	ug/L	---	10/26/20 12:21	4755150

LABORATORY REPORT

Sampling Point: RP10a BHFEA 18 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.6**	ug/L	---	10/26/20 12:24	4755151
7439-92-1	Lead	200.8	15 !	1.0	**6.1**	ug/L	---	10/26/20 12:24	4755151

Sampling Point: RP10a BHFEA 18 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 12:27	4755152
7439-92-1	Lead	200.8	15 !	1.0	**5.1**	ug/L	---	10/26/20 12:27	4755152

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: RP10a BHFree 84 1st Draw PWS ID: MI600

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Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.2**	ug/L	---	10/26/20 12:29	4755153
7439-92-1	Lead	200.8	15 !	1.0	**6.3**	ug/L	---	10/26/20 12:29	4755153

Sampling Point: RP10a BHFree 84 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 12:32	4755154
7439-92-1	Lead	200.8	15 !	1.0	**5.1**	ug/L	---	10/26/20 12:32	4755154

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Report #: 501568

Sampling Point: RP10a BHFree 22 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**8.4**	ug/L	---	10/26/20 12:41	4755155
7439-92-1	Lead	200.8	15 !	1.0	**8.6**	ug/L	---	10/26/20 12:41	4755155

LABORATORY REPORT

Sampling Point: RP10a BHFree 22 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**11**	ug/L	---	10/26/20 12:49	4755156
7439-92-1	Lead	200.8	15 !	1.0	**3.9**	ug/L	---	10/26/20 12:49	4755156

Sampling Point: RP10a BHFEA 50 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 12:52	4755157
7439-92-1	Lead	200.8	15 !	1.0	**2.9**	ug/L	---	10/26/20 12:52	4755157

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: RP10a BHFEA 50 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 12:55	4755158
7439-92-1	Lead	200.8	15 !	1.0	**2.9**	ug/L	---	10/26/20 12:55	4755158

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Sampling Point: RP10a BHFree 33 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**5.8**	ug/L	---	10/26/20 12:57	4755159
7439-92-1	Lead	200.8	15 !	1.0	**4.1**	ug/L	---	10/26/20 12:57	4755159

Client Name: City of Benton Harbor

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Report #: 501568

Sampling Point: RP10a BHFree 33 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**6.6**	ug/L	---	10/26/20 13:00	4755160
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	10/26/20 13:00	4755160

LABORATORY REPORT

Sampling Point: RP10a BHFEA 22 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.9**	ug/L	---	10/26/20 13:03	4755161
7439-92-1	Lead	200.8	15 !	1.0	**3.8**	ug/L	---	10/26/20 13:03	4755161

Sampling Point: RP10a BHFEA 22 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**5.0**	ug/L	---	10/26/20 13:06	4755162
7439-92-1	Lead	200.8	15 !	1.0	**3.2**	ug/L	---	10/26/20 13:06	4755162

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Sampling Point: RP10a BHFEA 37 1st Draw PWS ID: MI600

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Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 13:09	4755163
7439-92-1	Lead	200.8	15 !	1.0	**1.3**	ug/L	---	10/26/20 13:09	4755163

Sampling Point: RP10a BHFEA 37 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/26/20 13:11	4755164
7439-92-1	Lead	200.8	15 !	1.0	**1.1**	ug/L	---	10/26/20 13:11	4755164

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

LABORATORY REPORT

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

If applicable, the calculation of the matrix spike (MS) or matrix spike duplicate (MSD) percent recovery is as follows: (MS or MSD value - Sample value) * 100 / spike target / dilution factor = **Recovery %**

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

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Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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Order # 409754
Batch # 501432 SS 10-20-2020

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CHAIN OF CUSTODY RECORD

501568

Page 1 of 2

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Mike O'Malley, momalley@cityofbentonharbormi.gov	Mike O'Malley	600	MI	Lead and copper 2nd half of 2020 2nd round of 10 samples	S05231
BILL TO: awade@cityofbentonharbormi.gov	COMPLIANCE MONITORING: Yes = x; No =	POPULATION SERVED: 9,639	SOURCE WATER: Lake Michigan		

LABORATORY REPORT

	LAB Number	COLLECTION DATE	COLLECTION TIME	AM	PM	SAMPLING SITE Print copy is right digital copy lost	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	4755145 *	10/14/20	6:00	x		RP10a BHFEA 130	Lead & Copper	1st draw	x		1	SW	$W
2	146 *	10/14/20	6:00	x		RP10a BHFEA130	Lead & Copper	5th draw	x		1	SW	$W
3	147	10/14/20	8:30	x		RP10a BHFEA 16	Lead & Copper	1st draw	x		1	SW	$W
4	148	10/14/20	8:30	x		RP10a BHFEA 16	Lead & Copper	5th draw	x		1	SW	$W
5	149	10/14/20	8:20	x		RP10aBHFree 4	Lead & Copper	1st draw	x		1	SW	$W
6	150	10/14/20	8:20	x		RP10aBHFree 4	Lead & Copper	5th draw	x		1	SW	$W
7	151	10/14/20	7:23	x		RP10a BHFEA 18	Lead & Copper	1st draw	x		1	SW	$W
8	152	10/14/20	7:23	x		RP10a BHFEA 18	Lead & Copper	5th draw	x		1	SW	$W
9	153	10/14/20	7:00	x		RP10a BHFree 84	Lead & Copper	1st draw	x		1	SW	$W
10	154	10/14/20	7:00	x		RP10a BHFree 84	Lead & Copper	5th draw	x		1	SW	$W
11	155	10/14/20	8:00	x		RP10a BHFree 22 Bottle shows 1, cap shows 2	Lead & Copper	1st draw	x		1	SW	$W
12	156	10/14/20	8:00	x		RP10a BHFree 22 Bottle shows 5, cap shows	Lead & Copper	5th draw	x		1	SW	$W
13													
14						* No samples received SS 10-16-2020 - See comment above SS 10-20-2020							

Samples were received had labels on both sides of bottles and appeared to be a 2nd site for BHFEA 50 SS 10-20-2020
Bottle ~ 5/6 full SS 10-16-2020
(caps switched?) SS 10-16-2020

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
	10/16	2:00 AM PM		10/16	2:00 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
	10/16	3:38 AM PM		10-16-2020	1538 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one):
___ Iced: Wet/Blue ___X___ Ambient ___ °C Upon Receipt ___X___ N/A

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MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days)	0%	IV* = Immediate Verbal: (3 working days)	100%
RV* = Rush Verbal: (5 working days)	50%	IW* =Immediate Written: (3 working days)	125%
RW* = Rush Written: (5 working days)	75%	SP* = Weekend, Holiday	CALL
		STAT* = Less than 48 hours	CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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CHAIN OF CUSTODY RECORD

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REPORT TO:
Mike O'Malley, momalley@bhcity.us

BILL TO:
awade@cityofbentonharbormi.com

SAMPLER (Signature): Mike O'Malley Individual residents

COMPLIANCE MONITORING	Yes	No
	x	

PWS ID #	STATE (sample origin)	POPULATION SERVED	SOURCE WATER
600	MI	9,639	Lake Michigan

PROJECT NAME: Lead and copper 2nd half of 2020 2nd round of 10 samples

PO#: S05231

LABORATORY REPORT

	LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	4755157	10/14/2020	8:00	x		RP10a BHFEA 50 1st Draw	Lead & Copper	1st draw	x		1	sw	sw
2	158	10/14/2020	8:00	x		RP10a BHFEA 50 5th Draw	Lead & Copper	5th draw	x		1	sw	sw
3	159	10/14/2020	8:30	x		RP10a BHFree 33 1st Draw	Lead & Copper	1st draw	x		1	sw	sw
4	160	10/14/2020	8:30	x		RP10a BHFree 33 5th Draw	Lead & Copper	5th draw	x		1	sw	sw
5	161	10/14/2020	8:10	x		RP10a BHFEA 22 1st Draw	Lead & Copper	1st draw	x		1	sw	sw
6	162	10/14/2020	8:10	x		RP10a BHFEA 22 5th Draw	Lead & Copper	5th draw	x		1	sw	sw
7	163	10/14/2020	8:10	x		RP10a BHFEA 37 1st Draw	Lead & Copper	1st draw	x		1	sw	sw
8	164	10/14/2020	8:10	x		RP10a BHFEA 37 5th Draw	Lead & Copper	5th draw	x		1	sw	sw
9	Listed Twice *	10/14/2020	8:00	x		RP10a BHFEA 130 1st Draw	Lead & Copper	1st draw	x		1	sw	sw
10	* SS 10-30-2020	10/14/2020	8:00	x		RP10a BHFEA 130 5th Draw	Lead & Copper	5th draw	x		1	sw	sw
11													
12						* No Samples received SS 10-16-2020								
13													
14													

RELINQUISHED BY:(Signature) — DATE 10/16 — TIME 2:00 AM PM — RECEIVED BY:(Signature) — DATE 10/16 — TIME 2:00 AM PM

RELINQUISHED BY:(Signature) — DATE — TIME AM PM — RECEIVED BY:(Signature) — DATE — TIME AM PM

RELINQUISHED BY:(Signature) — DATE 10/16 — TIME 3:38 AM PM — RECEIVED FOR LABORATORY BY: — DATE 10-16-2020 — TIME 1535 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one):
___ Iced: Wet/Blue _X_ Ambient ___ °C Upon Receipt _X_ N/A

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

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MATRIX CODES:
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RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days)	0%	IV* = Immediate Verbal: (3 working days)	100%
RV* = Rush Verbal: (5 working days)	50%	IW* =Immediate Written: (3 working days)	125%
RW* = Rush Written: (5 working days)	75%	SP* = Weekend, Holiday	CALL
		STAT* = Less than 48 hours	CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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STATE CERTIFICATION LIST

State	Certification	State	Certification
Alabama	40700	Missouri	880
Alaska	IN00035	Montana	CERT0026
Arizona	AZ0432	Nebraska	NE-OS-05-04
Arkansas	IN00035	Nevada	IN00035
California	2920	New Hampshire*	2124
Colorado	IN00035	New Jersey*	IN598
Colorado Radiochemistry	IN00035	New Mexico	IN00035
Connecticut	PH-0132	New York*	11398
Delaware	IN035	North Carolina	18700
Florida(Primary AB)*	E87775	North Dakota	R-035
Georgia	929	Ohio	87775
Hawaii	IN035	Oklahoma	D9508
Idaho	IN00035	Oregon*	4156
Illinois*	200001	Pennsylvania*	68-00466
Illinois Microbiology	17767	Puerto Rico	IN00035
Illinois Radiochemistry	IN00035	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA014	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
EPA	IN00035		

*NELAP/TNI Recognized Accreditation Bodies

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Revision date: 09/29/2020

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Laboratory Report

Client: City of Benton Harbor
LABORATORY REPORT
Attn: Michael O'Malley
200 East Wall Street
Benton Harbor, MI 49002

Report: 502100
Priority: Standard Written
Status: Final
PWS ID: MI600

Sample Information					
EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
4759899	RP10bBHFEA 48 1st Draw	200.8	10/21/20 08:30	Client	10/26/20 11:00
4759900	RP10bBHFEA 48 5th Draw	200.8	10/21/20 08:30	Client	10/26/20 11:00
4759901	RP10bBHFree 29 1st Draw	200.8	10/21/20 03:00	Client	10/26/20 11:00
4759902	RP10bBHFree 29 5th Draw	200.8	10/21/20 03:00	Client	10/26/20 11:00
4759903	RP10bBHFree 69 1st Draw	200.8	10/20/20 17:00	Client	10/26/20 11:00
4759904	RP10bBHFree 69 5th Draw	200.8	10/20/20 17:00	Client	10/26/20 11:00
4759905	RP10bBHFree 1 1st Draw	200.8	10/21/20 07:00	Client	10/26/20 11:00
4759906	RP10bBHFree 1 5th Draw	200.8	10/21/20 07:00	Client	10/26/20 11:00
4759907	RP10bBHFree 53 1st Draw	200.8	10/21/20 10:00	Client	10/26/20 11:00
4759908	RP10bBHFree 53 5th Draw	200.8	10/21/20 10:00	Client	10/26/20 11:00
4759909	RP10bBHFEA 12 1st Draw	200.8	10/21/20 06:00	Client	10/26/20 11:00
4759910	RP10bBHFEA 12 5th Draw	200.8	10/21/20 06:00	Client	10/26/20 11:00
4759911	RP10bBHFree 67 1st Draw	200.8	10/21/20 08:00	Client	10/26/20 11:00
4759912	RP10bBHFree 67 5th Draw	200.8	10/21/20 08:00	Client	10/26/20 11:00
4759913	RP10bBHFree 56 1st Draw	200.8	10/20/20 23:00	Client	10/26/20 11:00
4759914	RP10bBHFree 56 5th Draw	200.8	10/20/20 23:00	Client	10/26/20 11:00

you have any questions concerning this report, please do not hesitate to call us at
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Report Summary

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Pat Muff at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from EEA.

Pat Muff ASM

Authorized Signature | Title

11/02/2020
Date

Client Name: City of Benton Harbor
Report #: 502100

Client Name: City of Benton Harbor

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Report #: 502100

Sampling Point: RP10bBHFEA 48 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**6.5**	ug/L	---	10/28/20 19:42	4759899
7439-92-1	Lead	200.8	15 !	1.0	**2.1**	ug/L	---	10/28/20 19:42	4759899

LABORATORY REPORT

Sampling Point: RP10bBHFEA 48 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.4**	ug/L	---	10/28/20 19:45	4759900
7439-92-1	Lead	200.8	15 !	1.0	**1.8**	ug/L	---	10/28/20 19:45	4759900

Sampling Point: RP10bBHFree 29 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**36**	ug/L	---	10/29/20 17:33	4759901
7439-92-1	Lead	200.8	15 !	1.0	**240**	ug/L	---	10/29/20 17:33	4759901

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: RP10bBHFree 29 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.5**	ug/L	---	10/29/20 17:36	4759902
7439-92-1	Lead	200.8	15 !	1.0	**50**	ug/L	---	10/29/20 17:36	4759902

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Sampling Point: RP10bBHFree 69 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**3.1**	ug/L	---	10/29/20 17:38	4759903
7439-92-1	Lead	200.8	15 !	1.0	**5.2**	ug/L	---	10/29/20 17:38	4759903

Client Name: City of Benton Harbor

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Report #: 502100

Sampling Point: RP10bBHFree 69 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.8**	ug/L	---	10/29/20 17:41	4759904
7439-92-1	Lead	200.8	15 !	1.0	**3.6**	ug/L	---	10/29/20 17:41	4759904

LABORATORY REPORT

Sampling Point: RP10bBHFree 1 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**36**	ug/L	---	10/29/20 17:44	4759905
7439-92-1	Lead	200.8	15 !	1.0	**2.6**	ug/L	---	10/29/20 17:44	4759905

Sampling Point: RP10bBHFree 1 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**42**	ug/L	---	10/29/20 17:47	4759906
7439-92-1	Lead	200.8	15 !	1.0	**5.1**	ug/L	---	10/29/20 17:47	4759906

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Sampling Point: RP10bBHFree 53 1st Draw PWS ID: MI600

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Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**52**	ug/L	---	10/29/20 17:50	4759907
7439-92-1	Lead	200.8	15 !	1.0	**6.9**	ug/L	---	10/29/20 17:50	4759907

Sampling Point: RP10bBHFree 53 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**44**	ug/L	---	10/29/20 17:58	4759908
7439-92-1	Lead	200.8	15 !	1.0	**7.1**	ug/L	---	10/29/20 17:58	4759908

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Report #: 502100

Sampling Point: RP10bBHFEA 12 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.2**	ug/L	---	10/29/20 18:01	4759909
7439-92-1	Lead	200.8	15 !	1.0	**25**	ug/L	---	10/29/20 18:01	4759909

LABORATORY REPORT

Sampling Point: RP10bBHFEA 12 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.7**	ug/L	---	10/29/20 18:04	4759910
7439-92-1	Lead	200.8	15 !	1.0	**25**	ug/L	---	10/29/20 18:04	4759910

Sampling Point: RP10bBHFree 67 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.1**	ug/L	---	10/29/20 18:12	4759911
7439-92-1	Lead	200.8	15 !	1.0	**8.7**	ug/L	---	10/29/20 18:12	4759911

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00) 332-4345 or (574) 233-4777.

Sampling Point: RP10bBHFree 67 5th Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	10/29/20 18:15	4759912
7439-92-1	Lead	200.8	15 !	1.0	**4.2**	ug/L	---	10/29/20 18:15	4759912

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Sampling Point: RP10bBHFree 56 1st Draw PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.9**	ug/L	---	10/29/20 18:17	4759913
7439-92-1	Lead	200.8	15 !	1.0	**7.0**	ug/L	---	10/29/20 18:17	4759913

Client Name: City of Benton Harbor

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Report #: 502100

Sampling Point: RP10bBHFree 56 5th Draw

PWS ID: MI600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.0**	ug/L	---	10/29/20 18:20	4759914
7439-92-1	Lead	200.8	15 !	1.0	**8.3**	ug/L	---	10/29/20 18:20	4759914

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	LABORATORY REPORT	SMCL	AL
Symbol:	*	^	!

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Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

LABORATORY REPORT

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

If applicable, the calculation of the matrix spike (MS) or matrix spike duplicate (MSD) percent recovery is as follows: (MS or MSD value - Sample value) * 100 / spike target / dilution factor = **Recovery %**

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Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

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Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

Order # 410236
Batch # 502100

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Shaded area for EEA use only

REPORT TO: Mike O'Malley, momalley@cityofbentonharbormi.gov

BILL TO: awade@cityofbentonharbormi.gov

SAMPLER (Signature): Mike O'Malley & Residents

PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
600	MI	Lead and Copper 3rd Round	S05233 10/26/2020

COMPLIANCE MONITORING	Yes	No
	x	

POPULATION SERVED	SOURCE WATER
9,639	Lake Michigan

LABORATORY REPORT

	LAB Number	DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	SAMPLE REMARKS	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	4759 899	10/21/2020	8:30 AM	x		RP10bBHFEA 48 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
2	900	10/21/2020	8:30 AM	x		RP10bBHFEA 48 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
3	901	10/21/2020	3:00 AM	x		RP10bBHFree 29 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
4	902	10/21/2020	3:00 AM	x		RP10bBHFree 29 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
5	903	10/20/2020	5:00 PM		x	RP10bBHFree 69 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
6	904	10/20/2020	5:00 PM		x	RP10bBHFree 69 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
7	905	10/21/2020	7:00 AM	x		RP10bBHFree 1 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
8	906	10/21/2020	7:00 AM	x		RP10bBHFree 1 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
9	907	10/21/2020	10:00 AM	x		RP10bBHFree 53 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
10	908	10/21/2020	10:00 AM	x		RP10bBHFree 53 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
11	909	10/21/2020	6:00 AM	x		RP10bBHFEA 12 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
12	910	10/21/2020	6:00 AM	x		RP10bBHFEA 12 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
	911	10/21/2020	8:00 AM	x		RP10bBHFree 67 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
	912	10/21/2020	8:00 AM	x		RP10bBHFree 67 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW
13	913	10/20/2020	11:00 PM		x	RP10bBHFree 56 1st Draw	Lead and Copper 1st Draw		x		1	SW	SW
14	914	10/20/2020	11:00 PM		x	RP10bBHFree 56 5th Draw	Lead and Copper 5th Draw		x		1	SW	SW

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
	10/22/20	12:30 AM PM		10/26/20	10:00 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
	10/26/20	11:00 AM PM		10-26-2020	1100 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one): X Iced: Wet/Blue ___ X Ambient ___ °C Upon Receipt ___ X N/A

S10-26-2020

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MATRIX CODES:

DW-DRINKING WATER
RW-REAGENT WATER
GW-GROUND WATER
EW-EXPOSURE WATER
SW-SURFACE WATER
PW-POOL WATER
WW-WASTE WATER

TURN-AROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days)	0%	IV* = Immediate Verbal: (3 working days)	100%
RV* = Rush Verbal: (5 working days)	50%	IW* =Immediate Written: (3 working days)	125%
RW* = Rush Written: (5 working days)	75%	SP* = Weekend, Holiday	CALL
		STAT* = Less than 48 hours	CALL

* Please call, expedited service not available for all testing

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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PURCHASE REQUISITION

PURCHASE ORDER: _____
_____ 20 _____

REQUISITION #: S 05233

DATE: 10/26/20

PURCHASING AGENT: _____

590.591.801 DEPARTMENT

VENDOR: Eurofins Eaton Analytical

CONTACT NAME: Lead/copper Sampling

110 S. Hill St. South Bend, IN 46617

LABORATORY REPORT

ACCOUNT	WHERE USED	QUANTITY	DESCRIPTION	UNIT PRICE ESTIMATE	UNIT PRICE QUOTED	EXTENSION	TRADE DISCOUNT	NET PRICE
		3	lead & Copper Collections					
		16	lead & Copper tests		30.00			$ 480.00

TERM: _____

APPROVAL SIGNATURE: _____

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STATE CERTIFICATION LIST

State	Certification	State	Certification
Alabama	40700	Missouri	880
Alaska	IN00035	Montana	CERT0026
Arizona	AZ0432	Nebraska	NE-OS-05-04
Arkansas	IN00035	Nevada	IN00035
California	2920	New Hampshire*	2124
Colorado	IN00035	New Jersey*	IN598
Colorado Radiochemistry	IN00035	New Mexico	IN00035
Connecticut	PH-0132	New York*	11398
Delaware	IN035	North Carolina	18700
Florida(Primary AB)*	E87775	North Dakota	R-035
Georgia	929	Ohio	87775
Hawaii	IN035	Oklahoma	D9508
Idaho	IN00035	Oregon*	4156
Illinois*	200001	Pennsylvania*	68-00466
Illinois Microbiology	17767	Puerto Rico	IN00035
Illinois Radiochemistry	IN00035	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA014	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
EPA	IN00035		

*NELAP/TNI Recognized Accreditation Bodies

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Revision date: 09/29/2020

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Laboratory Report

Client: City of Benton Harbor
Attn: Michael O'Malley
200 East Wall Street
Benton Harbor, MI 49002

LABORATORY REPORT

Report: 502626
Priority: Standard Written
Status: Final
PWS ID: MI0000600

Sample Information					
EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
4764970	RP10c BH Free 86 1st	200.8	10/29/20 07:00	Client	11/02/20 11:10
4764971	RP10c BH Free 86 5th	200.8	10/29/20 07:00	Client	11/02/20 11:10
4764972	RP10c BH FEA 38 1st	200.8	10/29/20 06:00	Client	11/02/20 11:10
4764973	RP10c BH FEA 38 5th	200.8	10/29/20 06:00	Client	11/02/20 11:10
4764974	RP10c BH Free 104 1st	200.8	10/29/20 08:30	Client	11/02/20 11:10
4764975	RP10c BH FEA 11 1st	200.8	10/29/20 08:00	Client	11/02/20 11:10
4764976	RP10c BH FEA 11 5th	200.8	10/29/20 08:00	Client	11/02/20 11:10
4764977	RP10c BH FEA 40 1st	200.8	10/29/20 07:30	Client	11/02/20 11:10
4764978	RP10c BH FEA 40 5th	200.8	10/29/20 07:30	Client	11/02/20 11:10

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Report Summary

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Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Pat Muff at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from EEA.

Pat Muff — ASM — 11/11/2020

Authorized Signature — Title — Date

Client Name: City of Benton Harbor
Report #: 502626

Client Name: City of Benton Harbor

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Report #: 502626

Sampling Point: RP10c BH Free 86 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/09/20 16:10	4764970
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/09/20 16:10	4764970

LABORATORY REPORT

Sampling Point: RP10c BH Free 86 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/09/20 16:12	4764971
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/09/20 16:12	4764971

Sampling Point: RP10c BH FEA 38 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.5**	ug/L	---	11/09/20 16:15	4764972
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/09/20 16:15	4764972

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00) 332-4345 or (574) 233-4777.

Sampling Point: RP10c BH FEA 38 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.0**	ug/L	---	11/09/20 16:22	4764973
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/09/20 16:22	4764973

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Sampling Point: RP10c BH Free 104 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.7**	ug/L	11/04/20 10:10	11/05/20 13:17	4764974
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	11/04/20 10:10	11/05/20 13:17	4764974

Client Name: City of Benton Harbor

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Report #: 502626

Sampling Point: RP10c BH FEA 11 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/09/20 16:24	4764975
7439-92-1	Lead	200.8	15 !	1.0	**7.0**	ug/L	---	11/09/20 16:24	4764975

LABORATORY REPORT

Sampling Point: RP10c BH FEA 11 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/09/20 16:27	4764976
7439-92-1	Lead	200.8	15 !	1.0	**11**	ug/L	---	11/09/20 16:27	4764976

Sampling Point: RP10c BH FEA 40 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.5**	ug/L	---	11/09/20 16:29	4764977
7439-92-1	Lead	200.8	15 !	1.0	**1.8**	ug/L	---	11/09/20 16:29	4764977

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Sampling Point: RP10c BH FEA 40 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.2**	ug/L	---	11/09/20 16:32	4764978
7439-92-1	Lead	200.8	15 !	1.0	**1.9**	ug/L	---	11/09/20 16:32	4764978

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† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

LABORATORY REPORT

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

If applicable, the calculation of the matrix spike (MS) or matrix spike duplicate (MSD) percent recovery is as follows: (MS or MSD value - Sample value) * 100 / spike target / dilution factor = **Recovery %**

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Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

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Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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110 S. Hill Street
South Bend, IN 46617
T: 1.800.332.4345
F: 1.574.233.8207

on 11/2/2020 4106663
Order # ~~397705~~
Batch # 5021026

www.EurofinsUS.com/Eaton

CHAIN OF CUSTODY RECORD

Page 1 of 1

Shaded area for EEA use only

REPORT TO:	SAMPLER (Signature)	PWS ID #	STATE (sample origin)	PROJECT NAME	PO#
Mike O'Malley	Residents Sample	0600	MI	Lead Cop 2nd Draw 2020	505243

BILL TO:	COMPLIANCE MONITORING		POPULATION SERVED	SOURCE WATER	Preservative Checks
Momalley@bhcity.us	Yes: X	No:	9674	Lake MI	

LAB Number	COLLECTION DATE	COLLECTION TIME	AM	PM	SAMPLING SITE	TEST NAME	pH accep-table? √	Residual Chlorine (P/A)	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1 4764970	10/29/20	~~7:00~~	X		RP 10c BH Free 86	1st	Lead/copper	1st draw			X	1	SW	SW
2 971	10/29/20	7:00	X		RP 10c BH Free 86	5th	"	5th draw			X	1	SW	SW
972	10/29	6:00	X		RP 10c BH FEA 38	1st	Lead/Copper	1st draw			X	1	SW	SW
973	10/29	6:00	X		RP 10c BH FEA 38	5th	Lead/copper	5th draw			X	1	SW	SW
974	10/29	8:20			RP 10c BH Free 104	1st	Lead/copper	1st			X	1	SW	SW
-	-	-			~~RP 10c BH Free 104~~	~~5th~~	~~Lead/copper~~	~~5th draw~~						
-	-	-												
975	10/29	8:00	X		RP 10c BH FEA 11	1st draw	Lead/copper	1st draw			X	1	SW	SW
976	10/29	8:00	X		RP 10c BH FEA 11	5th draw	Lead/copper	5th draw			X	1	SW	SW
977	10/29	7:30	X		RP 10c BH FEA 40	5th draw	Lead/copper	1st draw			X	1	SW	SW
978	10/29	7:30	X		RP 10c BH FEA 40	5th draw	Lead/copper	5th draw			X	1	SW	SW
14														

RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
	11/2/20	9:30 AM PM		11/2/20	9:30 AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED BY:(Signature)	DATE	TIME
		AM PM			AM PM
RELINQUISHED BY:(Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY:	DATE	TIME
	11/2/20	11:10 AM PM		11/2/20	1110 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

Cross Off on COC by Client

CONDITIONS UPON RECEIPT (check one):
___ Iced: Wet/Blue ___ Ambient
____ °C Upon Receipt____ N/A

MATRIX CODES:
DW-DRINKING WATER RW-REAGENT WATER GW-GROUND WATER EW-EXPOSURE WATER SW-SURFACE WATER PW-POOL WATER WW-WASTE WATER

TURN AROUND TIME (TAT) - SURCHARGES
SW = Standard Written: (15 working days) 0% RV* = Rush Verbal: (5 working days)
50% RW* = Rush Written: (5 working days) 75%
* Please call, expedited service not available for all testing
IV* = Immediate Verbal: (3 working days) IW* = Immediate Written: (3 working days) 100%
Weekend/Holiday SP* = 125%
STAT* = Less than 48 hours CALL
CALL

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.
06-LO-F0435 Issue 8.0 Effective Date: 2020-05-15

Sample analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by customer are deemed material alterations and are rejected unless expressly agreed to in writing by EEA.

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BENTON HARBOR
Port of Opportunities

PURCHASE REQUISITION

REQUISITION #: S 05243

PURCHASING AGENT: _____

DATE: water dist samplings

VENDOR: Eurofins Eaton Analytical

591.575.801 DEPARTMENT

110 S. Hill St. South Bend IN 46617

CONTACT NAME: 2nd half 2020 4th Quarter

ACCOUNT	WHERE USED	QUANTITY	DESCRIPTION	UNIT PRICE ESTIMATE	UNIT PRICE QUOTED	EXTENSION	TRADE DISCOUNT	NET PRICE
			LABORATORY REPORT					
		4	Sampling 1st & 5th draws					
			1 sample 1st draw only					
		9	lead & Copper Samples					

TERM: _____ APPROVAL SIGNATURE: _____

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STATE CERTIFICATION LIST

State	Certification	State	Certification
Alabama	40700	Missouri	880
Alaska	IN00035	Montana	CERT0026
Arizona	AZ0432	Nebraska	NE-OS-05-04
Arkansas	IN00035	Nevada	IN00035
California	2920	New Hampshire*	2124
Colorado	IN00035	New Jersey*	IN598
Colorado Radiochemistry	IN00035	New Mexico	IN00035
Connecticut	PH-0132	New York*	11398
Delaware	IN035	North Carolina	18700
Florida(Primary AB)*	E87775	North Dakota	R-035
Georgia	929	Ohio	87775
Hawaii	IN035	Oklahoma	D9508
Idaho	IN00035	Oregon*	4156
Illinois*	200001	Pennsylvania*	68-00466
Illinois Microbiology	17767	Puerto Rico	IN00035
Illinois Radiochemistry	IN00035	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA014	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
EPA	IN00035		

*NELAP/TNI Recognized Accreditation Bodies

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Revision date: 09/29/2020

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Laboratory Report

Client: City of Benton Harbor
LABORATORY REPORT
Attn: Rob Jones
27725 Stansbury Blvd
Suite 195
Farminton Hills, MI 48334

Report: 503861
Priority: Standard Written
Status: Final
PWS ID: MI0000600

Sample Information					
EEA ID #	**Client ID**	**Method**	**Collected Date / Time**	**Collected By:**	**Received Date / Time**
4775351	1248 Broadway 1st	200.8	11/09/20 18:00	Client	11/13/20 12:45
4775352	1248 Broadway 5th	200.8	11/09/20 18:00	Client	11/13/20 12:45
4775353	885 Mineral 1st	200.8	11/09/20 20:00	Client	11/13/20 12:45
4775354	885 Mineral 5th	200.8	11/09/20 20:00	Client	11/13/20 12:45
4775355	578 Edwards 1st	200.8	11/09/20 20:45	Client	11/13/20 12:45
4775356	578 Edwards 5th	200.8	11/09/20 20:45	Client	11/13/20 12:45
4775357	1191 Pavone 1st	200.8	11/10/20 08:30	Client	11/13/20 12:45
4775358	1191 Pavone 5th	200.8	11/10/20 08:30	Client	11/13/20 12:45
4775359	285 Hasting 1st	200.8	11/10/20 06:30	Client	11/13/20 12:45
4775360	285 Hasting 5th	200.8	11/10/20 06:30	Client	11/13/20 12:45
4775361	768 Broadway 1st	200.8	11/10/20 09:00	Client	11/13/20 12:45
4775362	768 Broadway 5th	200.8	11/10/20 09:00	Client	11/13/20 12:45
4775363	1225 Colfax 1st	200.8	11/09/20 18:00	Client	11/13/20 12:45
4775364	1225 Colfax 5th	200.8	11/09/20 18:00	Client	11/13/20 12:45
4775365	1115 Superior 1st	200.8	11/05/20 06:00	Client	11/13/20 12:45
4775366	1115 Superior 5th	200.8	11/05/20 06:00	Client	11/13/20 12:45
4775367	1026 Bishop 1st	200.8	11/09/20 21:30	Client	11/13/20 12:45
4775368	1026 Bishop 5th	200.8	11/09/20 21:30	Client	11/13/20 12:45
4775369	141 Winah 1st	200.8	11/09/20 07:50	Client	11/13/20 12:45
4775370	141 Winah 5th	200.8	11/09/20 07:50	Client	11/13/20 12:45
4775371	1112 Agard 1st	200.8	11/10/20 07:00	Client	11/13/20 12:45
4775372	1112 Agard 5th	200.8	11/10/20 07:00	Client	11/13/20 12:45
4775373	1069 Hurd 1st	200.8	11/10/20 08:00	Client	11/13/20 12:45
4775374	1069 Hurd 5th	200.8	11/10/20 08:00	Client	11/13/20 12:45
4775375	819 Vineyard 1st	200.8	11/10/20 06:00	Client	11/13/20 12:45
4775376	819 Vineyard 5th	200.8	11/10/20 06:00	Client	11/13/20 12:45
4775377	1020 Bishop 1st	200.8	11/10/20 09:00	Client	11/13/20 12:45
4775378	1020 Bishop 5th	200.8	11/10/20 09:00	Client	11/13/20 12:45

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Report Summary

Detailed quantitative results are presented on the fc presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Pat Muff at (574) 233-4777.

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Pat Muff ASM

Authorized Signature Title

11/19/2020

Date

Client Name: City of Benton Harbor
Report #: 503861

Client Name: City of Benton Harbor

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Report #: 503861

Sampling Point: 1248 Broadway 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/18/20 14:02	4775351
7439-92-1	Lead	200.8	15 !	1.0	**4.1**	ug/L	---	11/18/20 14:02	4775351

LABORATORY REPORT

Sampling Point: 1248 Broadway 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/18/20 14:05	4775352
7439-92-1	Lead	200.8	15 !	1.0	**2.0**	ug/L	---	11/18/20 14:05	4775352

Sampling Point: 885 Mineral 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.2**	ug/L	---	11/18/20 14:07	4775353
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 14:07	4775353

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: 885 Mineral 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**5.5**	ug/L	---	11/18/20 14:15	4775354
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 14:15	4775354

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Sampling Point: 578 Edwards 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**19**	ug/L	---	11/18/20 14:17	4775355
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 14:17	4775355

City of Benton Harbor

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Report #: 503861

Sampling Point: 578 Edwards 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**150**	ug/L	---	11/18/20 14:19	4775356
7439-92-1	Lead	200.8	15 !	1.0	**6.6**	ug/L	---	11/18/20 14:19	4775356

LABORATORY REPORT

Sampling Point: 1191 Pavone 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.2**	ug/L	---	11/18/20 14:22	4775357
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 14:22	4775357

Sampling Point: 1191 Pavone 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.1**	ug/L	---	11/18/20 14:24	4775358
7439-92-1	Lead	200.8	15 !	1.0	**1.6**	ug/L	---	11/18/20 14:24	4775358

you have any questions concerning this report, please do not hesitate to call us at
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Sampling Point: 285 Hasting 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**7.2**	ug/L	---	11/18/20 14:27	4775359
7439-92-1	Lead	200.8	15 !	1.0	**1.6**	ug/L	---	11/18/20 14:27	4775359

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Sampling Point: 285 Hasting 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.6**	ug/L	---	11/18/20 14:29	4775360
7439-92-1	Lead	200.8	15 !	1.0	**1.3**	ug/L	---	11/18/20 14:29	4775360

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Report #: 503861

Sampling Point: 768 Broadway 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.2**	ug/L	---	11/18/20 14:37	4775361
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 14:37	4775361

LABORATORY REPORT

Sampling Point: 768 Broadway 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.1**	ug/L	---	11/18/20 14:39	4775362
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 14:39	4775362

Sampling Point: 1225 Colfax 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.9**	ug/L	---	11/18/20 14:41	4775363
7439-92-1	Lead	200.8	15 !	1.0	**4.5**	ug/L	---	11/18/20 14:41	4775363

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: 1225 Colfax 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	< 1.0	ug/L	---	11/18/20 14:49	4775364
7439-92-1	Lead	200.8	15 !	1.0	**3.2**	ug/L	---	11/18/20 14:49	4775364

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Sampling Point: 1115 Superior 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**51**	ug/L	---	11/18/20 14:51	4775365
7439-92-1	Lead	200.8	15 !	1.0	**3.6**	ug/L	---	11/18/20 14:51	4775365

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Report #: 503861

Sampling Point: 1115 Superior 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**54**	ug/L	---	11/18/20 14:54	4775366
7439-92-1	Lead	200.8	15 !	1.0	**3.9**	ug/L	---	11/18/20 14:54	4775366

LABORATORY REPORT

Sampling Point: 1026 Bishop 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**45**	ug/L	---	11/18/20 14:56	4775367
7439-92-1	Lead	200.8	15 !	1.0	**5.5**	ug/L	---	11/18/20 14:56	4775367

Sampling Point: 1026 Bishop 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.7**	ug/L	---	11/18/20 14:59	4775368
7439-92-1	Lead	200.8	15 !	1.0	**4.4**	ug/L	---	11/18/20 14:59	4775368

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: 141 Winah 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.4**	ug/L	---	11/18/20 15:01	4775369
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 15:01	4775369

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Sampling Point: 141 Winah 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.5**	ug/L	---	11/18/20 15:03	4775370
7439-92-1	Lead	200.8	15 !	1.0	**1.3**	ug/L	---	11/18/20 15:03	4775370

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Sampling Point: 1112 Agard 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**8.2**	ug/L	---	11/18/20 15:16	4775371
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 15:16	4775371

LABORATORY REPORT

Sampling Point: 1112 Agard 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.6**	ug/L	---	11/18/20 15:18	4775372
7439-92-1	Lead	200.8	15 !	1.0	**1.1**	ug/L	---	11/18/20 15:18	4775372

Sampling Point: 1069 Hurd 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**25**	ug/L	---	11/18/20 15:21	4775373
7439-92-1	Lead	200.8	15 !	1.0	**2.9**	ug/L	---	11/18/20 15:21	4775373

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Sampling Point: 1069 Hurd 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**1.5**	ug/L	---	11/18/20 15:28	4775374
7439-92-1	Lead	200.8	15 !	1.0	**3.7**	ug/L	---	11/18/20 15:28	4775374

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Sampling Point: 819 Vineyard 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**4.8**	ug/L	---	11/18/20 15:30	4775375
7439-92-1	Lead	200.8	15 !	1.0	**1.2**	ug/L	---	11/18/20 15:30	4775375

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Report #: 503861

Sampling Point: 819 Vineyard 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**2.4**	ug/L	---	11/18/20 15:33	4775376
7439-92-1	Lead	200.8	15 !	1.0	**2.4**	ug/L	---	11/18/20 15:33	4775376

LABORATORY REPORT

Sampling Point: 1020 Bishop 1st PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**14**	ug/L	---	11/18/20 15:35	4775377
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 15:35	4775377

Sampling Point: 1020 Bishop 5th PWS ID: MI0000600

Lead and Copper									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	EEA ID #
7440-50-8	Copper	200.8	1300 !	1.0	**5.8**	ug/L	---	11/18/20 15:38	4775378
7439-92-1	Lead	200.8	15 !	1.0	< 1.0	ug/L	---	11/18/20 15:38	4775378

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

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Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

LABORATORY REPORT

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

If applicable, the calculation of the matrix spike (MS) or matrix spike duplicate (MSD) percent recovery is as follows: (MS or MSD value - Sample value) * 100 / spike target / dilution factor = **Recovery %**

you have any questions concerning this report, please do not hesitate to call us at
00) 332-4345 or (574) 233-4777

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

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Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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South Bend, IN 46617
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F: 1.574.233.8207

11/13/2020 411514

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LABORATORY REPORT

REPORT TO: Rob Jones F+V

BILL TO: rjones@FV-operations.com Benton Harbor

SAMPLER (Signature): Resident

COMPLIANCE MONITORING: Yes X / No

PWS ID #: 0600

POPULATION SERVED: 9160

STATE (sample origin): MI

SOURCE WATER: LAKE michigan

PROJECT NAME:

PO#:

Preservative Checks

LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	pH acceptable? √	Residual Chlorine (P/A)	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1 4775351	11/9/20	6:00		X	1248 Broadway	1ST liter Lead/copper			✓			DW	
2 352	11/9/20	6:00		X	1248 Broadway	5th liter lead/copper			✓			"	
353	11/9/20	8:00		X	885 mineral	1st liter lead/copper			✓			"	
354	11/9/20	8:00		X	885 mineral	5th liter lead/copper			✓			"	
355	11/9/20	8:45		X	578 Edwards	1st liter lead/copper			✓			"	
356	11/9/20	8:45		X	578 Edwards	5th liter lead/copper			✓			"	
357	11/10/20	8:30	X		1191 PAVONE	1ST liter lead/copper			✓			"	
358	11/10/20	8:30	X		1191 PAVONE	5th liter lead copper			✓			"	
359	11/10/20	6:30	X		285 HASTING	1st liter lead/copper			✓			"	
360	11/10/20	6:30	X		285 HASTING	5th liter lead/copper			✓			"	
361	11/10/20	9:00	X		768 Broadway	1ST liter lead/copper			✓				
362	11/10/20	9:00	X		765 Broadway	5th liter lead/copper			✓				
363	11/9/20	6:00		X	1225 colfax	1st liter lead/copper			✓				
14 364	11/9/20	6:00		X	1225 Colfax	5th liter lead/copper			✓				

Page 1 of 7

RELINQUISHED BY:(Signature) — DATE 11/12/20 — TIME 12:45pm AM PM — RECEIVED BY:(Signature) — DATE — TIME AM PM

RELINQUISHED BY:(Signature) — DATE — TIME AM PM — RECEIVED BY:(Signature) — DATE — TIME AM PM

RELINQUISHED BY:(Signature) — DATE — TIME AM PM — RECEIVED FOR LABORATORY BY: Peggy Pehlig Wright — DATE 11-13-2020 — TIME 1245 AM PM

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one): ___ Iced: Wet/Blue ___ Ambient ___ °C Upon Receipt___ N/A

MATRIX CODES:
DW-DRINKING WATER RW-REAGENT WATER GW-GROUND WATER EW-EXPOSURE WATER SW-SURFACE WATER PW-POOL WATER WW-WASTE WATER

TURNAROUND TIME (TAT) - SURCHARGES
SW = Standard Written: (15 working days) 0% RV* = Rush Verbal: (5 working days)
50% RW* = Rush Written: (5 working days) 75%
* Please call, expedited service not available for all testing

IV* = Immediate Verbal: (3 working days) 100%
=Immediate Written: (3 working days) 125%
Weekend, Holiday CALL
STAT* = Less than 24 hours CALL

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

ple analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by [illegible] mer are deemed material alterations and are rejected unless expressly agreed to in writing by

you have any questions concerning this report, please do not hesitate to call us at 00) 332-4345 or (574) 233-4777

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REPORT TO:

BILL TO:

SAMPLER (Signature)

COMPLIANCE MONITORING — Yes / No

PWS ID #

STATE (sample origin)

POPULATION SERVED

SOURCE WATER

PROJECT NAME

PO#

Preservative Checks

	LAB Number	COLLECTION DATE	TIME	AM	PM	SAMPLING SITE	TEST NAME	pH accep-table? √	Residual Chlorine (P/A)	CHLORINATED YES	CHLORINATED NO	# OF CONTAINERS	MATRIX CODE	TURNAROUND TIME
1	4775365	11/15/20	6:00	X		1115 Superior	1st liter lead/copper			✓				
2	366	11/5/20	6:00	X		1115 Superior	5th liter lead/copper			✓				
	367	11/9/20	930		X	1026 Bishop	1st liter lead/copper			✓				
	368	11/9/20	930		X	1026 Bishop	5th liter lead/copper			✓				
	369	11/9/20	750	X		141 Winan	1st liter lead copper			✓				
	370	11/9/20	750	X		141 Winan	5th liter lead copper			✓				
	371	11/10/20	700	X		1112 Agard	1st liter lead copper			✓				
	372	11/10/20	700	X		1112 Agard	5th liter lead copper			✓				
	373	11/10/20	800	X		1069 Hurd	1st liter lead/copper			✓				
	374	11/10/20	800	X		1069 Hurd	5th liter lead copper			✓				
	375	11/10/20	600	X		819 Vineyard	1st liter lead copper			✓				
	376	11/10/20	600	X		819 Vineyard	5th liter lead copper			✓				
	377	11/10/20	900	X		1020 Bishop	1st liter lead copper			✓				
14	378	11/10/20	900	X		1020 Bishop	5th liter lead copper			✓				

RELINQUISHED BY:(Signature)	DATE	TIME AM PM	RECEIVED BY:(Signature)	DATE	TIME AM PM
			RECEIVED FOR LABORATORY BY: Penny Pehlig Wright	11-13-2020	1245

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT

LAB COMMENTS

CONDITIONS UPON RECEIPT (check one): ___ Iced: Wet/Blue ✓ Ambient ___ °C Upon Receipt ___ N/A

MATRIX CODES:

DW-DRINKING WATER RW-REAGENT WATER GW-GROUND WATER EW-EXPOSURE WATER SW-SURFACE WATER PW-POOL WATER WW-WASTE WATER

TURNAROUND TIME (TAT) - SURCHARGES

SW = Standard Written: (15 working days) 0% RV* = Rush Verbal: (5 working days)
50% RW* = Rush Written: (5 working days) 75%
* Please call, expedited service not available for all testing

IV* = Immediate Verbal: (3 working days) IW* = Immediate Written: (3 working days) 50* = Weekend, Holiday 100% 125% CALL
STAT* = Less than 48 hours CALL

Samples received unannounced with less than 48 hours holding time remaining may be subject to additional charges.

06-LO-F0435 Issue 8.0 Effective Date: 2020-05-15

...nple analysis will be provided according to the standard EEA/Water Services Terms, which are available upon request. Any other terms proposed by Customer are deemed material alterations and are rejected unless expressly agreed to in writing by ...

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From:	Bolt, Jennifer (EGLE)
To:	Oswald, Eric (EGLE); Krisztian, George (EGLE); Thurston, Brian (EGLE); Philip, Kris (EGLE); Onan, Brandon (EGLE); Crider, Steven (DHHS); Che, Xun (DHHS-Contractor)
Cc:	McClellan, Michael (EGLE); Dean, Scott (EGLE); Boeskool, Travis (EGLE); Eickholt, Jay (EGLE); Gohlke, Holly (EGLE); Padden, James (MDARD); Dunleavy, Sean (MDARD); Singh, Anita (EGLE); Sasy, Ninah (EGLE); Nshimyimana, Jean Pierre (DHHS)
Subject:	FW: Lead Action Level Exceedance - City of Benton Harbor
Date:	Wednesday, July 15, 2020 5:19:19 PM
Attachments:	Public Advisory Distribution Checklist.docx PE Certificate -DRAFT 5 8 2019 NON-FACILITY 2.docx LCR_WQP_Report_Without_CCT_657149_7 (5).docx deq-dwmad-cw-tsu-LCR_Sample_Site_Selection_Criteria_643514_7.pdf 00600_BentonHarbor_LCR_ALELetter_2020-1_FINALIZED.pdf

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Lead Action Level exceedance for the city of Benton Harbor. Benton Harbor is a municipal drinking water system that serves a population of 9,970 in Berrien County.
This community had a lead Action Level exceedance in 2019. This is the next set of data from this community collected between January 1 and June 30, 2020.
This community does have lead service lines. They collected samples from 60 sites. Nine had elevated lead levels. This community would had a lead Action Level exceedance regardless of the $1^{st}/5^{th}$ liter sampling methodology. The 90th percentile calculation with the $1^{st}/5^{th}$ liter data is 23 parts per billion (ppb). The 90th percentile with only the 1st liter data is 20 ppb.
Benton Harbor is currently working on their Public Advisory document. A final copy will be forwarded once it is available.
Please let me know if you have any questions.

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

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From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, July 15, 2020 3:52 PM
To: emitchell@bhcity.us; Mike O'Malley <momalley@bhcity.us>; Darold Harlan <dharlan@fv-operations.com>; drice@bhcity.us
Cc: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Vincent, Courtney (EGLE) <VincentC4@michigan.gov>; EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>; nbritten@bchdmi.org; nmargaritis@bchdmi.org; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>
Subject: Lead Action Level Exceedance - City of Benton Harbor

Dear Mr. Ellis Mitchell,
Please see attached for the standard letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead and Copper Monitoring –

Lead Action Level Exceedance letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures. A hard copy of this letter will be sent to you via U.S. Mail.

Templates for the Public Advisory and Public Education documents have already been provided to you under separate cover.

If you have any questions regarding this correspondence, please contact myself or Jeni Bolt.

Thank you,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes,
and Energy
517-331-5161 | boltj@Michigan.gov
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Summary of Public Advisory (PA) Requirements and Distribution Checklist

For Community Water Supplies that Exceed the Lead Action Level

A Public Advisory (PA) must be issued within three business days after the Department of Environmental Quality (DEQ) notifies a water supply that an exceedance of the lead action level has occurred, per the Michigan Safe Drinking Water Act, 1976 PA 399, as amended.

To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation to the DEQ along with a sample copy of the PA that was issued.

Start Here (indicate one or more of the following activities)

1. Issue the PA using appropriate broadcast media, such as radio and television.
   Please list media outlets and date of broadcast: _____

2. Post the PA in conspicuous locations throughout the area served by the public water supply.
   Locations posted and date of posting: _____

3. Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage.
   Date delivered: _____

4. Use a communication method other than one listed, as approved in writing by the DEQ.
   Date delivered: _____

I affirm that the Public Advisory has been issued. I am enclosing a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

Send this checklist to the appropriate DEQ district office at http://michigan.gov/deq. Click Contacts, click on Environmental Contacts, click on District.

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

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☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

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WATER QUALITY PARAMETER DATA (when applicable):

System Name:_____ WSSN:_____

	Sample Location	Date	pH	Alk. (mg/L)	Ca as $CaCO_3$ (mg/L)	Cond. (umhos)	Temp (ºC)	Inhibitor (mg/L) ☐ Orthophosphate (PO_4) ☐ Silica (Si)	Chloride (mg/L)	Sulfate (mg/L)
Entry Point to the Distribution System (Plant Tap)										
Distribution System										

INSTRUCTIONS:

WATER QUALITY PARAMETER SAMPLING LOCATIONS:

- Point-of-entry sampling locations: Each point-of-entry location is a required sampling point for WQPs. Exceptions can be made for wells that are offline or standby, or consecutive connections without additional treatment. Review your supply's monitoring schedule for specific requirements.
- Distribution sampling locations: Distribution sampling locations should be representative locations throughout the distribution system. Established bacteriological sampling locations can be used for WQP sampling.

WATER QUALITY PARAMETER SAMPLING:

Sampling procedure: WQP sampling requirements are a combination of analytes and test codes. Double check your monitoring schedule and check with your certified lab to make sure you have the correct bottle types, number of bottles, or appropriate field test kits to have your water analyzed for all required WQP analytes.

Note: Unlike lead and copper sampling, WQP sampling does not need to be within a home, does not require a stagnation period and does not need to be a first draw sample.

EGLE Laboratory test codes for WQP samples:

Test Description	Analytes	Fee	Unit Number	Test Code	Hold Time	Thermal Preservation
Automated Partial Chemistry	Chloride and Sulfate	$18	32,33	R	48 hours	Yes
Corrosion	Conductivity, Alkalinity, Orthophosphate, and Calcium	$51	33	CORR	48 hours	Yes
Field tests (at the time of sample collection)	pH, Temperature	N/A	N/A	N/A	N/A	N/A

WATER QUALTIY PARAMETER REPORTING:

Enter the water supply name, WSSN and corresponding related information from the water quality parameter monitoring carried out, if applicable. Indicate the street address of the sampling point (and the site code for entry point sampling points), date of sample collection and the results of chemical analyses. Dosages for corrosion control inhibitors (orthophosphate, silicates and alkalinity) must be reported on your Monthly Operational Report (MOR), due to your local district office on the 10th of the following month. Note: alkalinity and calcium analyses should be reported as mg/l as CaCO3; conductivity should be reported in umhos; temperature in degrees Celsius; and where applicable, phosphate as PO_4 and Silica a Si.

Michigan Lead and Copper Rules
Lead and Copper Sample Site Selection Criteria
(per June 2018 rule revisions)

Community water supplies must identify a pool of lead and copper sampling sites containing AT LEAST the number of sites necessary to conduct standard sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites unless**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used unless
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES – Single family residences with either:

- Lead service lines (LSL)*****
- Interior lead plumbing

Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.

TIER 2 SITES – Other buildings or multiple family residences with either:

- Lead service lines*****
- Interior lead plumbing

TIER 3 SITES – Single family residences with:

- Copper plumbing with lead solder installed before July 1988

OTHER SITES

- Sites representative of plumbing materials commonly found throughout the water supply

*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the same sampling sites. If an original sampling site is not available, collect a tap sample from another site meeting the same tier criteria as the original site and document the reason for the change.
- **DO NOT** sample from outside hose spigots or utility sinks. For residential sites, samples MUST BE collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples MUST BE collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as a water softener.

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 15, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The Benton Harbor community water supply's 90th percentile value exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from January 1, 2020, through June 30, 2020, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	23	9	0 - 440 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.0	0	0 – 0.2 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. A template has already been provided to you. Please contact EGLE if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit Michigan.gov/LCR.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system.

The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Reduce Corrosion Rates
Minimize lead in the drinking water by reducing corrosion of water pipes and household plumbing that contain lead. This is Benton Harbor's fourth AL exceedance. Benton Harbor has made corrective actions to the corrosion control treatment system per EGLE's direction in a letter dated February 13, 2020. EGLE anticipates this change having a positive impact on the distribution system's corrosion rates and will assess the effectiveness of the current corrosion control treatment based on sequential sampling at homes in the distribution system, corrosion control study results, and future rounds of compliance sampling.

Lead and Copper Monitoring
To show the ALs can be met, continue collecting lead and copper samples from 60 sites between July 1 and December 31, 2020, and again between January 1 and June 30, 2021.

If you need to select new sites, choose the highest Tier sites available within the distribution system, giving Tier 1 sites first priority. Document any changes on your Lead and Copper Sampling Site Plan and submit it to your local district office email address. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of results, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2021. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?

If you can show that both lead and copper ALs are met in two consecutive six-month periods then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks	Collect WQP samples.	Collect one set of WQP samples every two weeks from the entry point to the distribution system for pH, temperature, alkalinity, calcium, conductivity, orthophosphate, chloride, and sulfate.
August 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in the enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required whenever PE required.
Between July 1 and December 31, 2020	Collect samples 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples.	Collect WQP samples from ten locations in the distribution system quarterly.
September 30, 2020	For the January through June 2020 monitoring, send EGLE certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2021	Collect samples 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2021.**
Between January 1 and June 30, 2021	Collect WQP samples.	Collect WQP samples from ten locations in the distribution system quarterly.

Complete By	Requirement	Comments
March 31, 2021	For the July through December 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
July 1, 2021	Report the 2020 AL exceedance in the CCR.	Specific lead health effects language must be included.
September 28, 2021	For the January through June 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from each entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Distribution Checklist, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Lead PIlot Grant - Request #2 City of Benton Harbor
Date:	Monday, June 14, 2021 10:28:00 PM
Attachments:	Lead Pilot Grant-draw 2 submitted.pdf image002.png
Importance:	High

BH email

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, May 4, 2020 12:40 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; emitchell <emitchell@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: Lead PIlot Grant - Request #2 City of Benton Harbor
Importance: High

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Good Morning Clarence – Hope all is well with you! Attached is the Request for Disbursement #2 for the Lead Pilot Grant for the City of Benton Harbor. Included is the signed Request Form, a summary of expenses for Draw #2 and the project to-date, individual invoices paid that are part of the Request #2. Please let us know if there is any additional information that you need.

Take care and be safe!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION
REVOLVING LOAN SECTION

PILOT DRINKING WATER COMMUNITY WATER SUPPLY GRANT PROGRAM
REQUEST FOR DISBURSEMENT OF FUNDS

THIS INFORMATION IS REQUIRED UNDER AUTHORITY OF PA 201 of 2017.

DOCUMENTATION TO SUPPORT THE INCURRED COSTS MUST BE INCLUDED WITH EACH REQUEST
PLEASE SEE OTHER SIDE FOR INSTRUCTIONS TO COMPLETE REQUEST

A. Project #	B. Request #	C. Period Covered by Request	D. Request Type	E. Grantee's EIN	F. Grant Amount
1901-01 1	2	6-14-2019 (M/D/Y) to 12-31-2019 (M/D/Y)	☐ partial ☒ final	38-6004537	$284,000

G. Grantee Name: City of Benton Harbor	Phone #: 269-927-8457
Address: 200 E. Wall Street , Benton Harbor, MI 49022	Email: emitchell@cityofbentonharbormi.gov
H. Grantee's Bank Name: Fifth Third	Phone #
Address: 1295 East Napier, Benton Harbor, MI 49022	
Account Name: City of Benton Harbor - Utility Services	ABA #: 072400052 / Account #: 7161395665
Special Instructions:	

I. Budget Items (Include Eligible Costs Only Using Dollars and Cents)	Requested Incurred Costs This Period	Cumulative Costs Incurred To Date
1. PLANNING COSTS – DISTRIBUTION SYSTEM MATERIAL INVENTORY	$ 0	$ 35,260
2. DRINKING WATER ASSET MANAGEMENT PLAN COSTS	$ 0	$ 30,000
3. LEAD AND GALVANIZED SERVICE LINE CONSTRUCTION COSTS	$ 55,029	$ 218,740
4. TOTAL CUMULATIVE AMOUNT FOR PERIOD COVERED BY THIS REQUEST (add totals in 1st column)	$ 55,029	
5. TOTAL CUMULATIVE ELIGIBLE COSTS INCURRED TO DATE (add totals in 2nd column)		$ 284,000
6. LESS AMOUNT PREVIOUSLY DISBURSED		($ 228,971)
7. AMOUNT REQUESTED FOR DISBURSEMENT		$ 55,029

J. For each request, describe the scope of work completed to date. Attach separate sheet if more space is needed. Discuss the progress made on the services not yet complete and a schedule for their completion by the grant period end date. The incurred grant expense cannot exceed one (1) year from your grant agreement date.

Request is for reimbursement for retainage released to B&Z and Meeks for construction contracts for service verifications. Also included replacement of 6 additional lead service replacements and purchase of equipment from McCrometer.

I certify that I am an authorized representative of the grantee and am authorized to make the following certifications on behalf of the grantee: (i) there is no pending litigation or event which will materially and adversely affect the project or the prospects for its completion; (ii) the representations, warranties and covenants contained in the grant agreement for the obligations pursuant to which this request for disbursement is submitted continue to be true and accurate in all material respects as of the date hereof; (iii) to the best of my knowledge and belief, the costs above were incurred in accordance with the terms of the grant agreement and the application for assistance for this project; and (iv) the amount requested for disbursement has not previously been requested.

Authorized Representative Name (Print or Type): Ellis Mitchell **Title:** City Manager

Authorized Representative Signature (Original): Ellis E. Mitchell **Date:** 5-4-2020

EMAIL THIS COMPLETED REQUEST TO YOUR DEQ PROJECT MANAGER OR MAIL TO THE ADDRESS SHOWN ON THE REVERSE SIDE

(3/2018)

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01 - DRAW 2 REQUEST
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOIC DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
DRAW 1										
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	35,260.46	30,000.00	10,000.00		75,260.46
										-
B&Z-CONTRACT	HRU 12/31/18	2/14/19	70292	181239	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			9,000.00		9,000.00
	THRU 1/31/19	2/14/19	70292	190149/50/51	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			19,237.50		19,237.50
	THRU 2/28/19	3/14/19	70478	190256/57/58/59	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			21,060.00		21,060.00
	THRU 4/26/2019	5/23/19	70855	190437	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			5,895.00		5,895.00
					TOTAL B&Z CONTRACT	-	-	55,192.50	-	55,192.50
MEEKS-CONTRACT	HRU 12/31/18	2/13/19	70285	2116	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			5,265.00		5,265.00
	THRU 1/31/19	2/13/19	70285	2128	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			9,369.90		9,369.90
	THRU 2/28/19	3/28/19	70577	2131/2137/2138/2139	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			33,165.00		33,165.00
	THRU 3/31/19	4/11/19	70641	2143	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			9,000.10		9,000.10
	THRU 5/9/19	5/30/19	70902	2150/2151/PART RETAIN	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5			16,162.20		16,162.20
					TOTAL MEEKS CONTRACT	-	-	72,962.20	-	72,962.20
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	11,646.00	13,909.34	25,555.34
TOTAL DRAW 1						35,260.46	30,000.00	149,800.70	13,909.34	228,970.50
DRAW 2										
B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	LEAD SERVICE LINE CONSTRUCTION			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	INSTALL & TEST INSERTION MAGNETIC FLOW METER			1,550.00		1,550.00
MCCROMETER	6/20/2019	10/10/2019	71721	526233RI	FULL PRO INSPECTION MAG			13,919.54		13,919.54
MEEKS	8/19/2019	8/22/2019	71457	2173	LEAD SERVICE LINE REPLACEMENT-179 GARFIELD			5,750.00		5,750.00
MEEKS	9/11/2019	9/26/2019	71604	2176	LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP			2,600.00		2,600.00
MEEKS	9/11/2019	9/26/2019	71604	2176	LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP			2,600.00		2,600.00
MEEKS	10/25/2019	11/14/2019	71970	2186	LEAD SERVICE LINE REPLACEMENT- 1110 MILTON TO CURB STOP			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER			3,740.00		3,740.00
MEEKS	12/9/2019	1/3/2020	72215	2196	LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA			2,470.82		2,470.82
										-
					LESS AMOUNT IN EXCESS OF GRANT			(451.96)		(451.96)
TOTAL DRAW 2						-	-	55,029.50	-	55,029.50
TOTAL SPENDING THROUGH 12-31-2019						35,260.46	30,000.00	204,830.20	13,909.34	284,000.00
AMOUNT PER GRANT						35,000.00	30,000.00	199,000.00	20,000.00	284,000.00
REMAINING GRANT FUNDS						(260.46)	-	(5,830.20)	6,090.66	-

ABONMARCHE

Engineering • Architecture • Land Surveying

May 2, 2019

PAYMENT REQUEST NO. 5 - FINAL
For Retainage

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	51,325.00
Current Contract Amount	$	61,325.00
Work Completed	$	61,325.00
Retainage (10%)	$	0.00
Amount Earned	$	55,192.50
Less Previous Payments	$	55,192.50
Amount Due Contractor This Payment	$	6,132.50

541-000-212.000

RECOMMENDED BY: Contractor

Bruce Bingee

Bruce Binger (B & Z)

5-8-2019
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/8/19
Date

ACCEPTED BY: Owner

Darwin Watson

Darwin Watson (Benton Harbor)

5/14/19
Date

ABONMARCHE

Engineering • Architecture • Land Surveying

May 20, 2019

PAYMENT REQUEST NO. 6 & FINAL
For Work Completed Through 05/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$ 6,500.00
Change Orders (#1 - #3)	$ 69,462.20
Current Contract Amount	$ 75,962.20
Work Completed	$ 75,962.20
Retainage	$ -
Amount Earned	$ 75,962.20
Less Previous Payments (PR#1 - #5)	$ 72,962.20
Amount Due Contractor This Payment	$ 3,000.00

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — 5-20-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 5/21/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 5/21/19 Date

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 127669
09/10/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 8/31/19, including construction administration, and obtaining contractor quotes for remaining lead service work.

	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$35,260.46	$0.00	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$30,000.00	$0.00	$0.00
103 Lead Service Line Construction	$15,258.60	$10,000.00	$5,258.60	$0.00
Totals:	$80,519.06	$75,260.46	$5,258.60	$0.00

Invoice Amount **$5,258.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

OUDBIER INSTRUMENT CO.
4136 Ranchero Dr
Dorr MI 49323
(269) 792-4404

Invoice

DATE	INVOICE #
7/15/2019	9204

BILL TO
Benton Harbor Water Billing 200 East Wall St. Benton Harbor MI 49022

P.O. NO.	TERMS	PROJECT
5331419	Net 30	

QUANTITY	DESCRIPTION	RATE	AMOUNT
1.5	Install, wire and test operation of the new insertion magnetic flow meter.	900.00	1,350.00
1	General Hardware, Nuts, Bolts, Conduit fittings and Wire	200.00	200.00
		Total	$1,550.00

McCROMETER

3255 West Stetson Avenue • Hemet, CA 92545-7763 USA
Tel: 951 652-6811 • Fax: 951 652-3078 • payments@mccrometer.com

Page Number -	1
Date -	06/20/19
Customer -	46261
Brn/Plt -	MCI000
Related Ord -	760725
Order Nbr -	326136 SO
Invoice -	626233 RI

SALES INVOICE

571-977-800 (or Equip)
591.~~570.930~~
Charge to MDEQ
Pilot Grant

Sold To: CITY OF BENTON HARBOR
200 E WALL STREET
BENTON HARBOR MI 49022

Ship To: BENTON HARBOR WATER PLANT
601 RIDGEWAY
ATTN: MIKE O'MALLEY - SUPERINTENDENT
CELL 269-363-0575
ST JOSEPH MI 49085

Metering required as part of the MDEQ Corrosion Control system design

Tax ID: 386004537
Tax Cert: MI

002 / 077 / 273

REP: 21763 MIDWEST MUNICIPAL INSTRUMENTAT
RSN:

Request Date	Customer P.O.		Ship : FEDEX FRT/PPC
06/18/19	S332693	EXW Seller's Premises	Inst : 06/19/19

Ln/Rq Dt	Description	Item Number	UM	Ship/Back/Cance	Price	Extended Price	Tax
	Please Note, -All McCrometer facilities will be closed on Thursday July 4th, 2019 in observance of Independence Day. Normal business hours will resume on Friday July 5th, 2019. SN/MARIAV						
1.000	FULL PRO INSERTION (FPI) MAG 395LC MI19-0280 & E19-02960		EA S	1	13,694.4467 Per EA	13,694.45	Y
	Total Sensor Length in Inches: 44 Total Cable Length in Feet: 40 Pipe ID: 28.75 Pipe OD: - Totalizer Unit: 1000 GAL Indicator Unit: 2800 GPM MIN Flow: 0 /AVG Flow: 2000 GPM /MAX Flow: 2800 GPM MAX Pressure PSI: 8 4-20ma=: 2800 GPM Cable Connection Type: Quick-Connect Electrode Type: 316 Stainless Steel Ball Valve Type: Stainless Steel Conductivity: Standard Conductivity Converter: M-Series,AC,CSA Hardware Size Requirement: 2"NPT, 1.25, Heavy, 3/8 TAG: HS SUNCTION LINE						
2.000	Shipping & Handling/NonTaxable 4195148366		EA		225.0900	225.09	N

took a very long time to get this invoice?

Item recieved & installed Earlier this year, June 2019

Okay to pay 10/4/19

$13,919.54

Item 13694.45
ship 225.09
Inv $ ~~[illegible]~~ 13,919.54

Terms	Net 30 Days from Invoice	Net Due Date 07/20/19	Tax Rt	Sales Tax	~~Total Order~~ 13,919.54

This is funny, just recieved Inv

MCCROMETER'S TERMS AND CONDITIONS APPLY UNLESS OTHERWISE STATED IN WRITING BETWEEN THE PARTIES; MCCROMETER'S TERMS AND CONDITIONS CAN BE VIEWED AT THE FOLLOWING URL: WWW.MCCROMETER.COM/TERMS_AND_CONDITIONS.PDF
REMIT TO: McCrometer, Inc. • 96894 Collections Center Drive • Chicago, IL 60693-0329 USA
INTERNATIONAL WIRE TRANSFERS: Bank of America • 231 South LaSalle Street • Chicago, IL 60697 USA
A.B.A. No. 026009593 Swift: BOFAUS3N Acct# 87655-61569

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
8/19/2019	2173

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Full lead service line replacement from the main to the meter		
1	179 Garfield	5,000.00	5,000.00
15	Site restoration pouring road patch topsoil placement. labor hours	50.00	750.00
		Total	$5,750.00

Req ∫332926
8/20/19
#5,750.00

A good price considering the road had to be open cut & restored w/ concrete surface

FYI LSLR cost around #5,000 to 9,000 each house

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
9/11/2019	2176

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Stop service leak and the replacement of Service Line from Main to curb stop at 1063 Superior.	2,600.00	2,600.00
1	Stop Service leak and the replacement of Service line from Main the Curb stop at 711 Buss	2,600.00	2,600.00
1	Repair of Hydrant located on the corner of McAlister and Harrison	450.00	450.00
1	Repair and investigation of service leak located at 1283 Ogden	450.00	450.00
1	Repair of Manhole in the intersection of Lake and Ohio Include concrete patch	975.00	975.00

Leg $ [illegible]
9/11/19
Lead service leak
Partial copper replacement
#2,600.00

	Total	$7,075.00

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
10/25/2019	2186

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
S04675	Due on receipt	

Quantity	Description	Rate	Amount
1	Total Line replacement 1110 Milton Ave	5,000.00	5,000.00
-1	3/4" K Copper Credit	280.00	-280.00

591-571-977.300
MDEQ

Total $4,720.00

ks Contracting Services LLC
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
12/11/2019	2197

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	This Invoice is for 1063 Superior Water line from curb stop to meter Waterline installation	3,740.00	3,740.00

1063 Superior
Lead Service Line Replacement
City supply Copper, curb stop box & valve box
Req. 504252
$3,740.00
Okay to Pay

Total $3,740.00

Invoice

...s Contracting Services LLC
...271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
12/9/2019	2196

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

HAS Not Been Paid.

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	This Invoice is for 711 Buss Water line from curb stop to meter Waterline installation	3,740.00	3,740.00

LSL Replacement
full
711 Buss

Eligible for Grant

Req. 504300
12.30.19

MEEQ

Total	$3,740.00

Invoice

Meeks Contracting Services LLC
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
11/25/2019	2193

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	This invoice is for the repair of a leaking service line located at 876 Wauceda.		
	Replaced old shut off and replace 2' of customers line	125.00	875.00
	extra labor cost billed for stopping leak to repair line	50.00	1,400.00
7	Mini Excavator	98.00	98.00
28	4 Labors	97.82	97.82
1	Pump rental		
1	Parts		

Total $2,470.82

From:	Jones, Clarence (EGLE)
To:	Patton, Karol (EGLE)
Subject:	FW: Lead Pilot Grant Reimbursement Request #1
Date:	Monday, June 14, 2021 10:07:00 PM
Attachments:	Lead Pilot Grant - total draw 1 package to state.pdf image001.png
Importance:	High

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Monday, June 24, 2019 10:31 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Lead Pilot Grant Reimbursement Request #1
Importance: High

Hi Clarence – attached is the Request for Disbursement of Funds and all the related documentation for the costs incurred to date for the City of Benton Harbor. I have also included a summary schedule (2nd page) that lists all the invoices/cleared checks that are included for this Request. Please send me the address that you would like these documents mailed to as I will get them sent via FedEx today. The address on your form is a PO address and FedEx will need a street address to deliver the package.

Thanks for your help!

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, 511 Renaissance Drive Ste. 120, Saint Joseph, MI 49085
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions
Celebrating our 21st year as one of FORTUNE's "100 Best Companies to Work For®"

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION
REVOLVING LOAN SECTION

PILOT DRINKING WATER COMMUNITY WATER SUPPLY GRANT PROGRAM
REQUEST FOR DISBURSEMENT OF FUNDS

THIS INFORMATION IS REQUIRED UNDER AUTHORITY OF PA 201 of 2017.

DOCUMENTATION TO SUPPORT THE INCURRED COSTS MUST BE INCLUDED WITH EACH REQUEST
PLEASE SEE OTHER SIDE FOR INSTRUCTIONS TO COMPLETE REQUEST

A. Project #	B. Request #	C. Period Covered by Request	D. Request Type	E. Grantee's EIN	F. Grant Amount
1901-01	1	7/1/2018 (M/D/Y) to 6/13/2018 (M/D/Y)	☒ partial ☐ final	38-6004537	$284,000

G. Grantee Name:	Phone #
City of Benton Harbor	269-927-8455
Address: 200 East Wall Street, Benton Harbor, MI 49022	**Email:** dwatson@cityofbentonharbormi.gov

H. Grantee's Bank Name:	Phone #
Fifth Third	
Address: 1295 East Napier, Benton Harbor, MI 49022	
Account Name: City of Benton Harbor-Utility Services	**ABA #** 072400052 / **Account #** 7161395665
Special Instructions:	

I. Budget Items (Include Eligible Costs Only Using Dollars and Cents)	Requested Incurred Costs This Period	Cumulative Costs Incurred To Date
1. PLANNING COSTS – DISTRIBUTION SYSTEM MATERIAL INVENTORY	$ 35,260	$ 35,260
2. DRINKING WATER ASSET MANAGEMENT PLAN COSTS	$ 30,000	$ 30,000
3. LEAD AND GALVANIZED SERVICE LINE CONSTRUCTION COSTS/Corrosion Control	$ 163,710	$ 163,710
4. TOTAL CUMULATIVE AMOUNT FOR PERIOD COVERED BY THIS REQUEST (add totals in 1st column)	$ 228,970	
5. TOTAL CUMULATIVE ELIGIBLE COSTS INCURRED TO DATE (add totals in 2nd column)		$ 228,970
6. LESS AMOUNT PREVIOUSLY DISBURSED		($ 0)
7. AMOUNT REQUESTED FOR DISBURSEMENT		$ 228,970

J. For each request, describe the scope of work completed to date. Attach separate sheet if more space is needed. Discuss the progress made on the services not yet complete and a schedule for their completion by the grant period end date. The incurred grant expense cannot exceed one (1) year from your grant agreement date.

Work completed to date includes developing bid packages for Lead Service Replacement and Service verification and inventories, completing construction contracts to replace 17 existing lead services and 94 water service verifications, and work completed in preparation for corrosion control protection at the Water Treatment Plant. Construction contracts with B&Z and Meeks are completed, except for the payment of retainage.

I certify that I am an authorized representative of the grantee and am authorized to make the following certifications on behalf of the grantee: (i) there is no pending litigation or event which will materially and adversely affect the project or the prospects for its completion; (ii) the representations, warranties and covenants contained in the grant agreement for the obligations pursuant to which this request for disbursement is submitted continue to be true and accurate in all material respects as of the date hereof; (iii) to the best of my knowledge and belief, the costs above were incurred in accordance with the terms of the grant agreement and the application for assistance for this project; and (iv) the amount requested for disbursement has not previously been requested.

Authorized Representative Name (Print or Type): Darwin Watson **Title:** City Manager

Authorized Representative Signature (Original): Darwin Watson **Date:** 6/21/2019

EMAIL THIS COMPLETED REQUEST TO YOUR DEQ PROJECT MANAGER OR
MAIL TO THE ADDRESS SHOWN ON THE REVERSE SIDE

(3/2018)

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH JUNE 13, 2019
REQUEST FOR DISBURSEMENT OF FUNDS - #1

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	THRU 12/31/18	2/14/19	70292	181239	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			9,000.00		9,000.00
	THRU 1/31/19	2/14/19	70292	190149/50/51	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			19,237.50		19,237.50
	THRU 2/28/19	3/14/19	70478	190256/57/58/59	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			21,060.00		21,060.00
	THRU 4/26/2019	5/23/19	70855	190437	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			5,895.00		5,895.00
					TOTAL B&Z CONTRACT	-	-	**55,192.50**	-	**55,192.50**
MEEKS-CONTRACT	THRU 12/31/18	2/13/19	70285	2116	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			5,265.00		5,265.00
	THRU 1/31/19	2/13/19	70285	2128	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			9,369.90		9,369.90
	THRU 2/28/19	3/28/19	70577	2131/2137/2138/2139	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			33,165.00		33,165.00
	THRU 3/31/19	4/11/19	70641	2143	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			9,000.10		9,000.10
	THRU 5/9/19	5/30/19	70902	2150/2151/PART RETAINAGE	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5			16,162.20		16,162.20
					TOTAL MEEKS CONTRACT	-	-	**72,962.20**	-	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				$85.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL SPENT THROUGH 6/13/2019						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	-	**49,199.30**	**6,090.66**	**55,029.50**

DWatson 8/8/18

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 122581
07/31/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Christopher J. Cook CJC 591-570-801.000

Professional services through 7/15/18:

Update Atlas - $ 2,478.75
Grant Administration/Project Management/Meetings - $ 2,837.50

Invoice Amount **$5,316.25**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

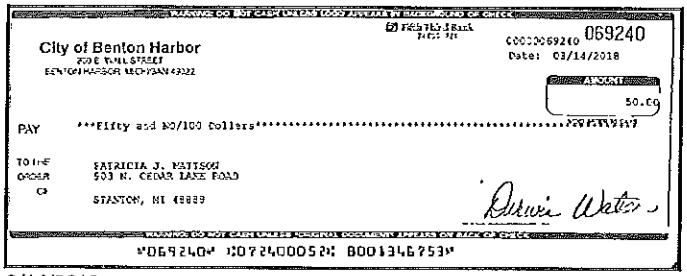
Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

Vendor: 4899 ABONMARCHE CONSULTANTS, INC. Check #: 00000069288 08/23/2018

Date	Invoice	Description/Detail	Amount
07/31/18	122647	CULVERT ASSESSMENT PROGRAM-CITY WIDE	5,189.00
08/13/18	122756	STEVENS ST STORM SEWER IMPROVEMENTS	1,156.25
08/08/18	122718	PIPESTONE/JEFFERSON/BROADWAY TRAFFIC SIG	420.00
08/07/18	122689	18-0200 GENERAL ENGINEERING	3,855.00
08/08/18	122712	18-0972 WATER METERING FOR CITY HALL & P	2,121.25
08/08/18	122711	18-0971 SIDEWALK ASSESSMENT FOR CITY	4,518.75
07/31/18	122581	18-0942 PILOT DRINKING WATER GRANT	5,316.25
07/31/18	122579	18-0200 GENERAL ENGINEERING	2,090.00

Total: 24,666.50

FIFTH THIRD BANK


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069240
Date: 08/14/2018

AMOUNT
50.00

PAY ***Fifty and 00/100 Dollars

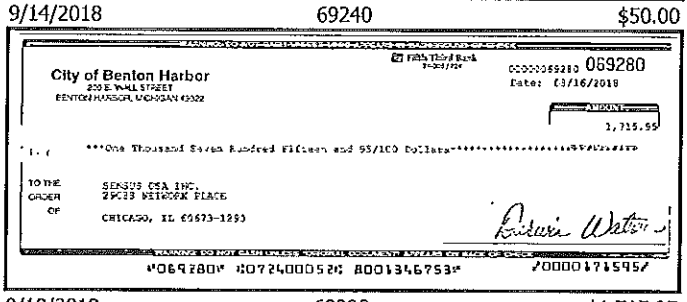
TO THE ORDER OF
PATRICIA J. WATTSON
503 N. CEDAR LAKE ROAD
STANTON, MI 48888

Derwin Watson

⑈069240⑈ ⑆072400052⑆ 8001346753⑈

9/14/2018 69240 $50.00

9/14/2018 69240 $50.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069280
Date: 08/16/2018

AMOUNT
1,715.95

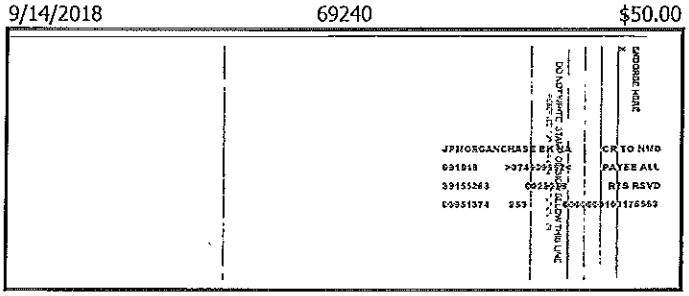
PAY ***One Thousand Seven Hundred Fifteen and 95/100 Dollars

TO THE ORDER OF
SENSUS USA INC.
2525 NETWORK PLACE
CHICAGO, IL 60673-1253

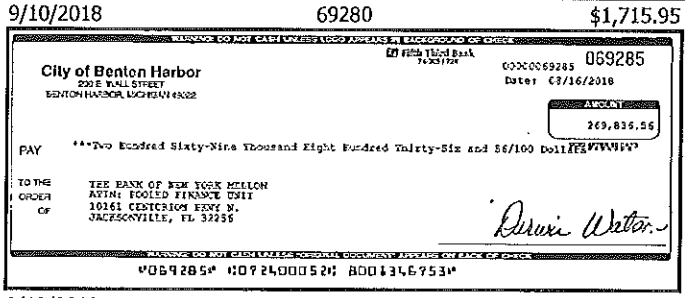
Derwin Watson

⑈069280⑈ ⑆072400052⑆ 8001346753⑈ ⑈0000171595⑈

9/10/2018 69280 $1,715.95


JPMORGANCHASE BK, NA
CR TO NYD
PAYEE ALL
R/S RSVD

9/10/2018 69280 $1,715.95


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069285
Date: 08/16/2018

AMOUNT
269,836.56

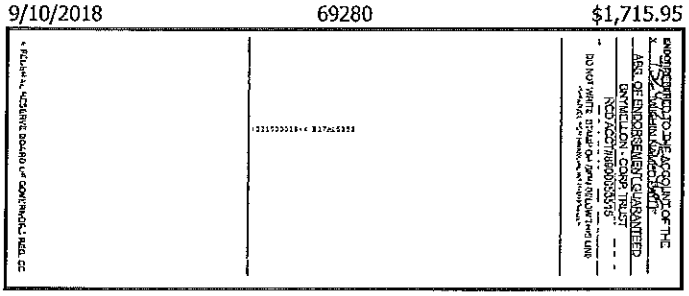
PAY ***Two Hundred Sixty-Nine Thousand Eight Hundred Thirty-Six and 56/100 Dollars

TO THE ORDER OF
THE BANK OF NEW YORK MELLON
ATTN: ESCROW FINANCE UNIT
10161 CENTURION PKWY N.
JACKSONVILLE, FL 32256

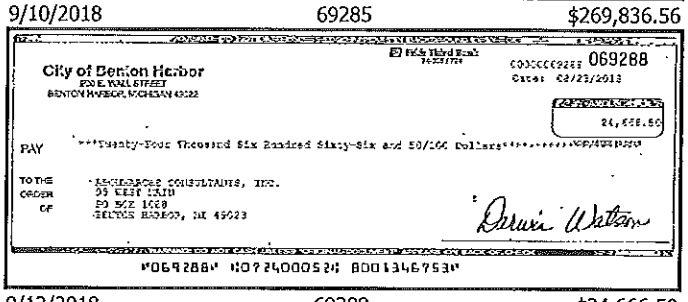
Derwin Watson

⑈069285⑈ ⑆072400052⑆ 8001346753⑈

9/10/2018 69285 $269,836.56


ABA, OR ENDORSEMENT GUARANTEED
BNY MELLON - CORP. TRUST
RCD ACCT/7880035315
DO NOT WRITE, STAMP OR MARK BELOW THIS LINE

9/10/2018 69285 $269,836.56


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069288
Date: 08/23/2018

AMOUNT
24,666.50

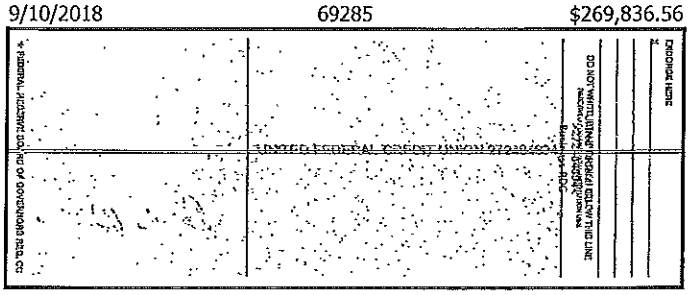
PAY ***Twenty-Four Thousand Six Hundred Sixty-Six and 50/100 Dollars

TO THE ORDER OF
ARCHDEACON CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1020
BELTON HARBOR, MI 49023

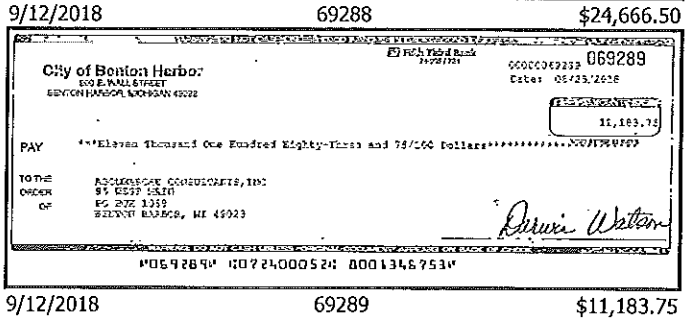
Derwin Watson

⑈069288⑈ ⑆072400052⑆ 8001346753⑈

9/12/2018 69288 $24,666.50


UNITED FEDERAL CREDIT UNION 272210604
DO NOT WRITE, STAMP OR MARK BELOW THIS LINE

9/12/2018 69288 $24,666.50


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069289
Date: 08/23/2018

AMOUNT
11,183.75

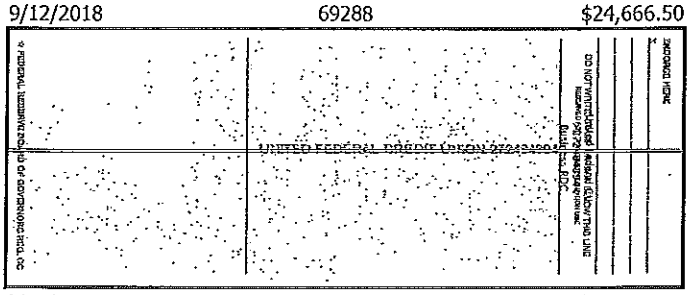
PAY ***Eleven Thousand One Hundred Eighty-Three and 75/100 Dollars

TO THE ORDER OF
ARCHDEACON CONSULTANTS, INC
95 WEST MAIN
PO BOX 1020
BELTON HARBOR, MI 49023

Derwin Watson

⑈069289⑈ ⑆072400052⑆ 8001346753⑈

9/12/2018 69289 $11,183.75


UNITED FEDERAL CREDIT UNION 272210604
DO NOT WRITE, STAMP OR MARK BELOW THIS LINE

9/12/2018 69289 $11,183.75

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE
No. 123120
09/10/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 8/31/18:

Update Atlas - $ 5,741.25
Grant Administration/Project Management/Meetings - $ 2,672.50
Construction Documents - $ 2,260.00

Invoice Amount **$10,673.75**

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If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

591-571-977.300

FIFTH THIRD BANK
(WESTERN MICHIGAN)
P.O. BOX 630900 CINCINNATI OH 45263-0900

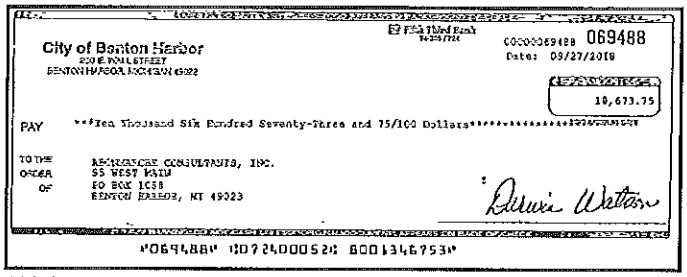
CITY OF BENTON HARBOR
GENERAL ACCT
ATTN FINANCE DIRECTOR
PO BOX 648
BENTON HARBOR MI 49023-0648

0

1560

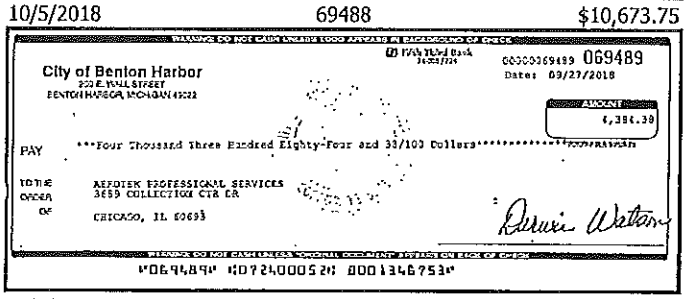
Statement Period Date: 10/1/2018 - 10/31/2018
Account Type: COMM'L 53 ANALYZED
Account Number: 8001346753

Banking Center: St Joseph South
Banking Center Phone: 269-983-0983
Commercial Client Services: 866-475-0729



City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069488 069488
Date: 09/27/2018
10,673.75
PAY ***Ten Thousand Six Hundred Seventy-Three and 75/100 Dollars
TO THE ORDER OF RECOMMENCE CONSULTANTS, INC.
55 WEST MAIN
PO BOX 1058
BENTON HARBOR, MI 49023
Derwin Watson
⑈069488⑈ ⑆072400052⑆ 8001346753⑈

10/5/2018 69488 $10,673.75

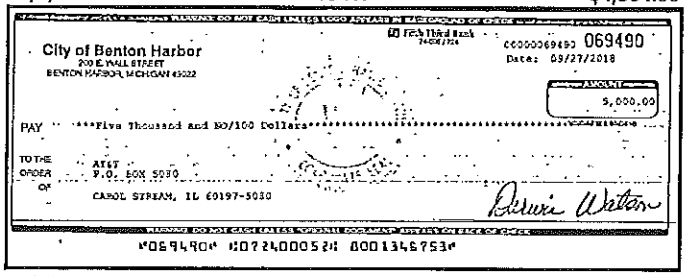


City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069489 069489
Date: 09/27/2018
4,384.38
PAY ***Four Thousand Three Hundred Eighty-Four and 38/100 Dollars
TO THE ORDER OF AEROTEK PROFESSIONAL SERVICES
3659 COLLECTION CTR DR
CHICAGO, IL 60693
Derwin Watson
⑈069489⑈ ⑆072400052⑆ 8001346753⑈

10/4/2018 69489 $4,384.38

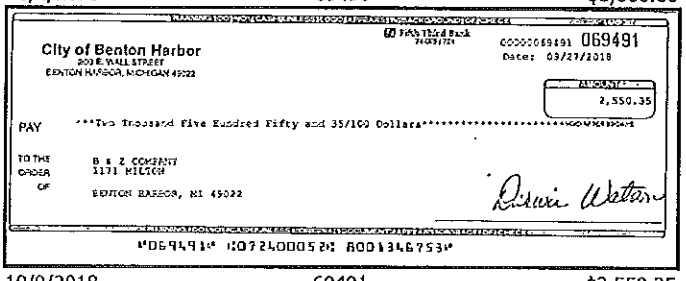
City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069490 069490
Date: 09/27/2018
5,000.00
PAY ***Five Thousand and 00/100 Dollars
TO THE ORDER OF AT&T
P.O. BOX 5080
CAROL STREAM, IL 60197-5080
Derwin Watson
⑈069490⑈ ⑆072400052⑆ 8001346753⑈

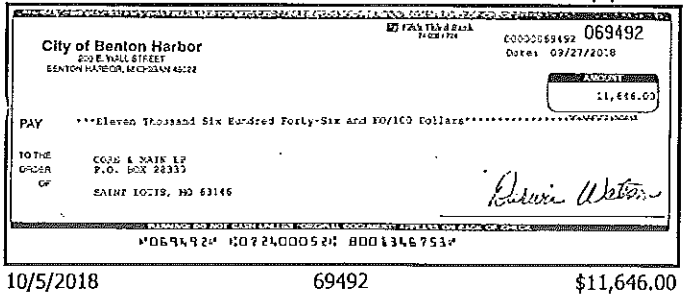
10/4/2018 69490 $5,000.00



City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069491 069491
Date: 09/27/2018
2,550.35
PAY ***Two Thousand Five Hundred Fifty and 35/100 Dollars
TO THE ORDER OF B & Z COMPANY
1171 HILTON
BENTON HARBOR, MI 49022
Derwin Watson
⑈069491⑈ ⑆072400052⑆ 8001346753⑈

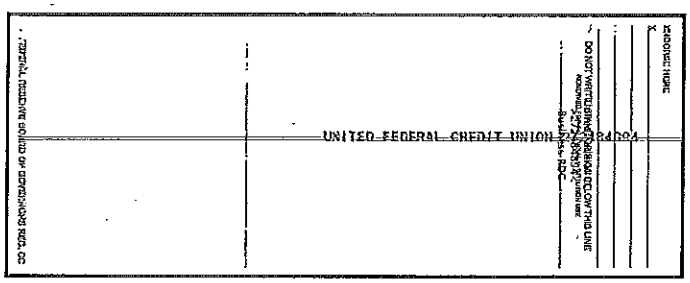
10/9/2018 69491 $2,550.35

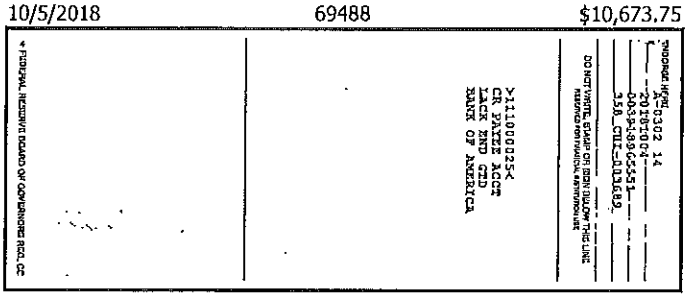


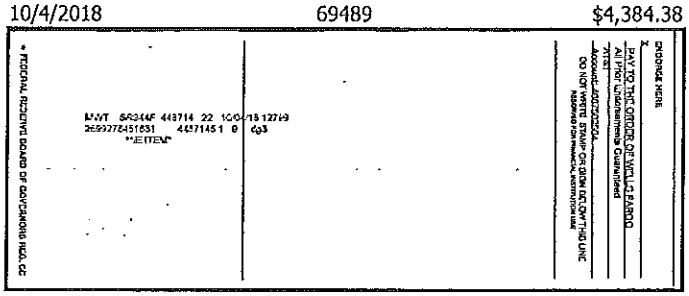


City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069492 069492
Date: 09/27/2018
11,646.00
PAY ***Eleven Thousand Six Hundred Forty-Six and 00/100 Dollars
TO THE ORDER OF CORE & MAIN LP
P.O. BOX 28330
SAINT LOUIS, MO 63146
Derwin Watson
⑈069492⑈ ⑆072400052⑆ 8001346753⑈

10/5/2018 69492 $11,646.00





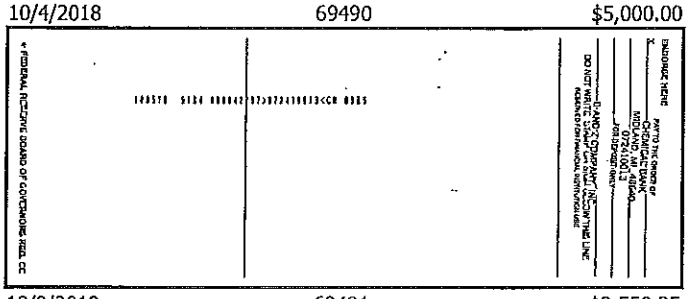


FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
UNITED FEDERAL CREDIT UNION
ENDORSE HERE
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/5/2018 69488 $10,673.75

FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
>111000025<
CR PAYEE ACCT
LACK END GTD
BANK OF AMERICA
ENDORSE HERE
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/4/2018 69489 $4,384.38

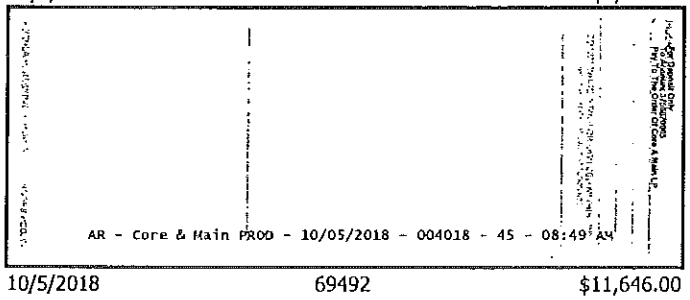


FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
MWT SR344F 448714 22 10/04/18 12749
2699278451631 44371451 9 dg3
ITEM
ENDORSE HERE
PAY TO THE ORDER OF WELLS FARGO
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/4/2018 69490 $5,000.00

FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
ENDORSE HERE
PAY TO THE ORDER OF
CHEMICAL BANK
MIDLAND, MI 48640
07241001
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/9/2018 69491 $2,550.35



AR - Core & Main PROD - 10/05/2018 - 004018 - 45 - 08:49 AM

10/5/2018 69492 $11,646.00

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 123487
10/01/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 9/30/18:

Update Atlas - $ 4,095.00
Grant Administration/Project Management/Meetings - $ 3,591.60
Construction Documents - $ 3,450.00

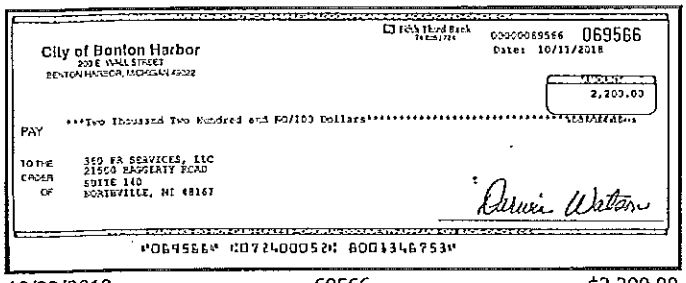
Invoice Amount **$11,136.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

FIFTH THIRD BANK


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069566 069566
Date 10/11/2018

AMOUNT 2,200.00

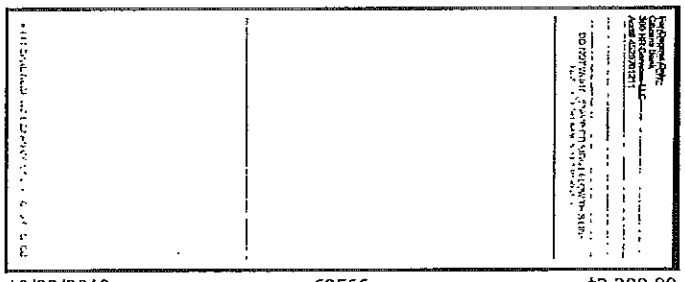
PAY ***Two Thousand Two Hundred and 00/100 Dollars***

TO THE ORDER OF 360 FA SERVICES, LLC
21500 HAGGERTY ROAD
SUITE 140
NORTHVILLE, MI 48167

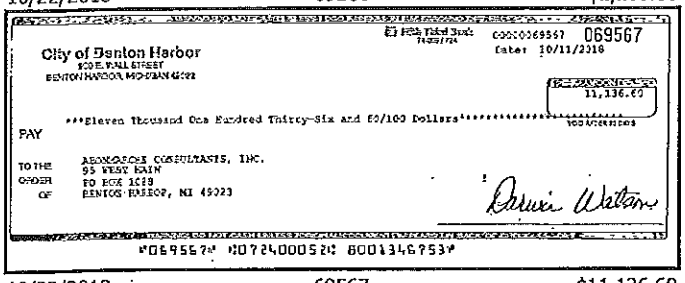
Darwin Watson

⑈069566⑈ ⑆072400052⑆ 8001346753⑈

10/22/2018 69566 $2,200.00



10/22/2018 69566 $2,200.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069567 069567
Date 10/11/2018

AMOUNT 11,136.60

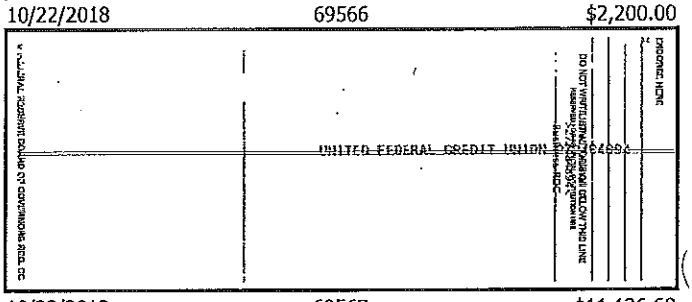
PAY ***Eleven Thousand One Hundred Thirty-Six and 60/100 Dollars***

TO THE ORDER OF ASSOCIATES CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

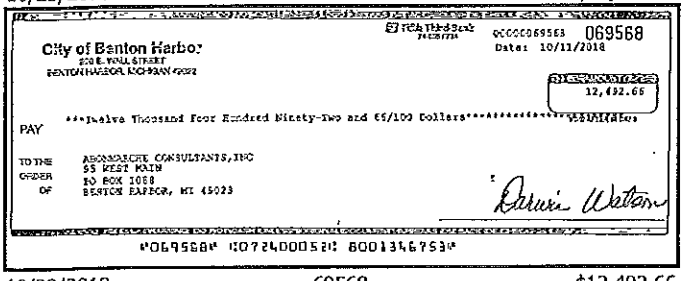
Darwin Watson

⑈069567⑈ ⑆072400052⑆ 8001346753⑈

10/23/2018 69567 $11,136.60


UNITED FEDERAL CREDIT UNION

10/23/2018 69567 $11,136.60


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069568 069568
Date 10/11/2018

AMOUNT 12,492.66

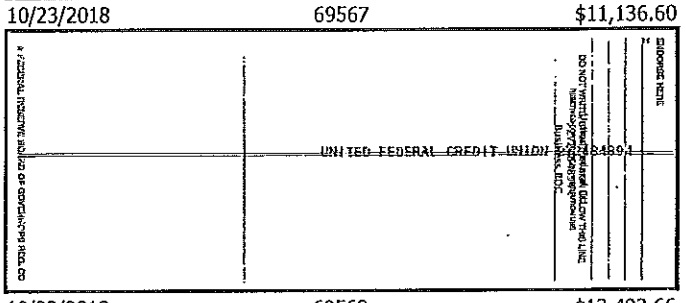
PAY ***Twelve Thousand Four Hundred Ninety-Two and 66/100 Dollars***

TO THE ORDER OF ASSOCIATES CONSULTANTS,INC
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

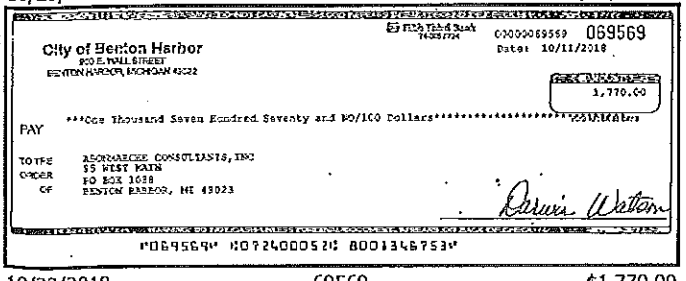
Darwin Watson

⑈069568⑈ ⑆072400052⑆ 8001346753⑈

10/23/2018 69568 $12,492.66


UNITED FEDERAL CREDIT UNION

10/23/2018 69568 $12,492.66


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069569 069569
Date 10/11/2018

AMOUNT 1,770.00

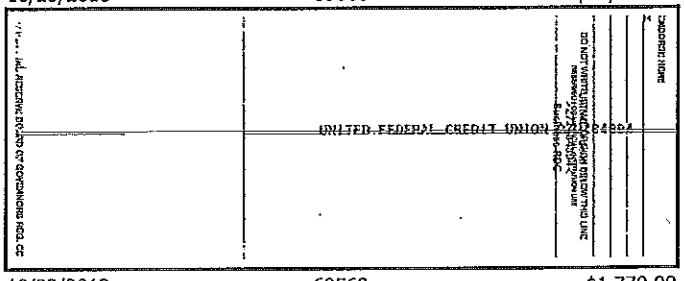
PAY ***One Thousand Seven Hundred Seventy and 00/100 Dollars***

TO THE ORDER OF ASSOCIATES CONSULTANTS,INC
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

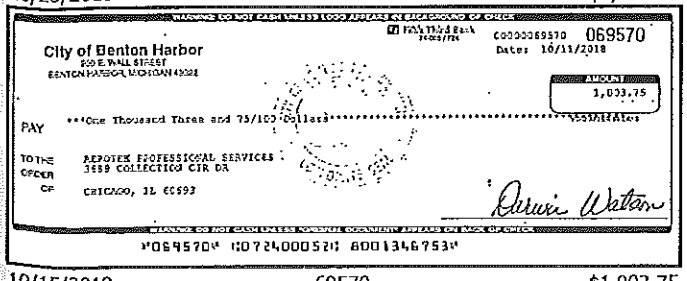
Darwin Watson

⑈069569⑈ ⑆072400052⑆ 8001346753⑈

10/23/2018 69569 $1,770.00


UNITED FEDERAL CREDIT UNION

10/23/2018 69569 $1,770.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069570 069570
Date 10/11/2018

AMOUNT 1,003.75

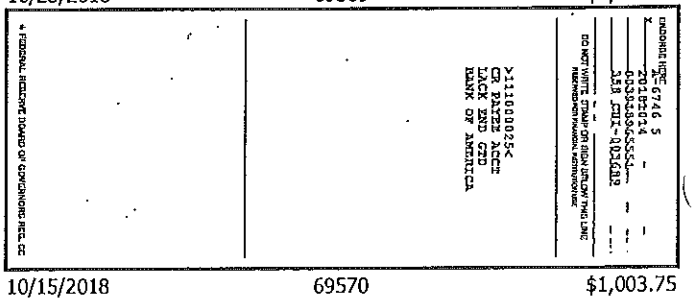
PAY ***One Thousand Three and 75/100 Dollars***

TO THE ORDER OF AEROTEK PROFESSIONAL SERVICES
3689 COLLECTION CTR DR
CHICAGO, IL 60693

Darwin Watson

⑈069570⑈ ⑆072400052⑆ 8001346753⑈

10/15/2018 69570 $1,003.75


>:110010025<
CR PAYEE ACCT
LOCK BND GRD
BANK OF AMERICA

10/15/2018 69570 $1,003.75

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

12/19/18

INVOICE

No. 124254
11/28/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt

Professional services through 11/15/18:

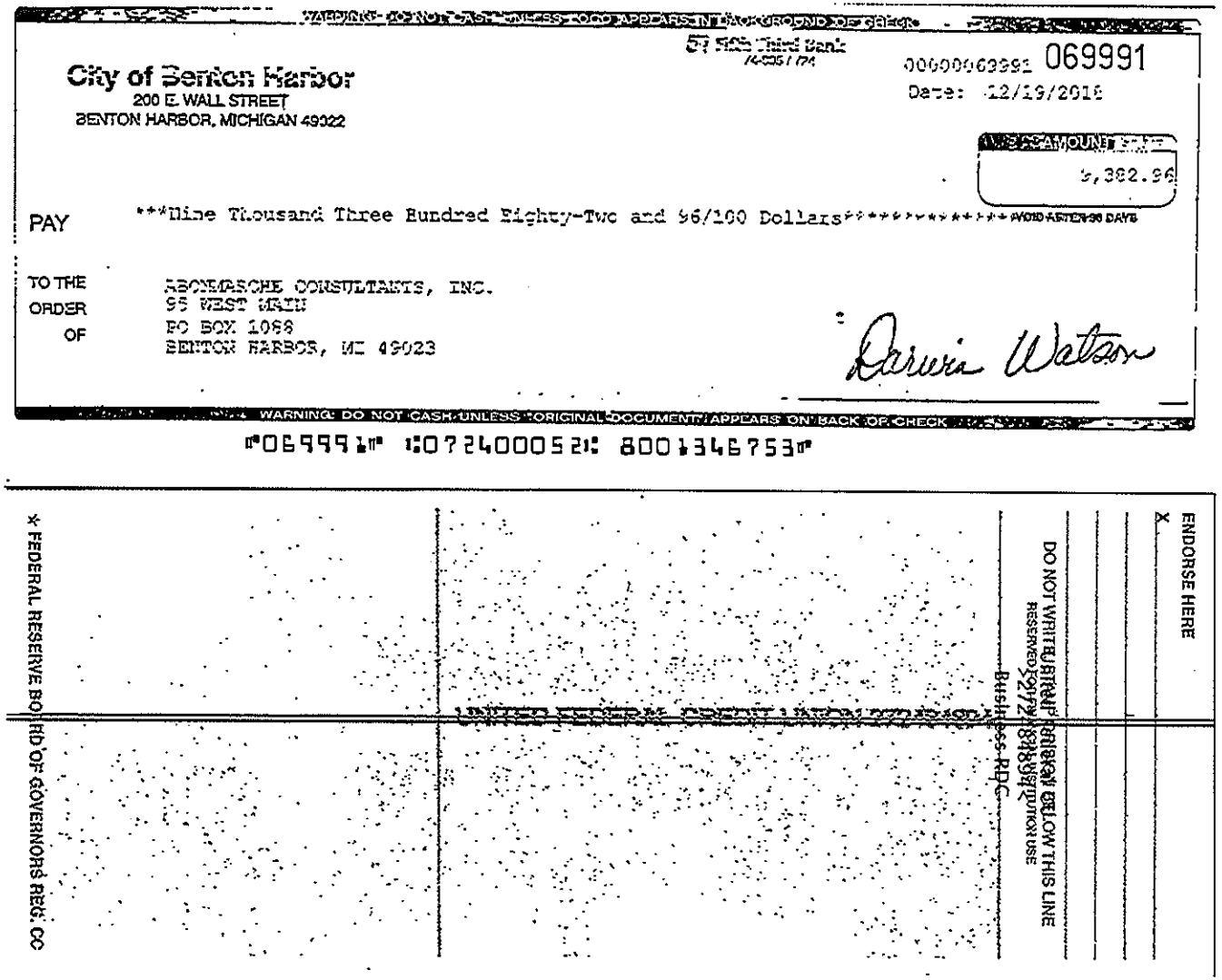
		Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101	Update Distribution System Inventory	$35,260.46	$12,315.00	$7,674.10	$15,271.36
	Herald Palladium Ad - $ 260.46				
102	Update/Improve Asset Management Program	$30,000.00	$9,101.60	$516.36	$20,382.04
103	Lead Service Line Construction	$10,000.00	$5,710.00	$1,192.50	$3,097.50
	Totals:	$75,260.46	$27,126.60	$9,382.96	$38,750.90

Invoice Amount **$9,382.96**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS IN BACK GROUND OF CHECK

5/3rd Third Bank
74-535/724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

000000069991 069991
Date: 12/19/2018

VOID AFTER 90 DAYS
AMOUNT
$ 9,382.96

PAY ***Nine Thousand Three Hundred Eighty-Two and 96/100 Dollars**********

TO THE ORDER OF
ABONMARCHE CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1068
BENTON HARBOR, MI 49023

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈069991⑈ ⑆072400052⑆ 800134675 3⑈

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

UNITED FEDERAL CREDIT UNION

DO NOT WRITE BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE

Business RDC

ENDORSE HERE
X

Transaction Type: Check	Customer Reference #: 69991
Transaction Date: 2019-01-11	Bank Reference #: 600474207372
Amount: 9382.96	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

1/9/19

INVOICE

No. 124634
12/31/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 12/15/18, including construction kickoffs with contractors, reviewing progress, and distributing door notices.

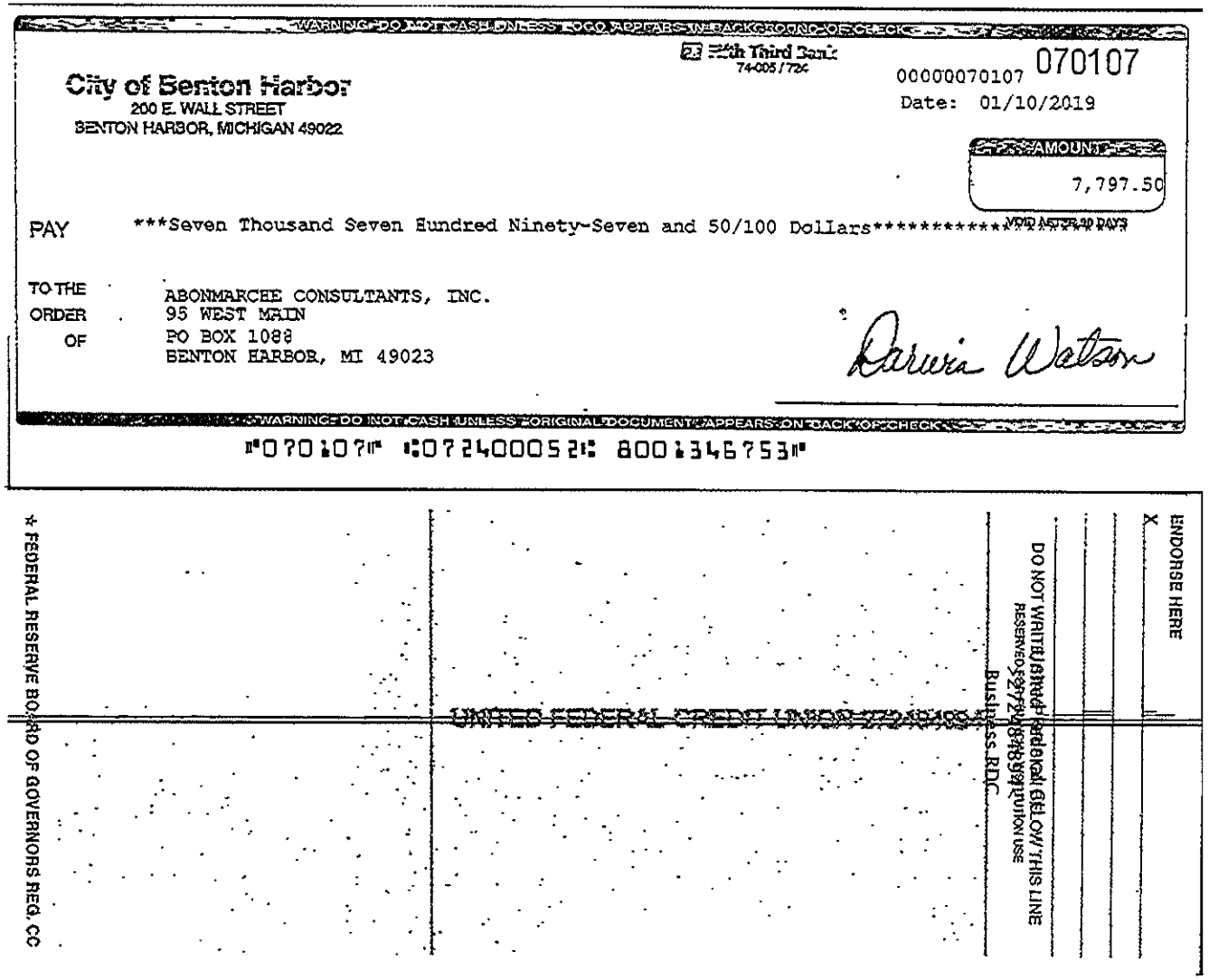
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$19,989.10	$4,945.00	$10,326.36
102 Update/Improve Asset Management Program	$30,000.00	$9,617.96	$2,517.50	$17,864.54
103 Lead Service Line Construction	$10,000.00	$6,902.50	$335.00	$2,762.50
Totals:	$75,260.46	$36,509.56	$7,797.50	$30,953.40

Invoice Amount **$7,797.50**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



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Transaction Date: 2019-01-28	Bank Reference #: 600479374077
Amount: 7797.50	
Description:	

ABONMARCHE

Engineering • Architecture • Lond Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

11/16/19

INVOICE

No. 124749
01/08/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 12/31/18, including construction review, construction estimates, project summary, grant review and field work locating curb stops.

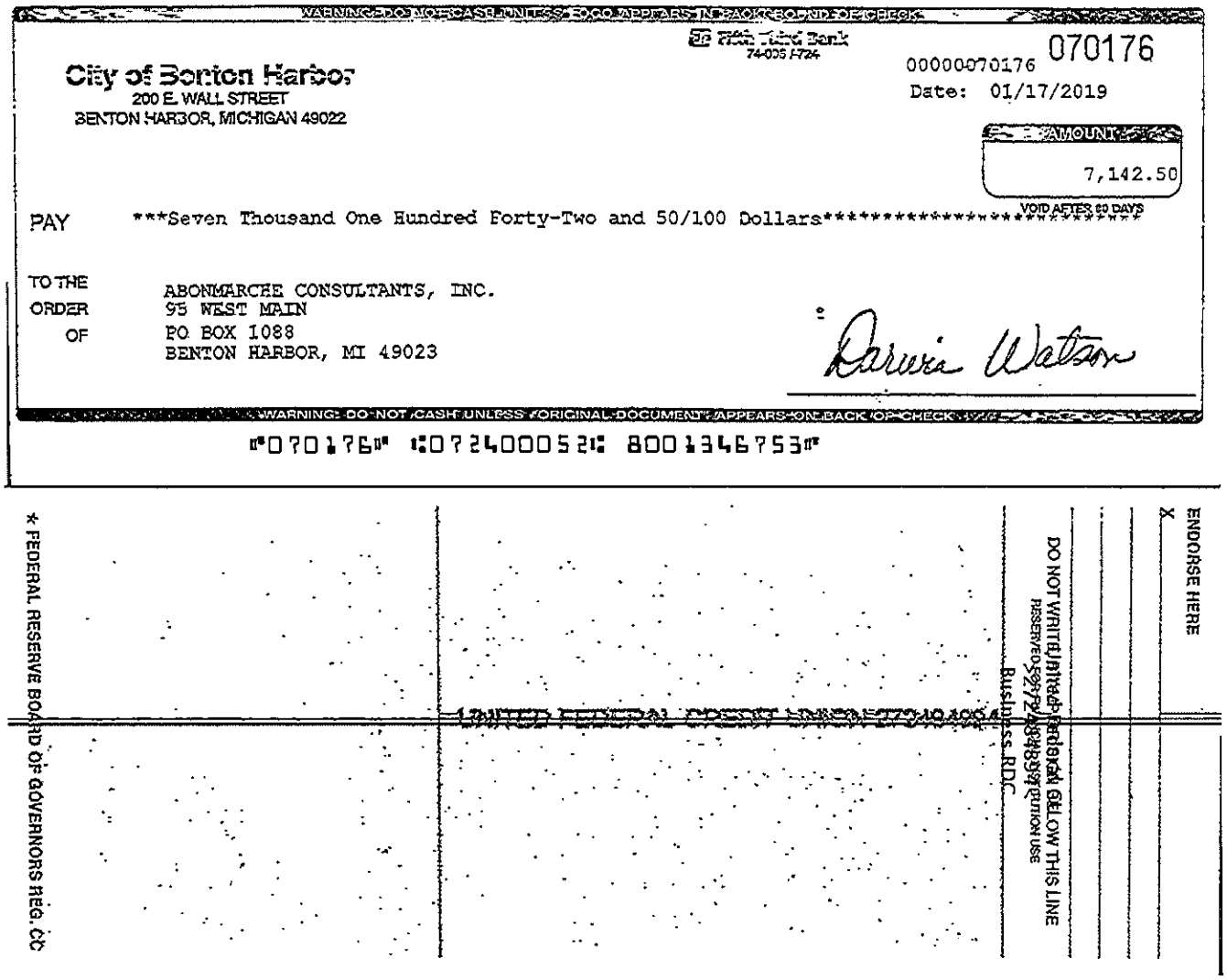
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$24,934.10	$1,552.50	$8,773.86
102 Update/Improve Asset Management Program	$30,000.00	$12,135.46	$5,590.00	$12,274.54
103 Lead Service Line Construction	$10,000.00	$7,237.50	$0.00	$2,762.50
Totals:	$75,260.46	$44,307.06	$7,142.50	$23,810.90

Invoice Amount **$7,142.50**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



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Transaction Date: 2019-01-28	Bank Reference #: 600479374074
Amount: 7142.50	
Description:	

DWatson
2/21/19

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 125102
02/13/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 1/31/19, including construction administration, construction estimates, project summary, grant review and on-site inspections and easement execution.

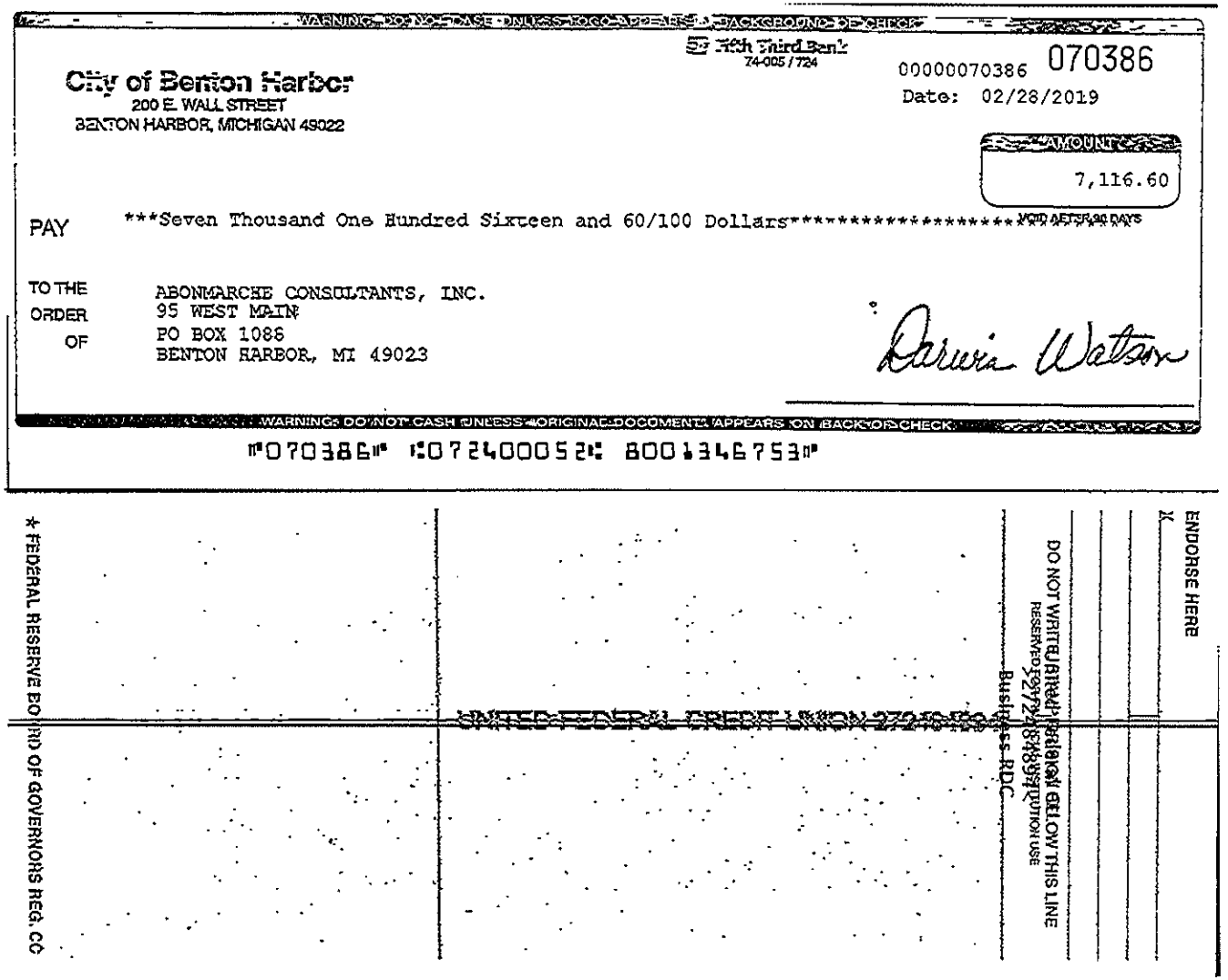
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$26,486.60	$5,929.25	$2,844.61
102 Update/Improve Asset Management Program	$30,000.00	$17,725.46	$0.00	$12,274.54
103 Lead Service Line Construction	$10,000.00	$7,237.50	$1,187.35	$1,575.15
Totals:	$75,260.46	$51,449.56	$7,116.60	$16,694.30

Invoice Amount **$7,116.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



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Amount: 7116.60	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

3/21/19

INVOICE

No. 125391
03/11/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 2/28/19, including construction administration, construction estimates, project summary, grant review, on-site inspections, easement execution, working with contractors on lead service replacement, service verification, and construction inspections.

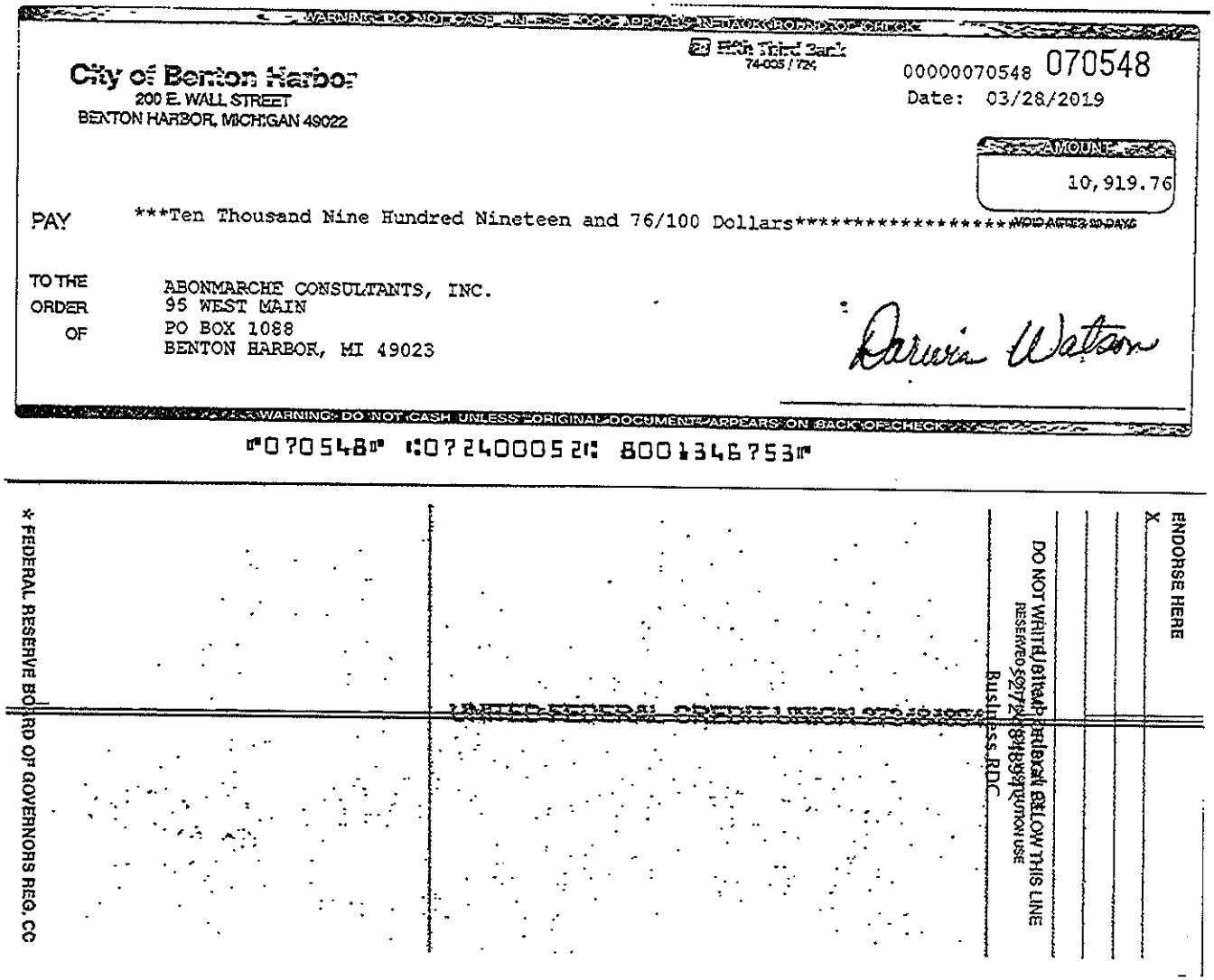
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$32,415.85	$2,844.61	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$17,725.46	$6,500.00	$5,774.54
103 Lead Service Line Construction	$10,000.00	$8,424.85	$1,575.15	$0.00
Totals:	$75,260.46	$58,566.16	$10,919.76	$5,774.54

Invoice Amount **$10,919.76**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



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Transaction Date: 2019-04-10	Bank Reference #: 600478717366
Amount: 10919.76	
Description:	

Rec'd 05/24/19

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

5/29/19

INVOICE

No. 126139
05/15/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 5/15/19, including construction administration, construction estimates, project summary, grant review, on-site inspections, easement execution, working with contractors on lead service replacement, service verification, and construction inspections. Compiling LSLR Review webinar and MDEQ memorandum.

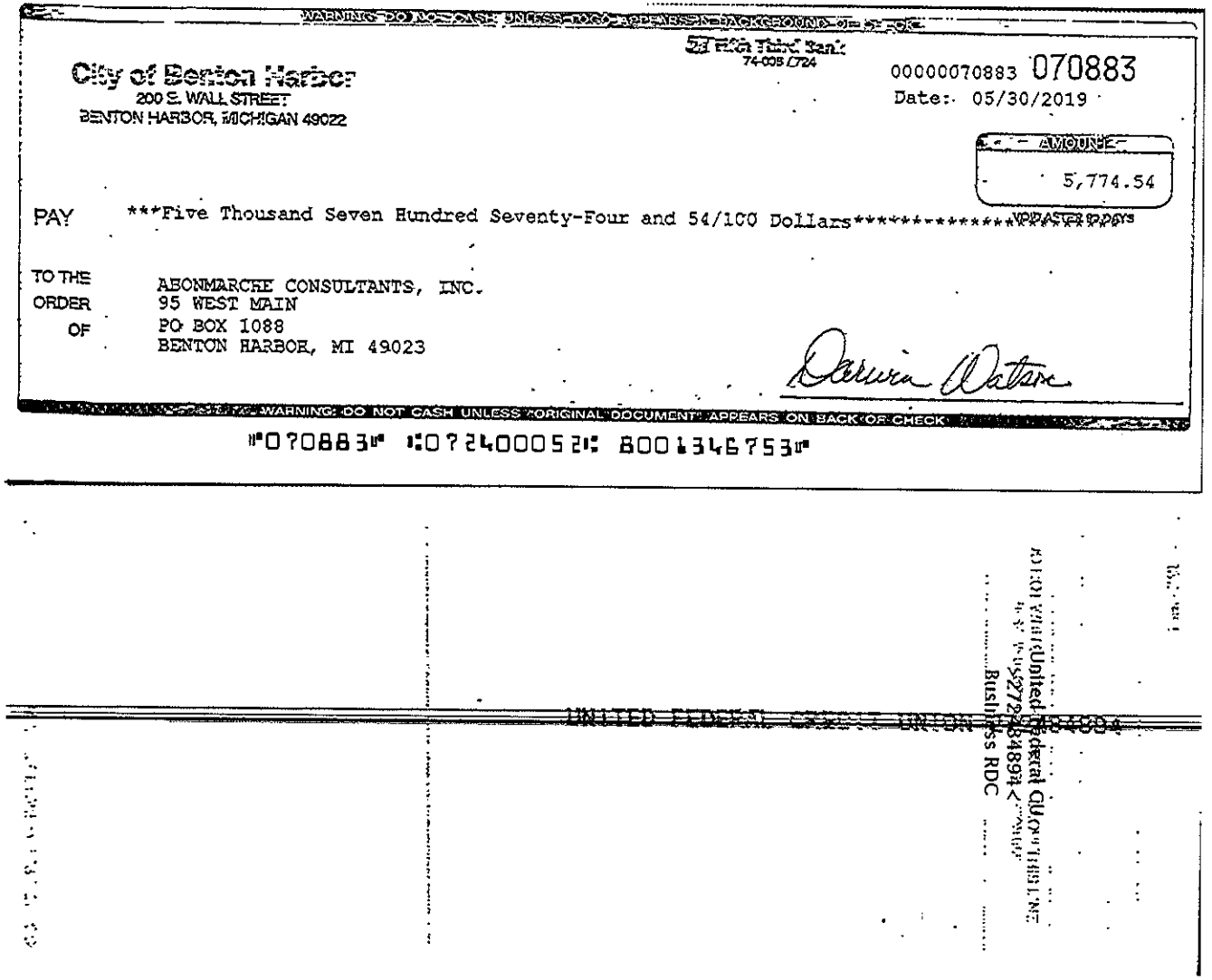
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$35,260.46	$0.00	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$24,225.46	$5,774.54	$0.00
103 Lead Service Line Construction	$10,000.00	$10,000.00	$0.00	$0.00
600 Deleted Phase	$0.00	$0.00	$0.00	$0.00
900 Deleted Phase	$0.00	$0.00	$0.00	$0.00
Totals:	$75,260.46	$69,485.92	$5,774.54	$0.00

Invoice Amount **$5,774.54** ✓

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-0058/724

00000070883 070883
Date: 05/30/2019

AMOUNT
5,774.54

PAY ***Five Thousand Seven Hundred Seventy-Four and 54/100 Dollars**********

TO THE ORDER OF
ABONMARCHE CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070883⑈ ⑆072400052⑆ 800134675 3⑈

UNITED FEDERAL CREDIT UNION

(United Federal Credit Union)
Business RDC

Transaction Type: Check	Customer Reference #: 70883
Transaction Date: 2019-06-10	Bank Reference #: 600478304791
Amount: 5774.54	
Description:	

pd

ABONMARCHE

Engineering • Architecture • Land Surveying

January 2, 2019

PAYMENT REQUEST NO. 1
For Work Completed Through 12/31/2018

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	0.00
Current Contract Amount	$	10,000.00
Work Completed	$	10,000.00
Retainage (10%)	$	1,000.00
Amount Earned	$	9,000.00
Less Previous Payments	$	0.00
Amount Due Contractor This Payment	$	9,000.00

RECOMMENDED BY: Contractor

Bruce Binger (B & Z) — 1-14-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 1/14/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 1/15/19 Date

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
12/27/2018	181239

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
Verbal	Multiple Locations	Net 10	1/6/2019

Date	Item	Description	Quan.	Units	Rate	Amount
		Lead service lines				
	Proposed Work	Dug up and inspected waterline to check for lead services	20	ea	500.00	10,000.00

An unpaid balance after the due date may be subject to a late payment charge of 1 5% per month
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$10,000.00**

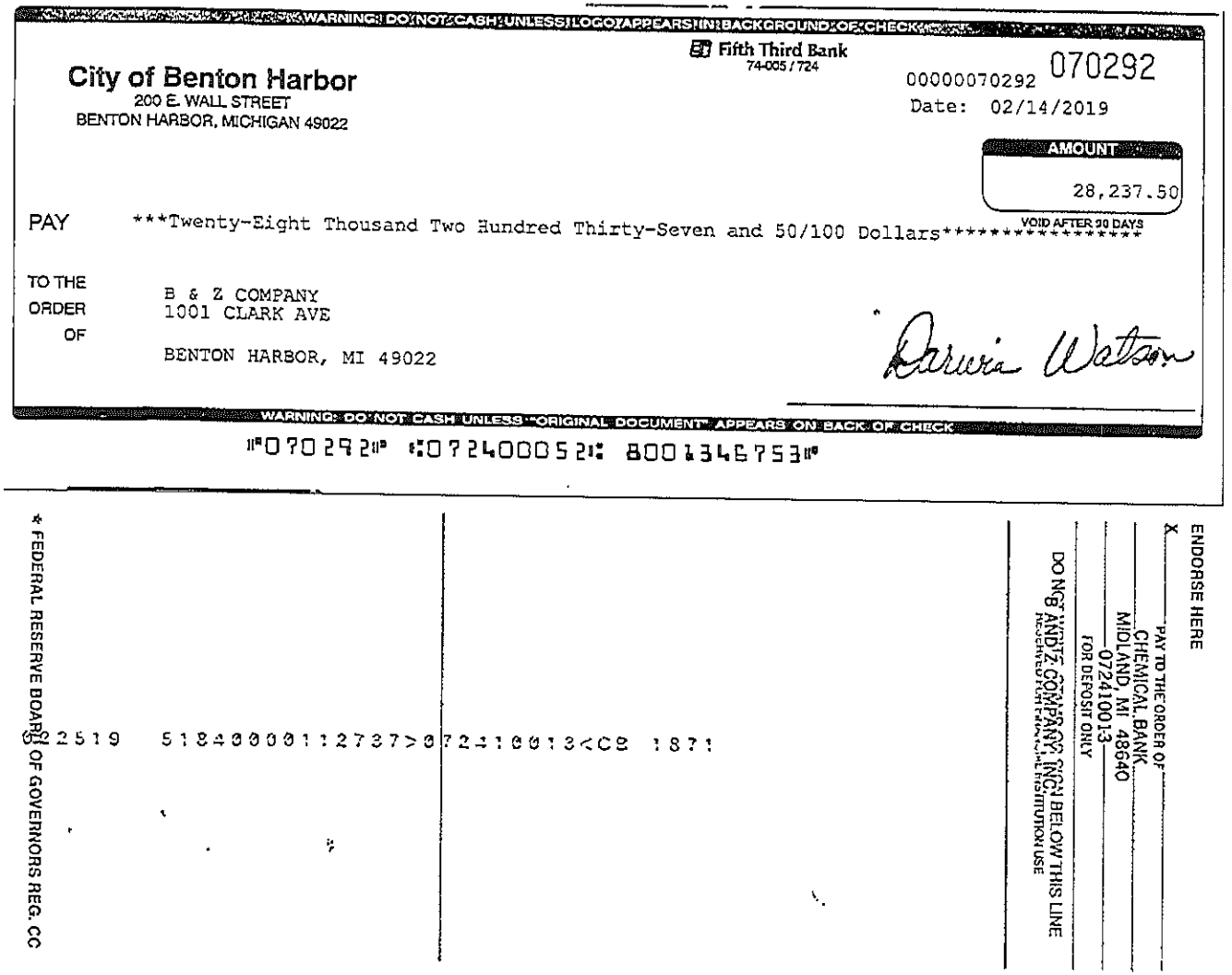
Phone #
269-925-6999

Fax #
269-925-0578

Vendor: 0686 B & Z COMPANY Check #: 00000070292 02/14/2019

Date	Invoice	Description/Detail	Amount
01/31/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	9,000.00
01/31/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	19,237.50

Total: 28,237.50



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070292 070292
Date: 02/14/2019

AMOUNT
28,237.50
VOID AFTER 90 DAYS

PAY ***Twenty-Eight Thousand Two Hundred Thirty-Seven and 50/100 Dollars**********

TO THE ORDER OF
B & Z COMPANY
1001 CLARK AVE
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070292⑈ ⑆072400052⑆ 8001346753⑈

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X
PAY TO THE ORDER OF
CHEMICAL BANK
MIDLAND, MI 48640
072410013
FOR DEPOSIT ONLY
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE
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022519 518400001127 37>072410013<CB 1871

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

Transaction Type: Check	Customer Reference #: 70292
Transaction Date: 2019-02-26	Bank Reference #: 600471951867
Amount: 28237.50	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

V70292
pd 2-14-19

February 01, 2019

PAYMENT REQUEST NO. 2

For Work Completed Through 01/31/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders (#1)	$	44,775.00
Current Contract Amount	$	54,775.00
Work Completed (Inv #s 181239, 190149, 190150 & 190151)	$	31,375.00
Retainage (10%)	$	3,137.50
Amount Earned	$	28,237.50
Less Previous Payments (PR#1)	$	9,000.00
Amount Due Contractor This Payment	$	19,237.50

RECOMMENDED BY: Contractor

Bruce Binger (B & Z) — Date: 2-1-2019

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 2/2/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 2/5/19

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
1/29/2019	190149

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
Verbal	Multiple Locations	Net 10	2/8/2019

Date	Item	Description	Quan.	Units	Rate	Amount
		Lead service lines				
	Proposed Work	Dug up and inspected waterline to check for lead services	25	ea	400.00	10,000.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$10,000.00**

Phone #
269-925-6999

Fax #
269-925-0578

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
1/29/2019	190150

Bill To

City of Benton Harbor
Attn: Accounts Payble
200 E. Wall St.
Benton Harbor, MI 49022

Project
Columbus

Phone	Fax

P.O. No.	Location	Terms	Due Date
5209	554 Columbus	Net 10	2/8/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main and disconnected the old line, ran a new line under the street to the curb stop where we ran a new waterline from the curb stop into the house and have a plumber do the interior connections. We kept the sidewalk intact and restore gravel or topsoil where needed for restoration along with patching the road.	1	ls	6,400.00	6,400.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$6,400.00**

Phone #
269-925-6999

Fax #
269-925-0578

B and Z Company

1001 Clarke Ave
Benton Harbor, MI 49022

Invoice

Date	Invoice #
1/29/2019	190151

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5211	884 Wauceda	Net 10	2/8/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	We retired the waterline running under the tree. Then we tapped a new line and ran it into the house where a plumber did the interior connections. We will then asphalt patch the road and finish with any yard restoration that is needed	1	ls	4,975.00	4,975.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$4,975.00**

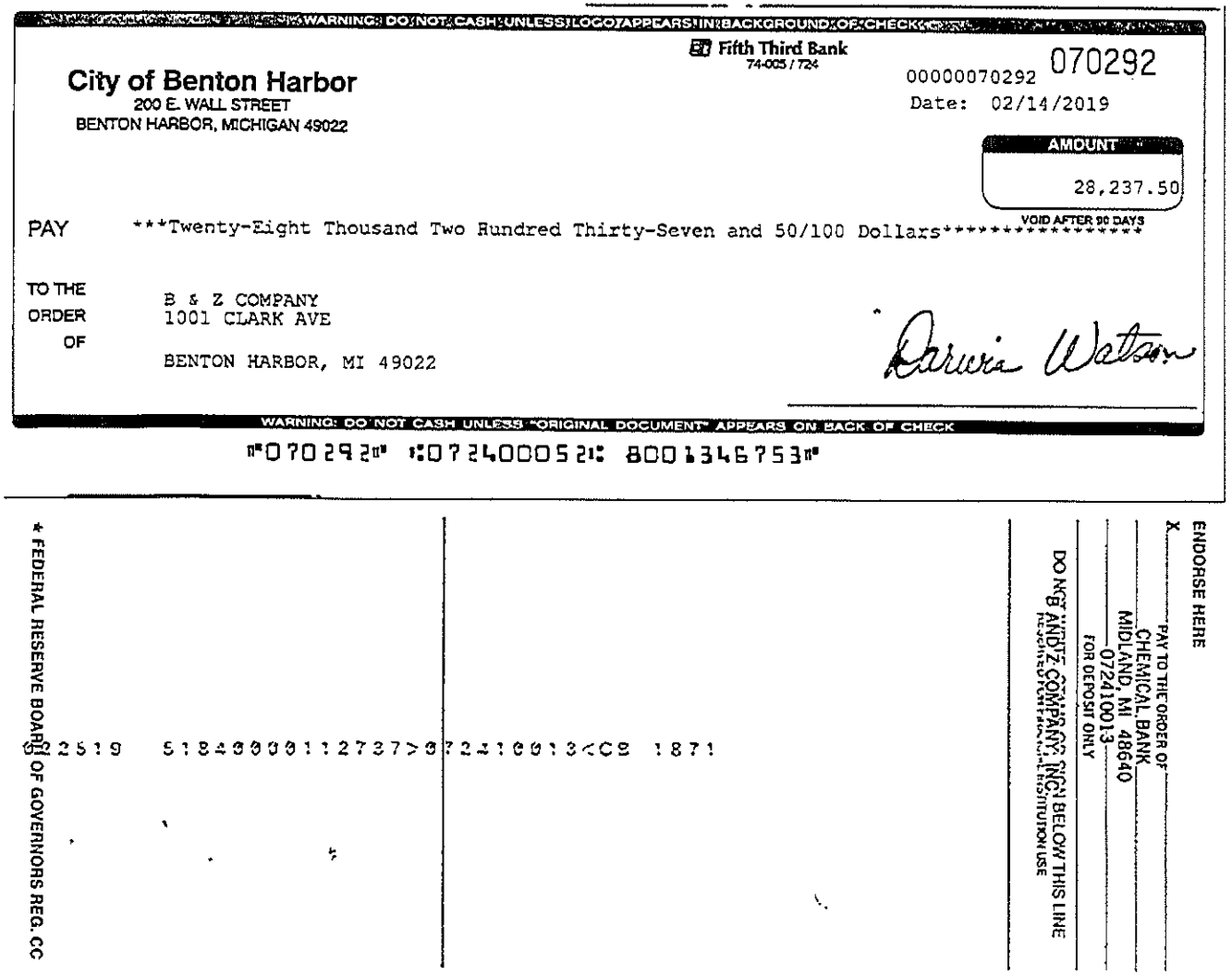
Phone #
269-925-6999

Fax #
269-925-0578

Vendor: 0686 B & Z COMPANY Check #: 00000070292 02/14/2019

Date	Invoice	Description/Detail	Amount
01/31/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	9,000.00
01/31/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	19,237.50

Total: 28,237.50



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070292 070292
Date: 02/14/2019

AMOUNT
28,237.50
VOID AFTER 90 DAYS

PAY ***Twenty-Eight Thousand Two Hundred Thirty-Seven and 50/100 Dollars**********

TO THE ORDER OF
B & Z COMPANY
1001 CLARK AVE
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070292⑈ ⑆072400052⑆ 8001346753⑈

ENDORSE HERE
X
PAY TO THE ORDER OF
CHEMICAL BANK
MIDLAND, MI 48640
072410013
FOR DEPOSIT ONLY
DO NOT WRITE, SIGN OR STAMP BELOW THIS LINE
B AND Z COMPANY, INC.
RESERVED FOR FINANCIAL INSTITUTION USE

022519 518400001127 37>072410013<CS 1871

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

Transaction Type: Check	Customer Reference #: 70292
Transaction Date: 2019-02-26	Bank Reference #: 600471951867
Amount: 28237.50	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

March 01, 2019

PAYMENT REQUEST NO. 3

For Work Completed Through 02/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders (#1)	$	44,775.00
Current Contract Amount	$	54,775.00 w/p 23,400
Work Completed	$	54,775.00
Retainage (10%)	$	5,477.50 retainage $2340
Amount Earned	$	49,297.50
Less Previous Payments (PR#1 & #2)	$	28,237.50
Amount Due Contractor This Payment	$	21,060.00 = pmt

RECOMMENDED BY: Contractor

Bruce Binger (B & Z) — Date: 3-1-2019

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 3/4/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 3/5/19

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	190256

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
Verbal	Multiple Locations	Net 10	3/10/2019

Date	Item	Description	Quan.	Units	Rate	Amount
		Lead service lines				
	Proposed Work	Dug up and inspected waterline to check for lead services (Final 12 of Phase 2, 37 lead lines total)	12	ea	400.00	4,800.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$4,800.00**

Phone #	Fax #

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	190257

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5210	1180 Lavette	Net 10	3/10/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main, disconnect the old waterline, tap a new line and ran it under the street to the curb stop. We then ran a new waterline from the curb stop into the house where we had a plumber do the interior connections. We will replace concrete sidewalk where we excavated around the curb stop, place topsoil, seed for restoration and patching of the road	1	ls	6,575.00	6,575.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$6,575.00**

Phone #	Fax #

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	190258

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5207	1093 Superior	Net 10	3/10/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main, disconnected the old line, tapped a new line and ran it under the road into the curb stop. Patched the road, finished with topsoil and seed for yard restoration	1	ls	6,925.00	6,925.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$6,925.00**

Phone #	Fax #

B and Z Company

1001 Clarke Ave
Benton Harbor, MI 49022

Invoice

Date	Invoice #
2/28/2019	190259

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5208	791 Buss	Net 10	3/10/2019

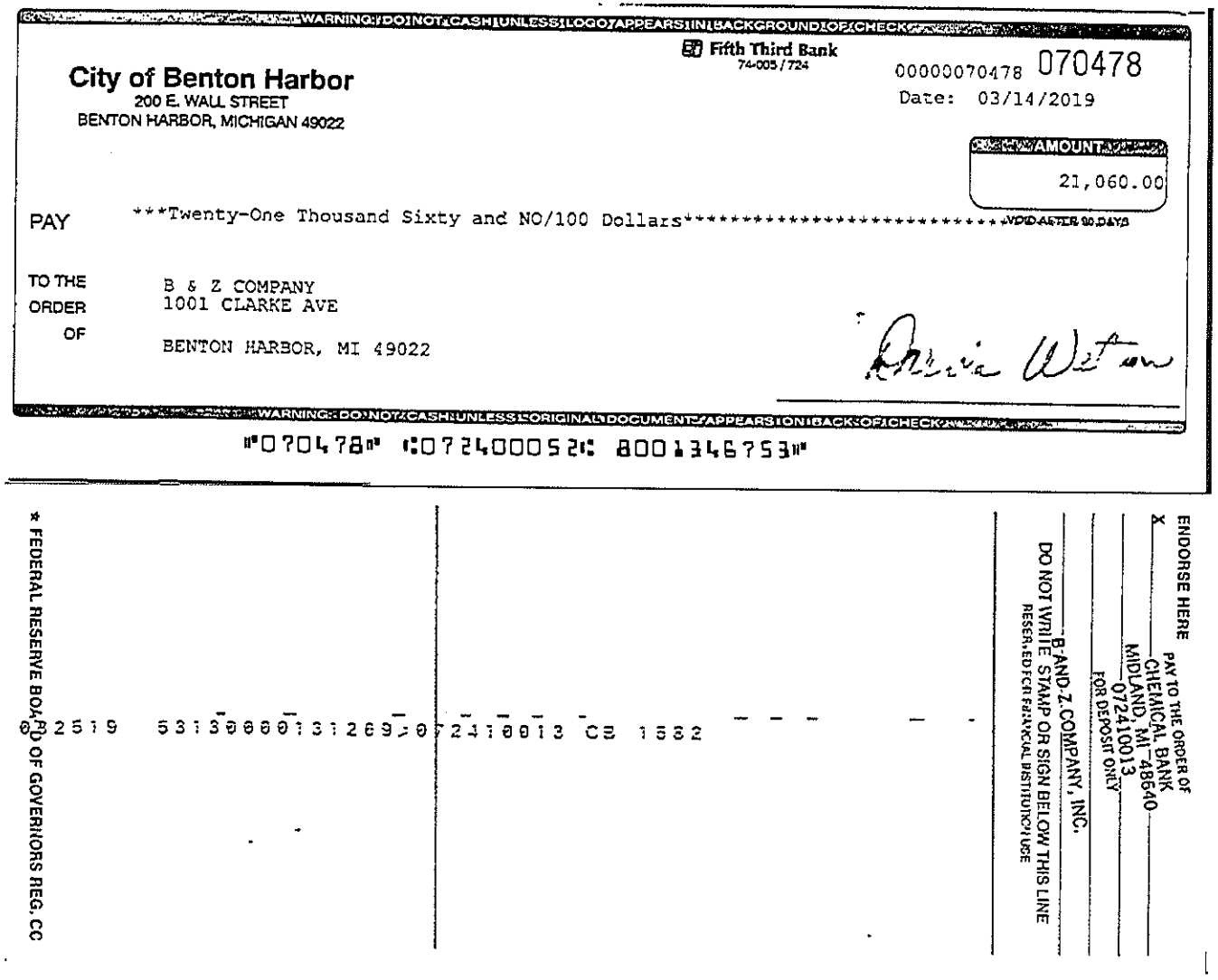
Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main, disconnected the old line, tapped and ran a new waterline under the street to the curb stop. Excavate and haul off concrete to run a new waterline from the curb stop into the house where we had a plumber do the interior connections. We will form and pour concrete driveway to replace where we excavated, we will finish with road patch and yard restoration	1	ls	7,150.00	7,150.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$7,150.00**

Phone #

Fax #



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005 / 724

00000070478 070478
Date: 03/14/2019

AMOUNT
21,060.00

PAY ***Twenty-One Thousand Sixty and NO/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
B & Z COMPANY
1001 CLARKE AVE
BENTON HARBOR, MI 49022

Dennis Weston

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070478⑈ ⑆072400052⑆ 8001346753⑈

ENDORSE HERE
X
PAY TO THE ORDER OF
CHEMICAL BANK
MIDLAND, MI 48640
072410013
FOR DEPOSIT ONLY
B AND Z COMPANY, INC.
DO NOT WRITE STAMP OR SIGN BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

0 82519 5313000013126 9 072410013 CB 1582

Transaction Type: Check	Customer Reference #: 70478
Transaction Date: 2019-03-26	Bank Reference #: 600472602180
Amount: 21060.00	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

May 2, 2019

PAYMENT REQUEST NO. 4
For Work Completed Through 04/26/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	51,325.00
Current Contract Amount	$	61,325.00
Work Completed	$	61,325.00
Retainage (10%)	$	6,132.50
Amount Earned	$	55,192.50
Less Previous Payments	$	49,297.50
Amount Due Contractor This Payment	$	5,895.00

6550.0
retainage 655.0
5895.0

RECOMMENDED BY: Contractor

Bruce Bringer

Bruce Bringer (B & Z)

5-8-2019
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/8/19
Date

ACCEPTED BY: Owner

Darwin Watson

Darwin Watson (Benton Harbor)

5/14/19
Date

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
4/25/2019	190437

Bill To

City of Benton Harbor
Attn: Mike O'Malley
200 E. Wall St.
Benton Harbor, MI 49022

Job Name / Location
385 Britain

Phone

Fax

P.O. No.	Project	Terms	Due Date
		Net 10	5/5/2019

Date	Item	Description	Quan.	Units	Rate	Amount
4/17/2019	Work Complete	Per proposal #5259 dated 3-19-19 - Replace water line at 385 E. Britain	1	ls	6,550.00	6,550.00

RECEIVED
APR 29 2019
ABONMARCHE
COPY

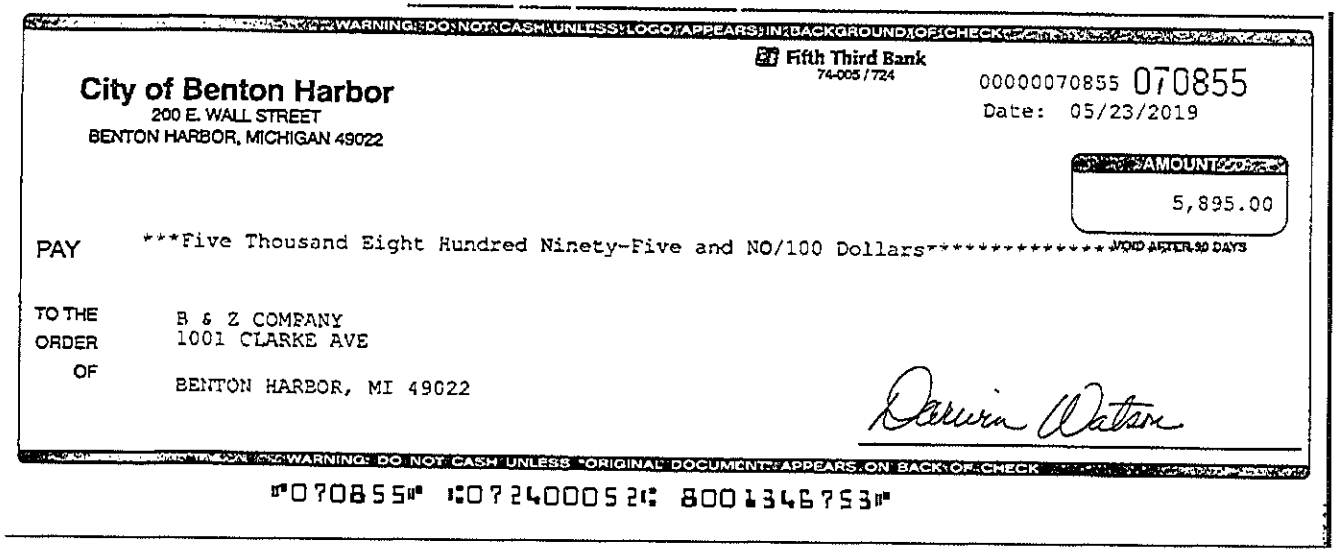
BB

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases.

Total	$6,550.00
Payments/Credits	$0.00
Balance Due	$6,550.00

Phone #

Fax #



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Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070855 070855
Date: 05/23/2019

AMOUNT
5,895.00

PAY ***Five Thousand Eight Hundred Ninety-Five and NO/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
B & Z COMPANY
1001 CLARKE AVE
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL" DOCUMENT APPEARS ON BACK OF CHECK

⑈070855⑈ ⑆072400052⑆ 8001346753⑈

053119 51840000159383>072410013<CB 1480

ENDORSE HERE
PAY TO THE ORDER OF
CHEMICAL BANK
MIDLAND, MI 48640
072410013
FOR DEPOSIT ONLY
B AND Z COMPANY, INC.

Transaction Type: Check	Customer Reference #: 70855
Transaction Date: 2019-06-03	Bank Reference #: 600479064453
Amount: 5895.00	
Description:	

Copy

ABONMARCHE

Engineering • Architecture • Land Surveying

January 2, 2019

PAYMENT REQUEST NO. 1

For Work Completed Through 12/31/2018

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00
Change Orders	$	0.00
Current Contract Amount	$	6,500.00
Work Completed	$	5,850.00
Retainage	$	585.00
Amount Earned	$	5,265.00
Less Previous Payments	$	0.00
Amount Due Contractor This Payment	$	5,265.00

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — Date: 1-14-19

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 1/14/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 1/15/19

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
12/21/2018	2116

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

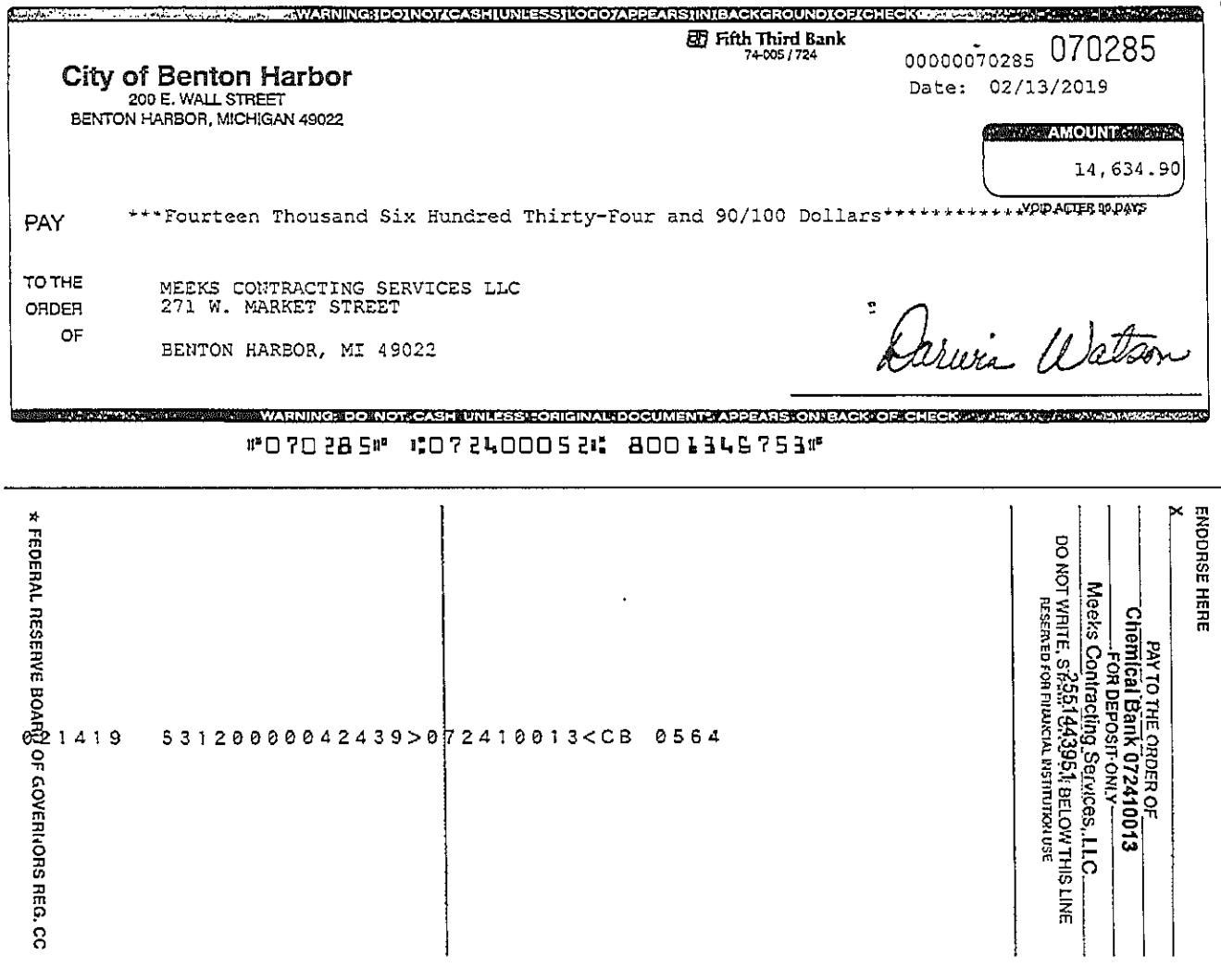
Quantity	Description	Rate	Amount
	Invoice for lead Verifications at the following Addresses		
1	277 Hastings	325.00	325.00
1	261 Searlos	325.00	325.00
1	274 Parker	325.00	325.00
1	191 Searles	325.00	325.00
1	1084 Salem	325.00	325.00
1	127 Searles	325.00	325.00
1	142 Searles	325.00	325.00
1	150 parker	325.00	325.00
1	1165 Hannan	325.00	325.00
~~1~~	~~1134 LaVatte~~ (SKIPPED DUE TO TREE ROOTS & GAS MAIN)	~~325.00~~	~~325.00~~
1	754 LaVatte	325.00	325.00
1	732 McAllister	325.00	325.00
1	846 McAlister	325.00	325.00
1	964 McAlister	325.00	325.00
1	1067 McAlister	325.00	325.00
1	1134 Pavone	325.00	325.00
1	839 Pavone	325.00	325.00
1	831 Pavone	325.00	325.00
~~1~~	~~828 Broadway~~ (SKIPPED, UNABLE TO LOCATE)	~~325.00~~	~~325.00~~
1	830 Broadway	325.00	325.00

Total ~~$6,500.00~~ $5,850.00

Vendor: 0798 MEEKS CONTRACTING SERVICES LLC Check #: 00000070285 02/13/2019

Date	Invoice	Description/Detail	Amount
01/02/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-1	5,265.00
02/01/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-2	9,369.90

Total: 14,634.90



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Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070285 070285
Date: 02/13/2019

AMOUNT
14,634.90

PAY ***Fourteen Thousand Six Hundred Thirty-Four and 90/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

Darwin Watson

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⑈070285⑈ ⑆072400052⑆ 8001346753⑈

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PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
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021419 53120000042439>072410013<CB 0564

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Transaction Type: Check	Customer Reference #: 70285
Transaction Date: 2019-02-15	Bank Reference #: 600471111186
Amount: 14634.90	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

February 01, 2019

PAYMENT REQUEST NO. 2
For Work Completed Through 01/31/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00
Change Orders (#1)	$	49,950.00
Current Contract Amount	$	56,450.00
Work Completed (INV 2116 + INV 2128)	$	16,261.00
Retainage (10%)	$	1,626.10
Amount Earned	$	14,634.90
Less Previous Payments (PR#1)	$	5,265.00
Amount Due Contractor This Payment	$	9,369.90

pd
✓ 70285
2-13-19

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — Date: 2.1.19

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 2/1/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 2/5/19

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
1-23-2019	2128

Bill To

City of Benton Harbor Water dept
200 E Wall St.
Benton Harbor, MI 49022

P O No	Terms	Project
	Due on receipt	

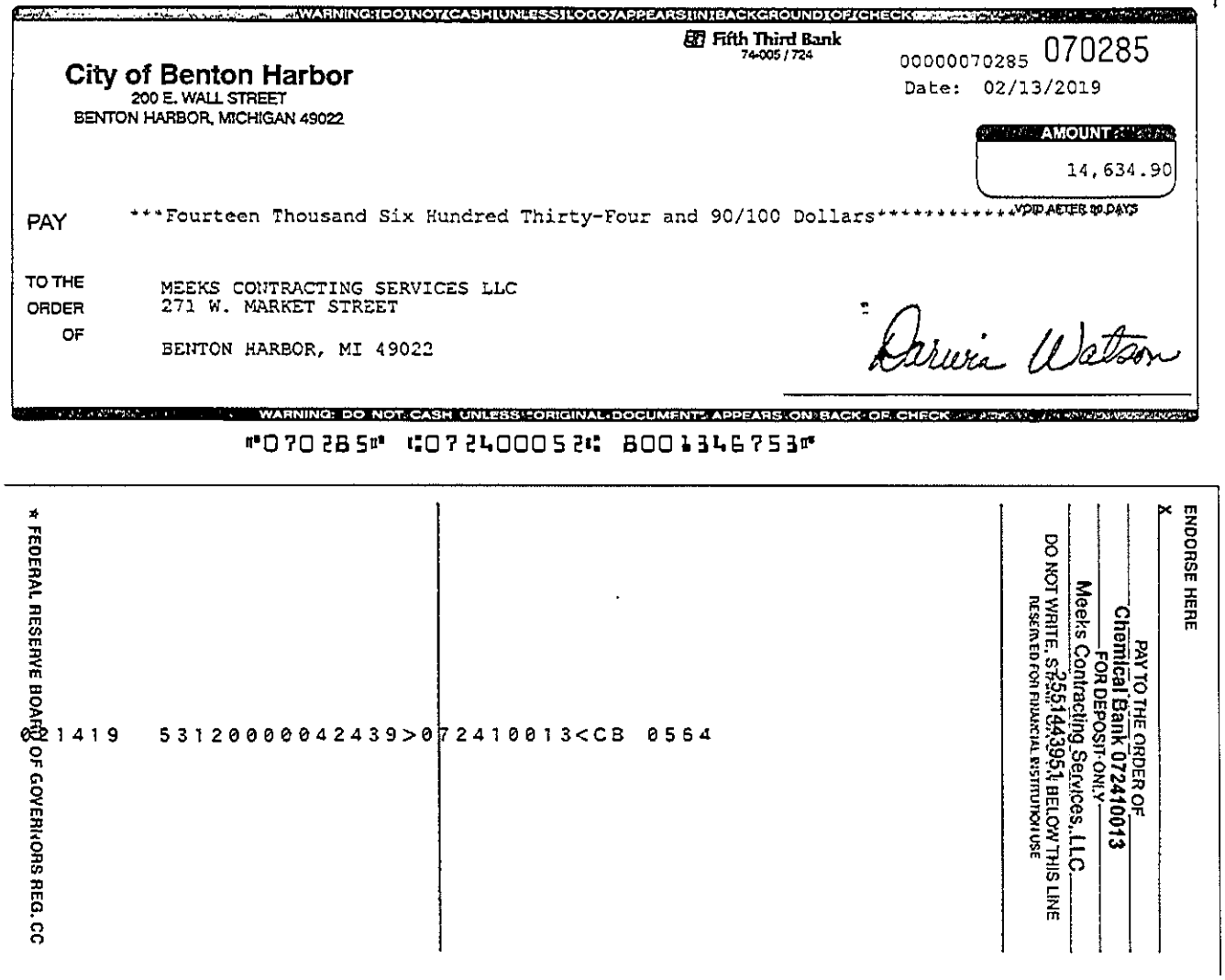
Quantity	Description	Rate	Amount
1	Lead Verification 1053 Jennings	325.00	325.00
1	Lead Verification 1050 Jennings	325.00	325.00
1	Line replacement main to house 1053 Jennings	5,000.00	5,000.00
1	Line replacement main to house 1050 Jennings	5,000.00	5,000.00
1	Refund for Caps Supplied 3/4" Copper pipe	-230.00	-230.00

Total $10,411.00

Vendor: 0798 MEEKS CONTRACTING SERVICES LLC Check #: 00000070285 02/13/2019

Date	Invoice	Description/Detail	Amount
01/02/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-1	5,265.00
02/01/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-2	9,369.90

Total: 14,634.90



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Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070285 070285
Date: 02/13/2019

AMOUNT
14,634.90

PAY ***Fourteen Thousand Six Hundred Thirty-Four and 90/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET

BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070285⑈ ⑆072400052⑆ 800134675 3⑈

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X
PAY TO THE ORDER OF
Chemical Bank 072410013
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Meeks Contracting Services, LLC
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⑈ FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

⑈1419 5312000042439>072410013<CB 0564

Transaction Type: Check	Customer Reference #: 70285
Transaction Date: 2019-02-15	Bank Reference #: 600471111186
Amount: 14634.90	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

March 01, 2019

PAYMENT REQUEST NO. 3
For Work Completed Through 02/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00	
Change Orders (#1)	$	49,950.00	
Current Contract Amount	$	56,450.00	Pay
Work Completed	$	53,111.00 16,261.00	36,850
Retainage (10%)	$	5,311.10 1626.10	< 3,685 >
Amount Earned	$	47,799.90	
Less Previous Payments (PR#1 & #2)	$	14,634.90	
Amount Due Contractor This Payment	$	33,165.00	33,165.00

RECOMMENDED BY: Contractor

Dorrie Meeks (Meeks Contracting Services, LLC) — 3-4-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 3/25/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 3/20/19 Date

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/6/2019	2131

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Lead Verification 669 Ogden	325.00	325.00
1	Line replacement main to meter 669 Ogden	5,000.00	5,000.00
	Total		$5,325.00

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/26/2019	2137

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Line Replacement from main to meter 831 Pavone	5,000.00	5,000.00
1	Line Replacement from main to meter 839 Pavone	5,000.00	5,000.00
1	Line Replacement from main to meter 838 LaVette	5,000.00	5,000.00
1	Line Replacement from main to meter 155 Kline	5,000.00	5,000.00

Total $20,000.00

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/26/2019	2138

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Lead Verifications	325.00	325.00
1	582 Pearl	325.00	325.00
1	664 Superior	325.00	325.00
1	753 Broadway	325.00	325.00
1	582 Niles	325.00	325.00
1	759 Ogden	325.00	325.00
1	776 Monroe	325.00	325.00
1	870 Ogden	325.00	325.00
1	1008 Pearl	325.00	325.00
1	1118 Broadway		

Total $2,925.(

Invoice

Meeks Contracting Services LLC

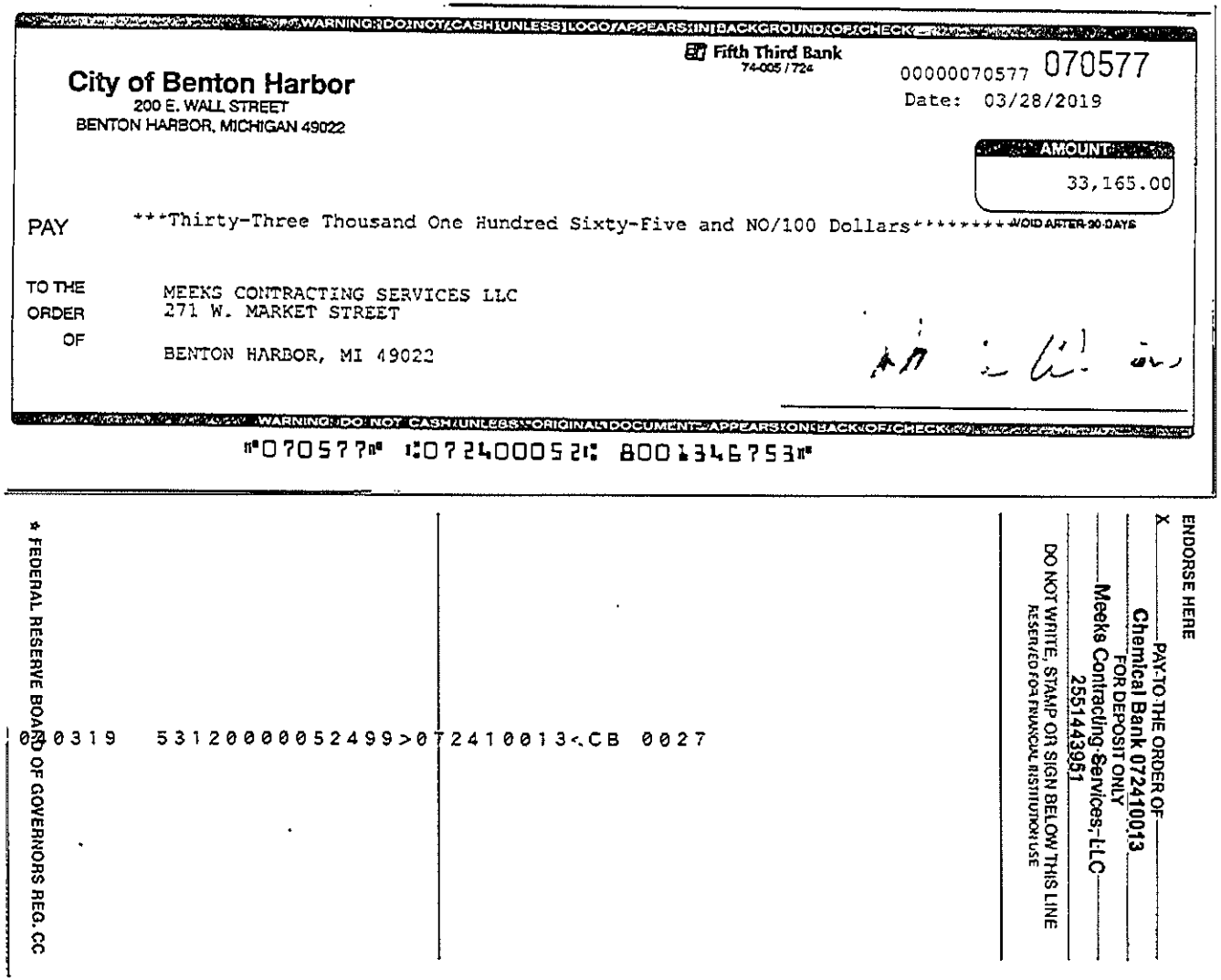
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	2139

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Line Replacement from curb stop to meter 805 McGuigan	3,600.00	3,600.00
1	Line replacement from Main to Meter 468 Colfax	5,000.00	5,000.00
		Total	$8,60



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City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005/724

00000070577 070577
Date: 03/28/2019

AMOUNT
33,165.00

PAY ***Thirty-Three Thousand One Hundred Sixty-Five and NO/100 Dollars******** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

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⑈070577⑈ ⑆072400052⑆ 800134675 3⑈

ENDORSE HERE
X
PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
255143951

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⑆072410013⑆ CB 0027

⑈ FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

Transaction Type: Check	Customer Reference #: 70577
Transaction Date: 2019-04-04	Bank Reference #: 600472385211
Amount: 33165.00	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

April 01, 2019

PAYMENT REQUEST NO. 4
For Work Completed Through 03/31/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00	
Change Orders (#1 & #2)	$	94,950.00	
Current Contract Amount	$	101,450.00	
Work Completed	$	63,111.00	10,000.10
Retainage (10%)	$	6,311.10	(1000.00) retain
Amount Earned	$	56,800.00	
Less Previous Payments (PR#1, #2 & #3)	$	47,799.90	9,000.10
Amount Due Contractor This Payment	$	9,000.10	

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — 3-27-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 4/8/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 4/9/19 Date

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

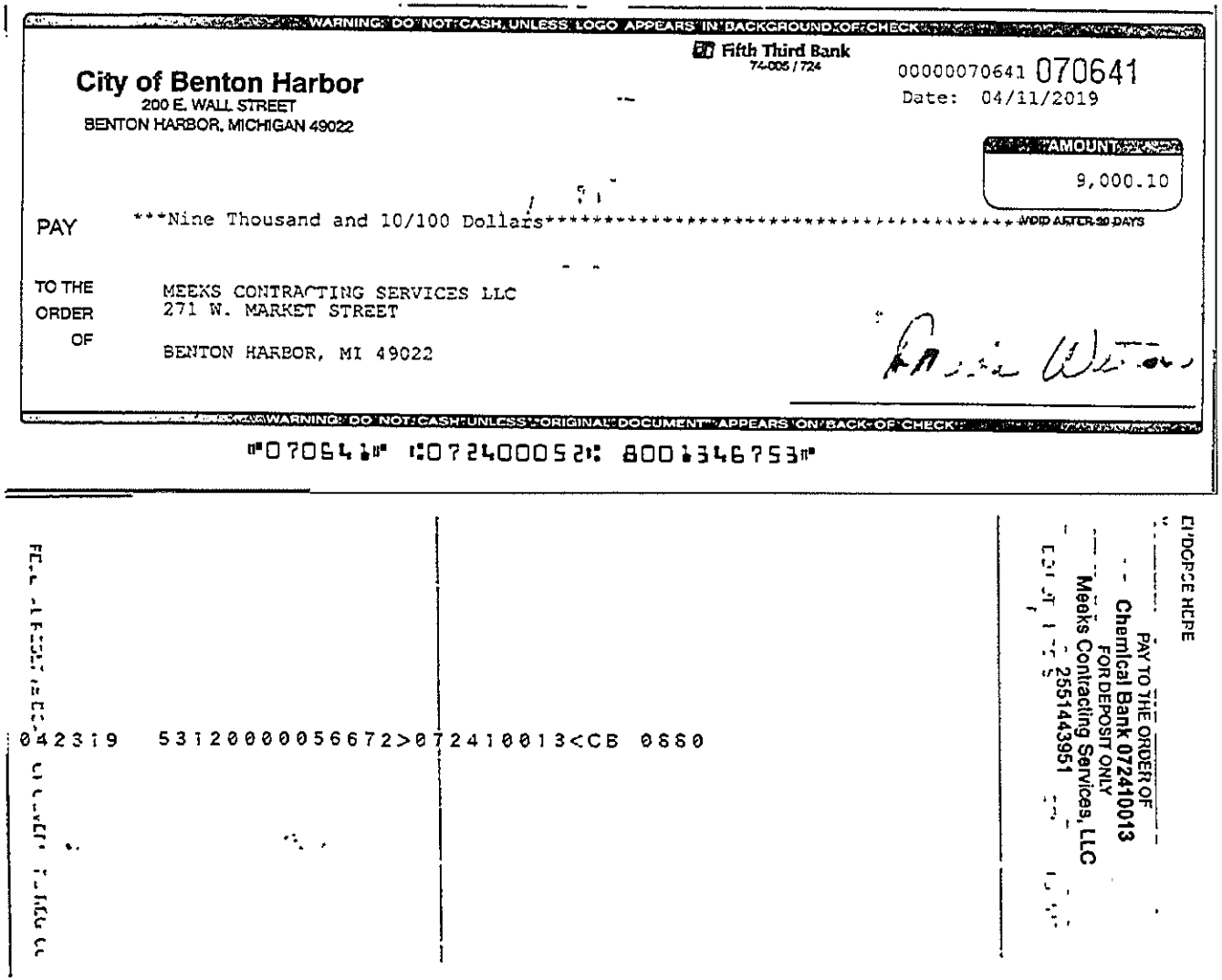
Invoice

Date	Invoice #
3/25/2019	2143

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Line replacement from Main to Meter 791 LaVette	5,000.00	5,000.00
1	Line replacement from Main to Meter 1190 McAlister	5,000.00	5,000.00
	Total		$10,000.00



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070641 070641
Date: 04/11/2019

AMOUNT
9,000.10

PAY ***Nine Thousand and 10/100 Dollars*** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070641⑈ ⑆072400052⑆ 800134675 3⑈

042319 5312000056672>072410013<CB 0880

PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
255144395 1

ENDORSE HERE

Transaction Type: Check	Customer Reference #: 70641
Transaction Date: 2019-04-23	Bank Reference #: 600474349898
Amount: 9000.10	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

May 20, 2019

PAYMENT REQUEST NO. 5
For Work Completed Through 05/09/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00
Change Orders (#1 - #3)	$	69,462.20
Current Contract Amount	$	75,962.20
Work Completed	$	75,962.20
Retainage	$	3,000.00
Amount Earned	$	72,962.20
Less Previous Payments (PR#1 - #4)	$	56,799.10
Amount Due Contractor This Payment	$	16,163.10

off -.90 16,162.20 due

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC)

5-20-19
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/21/19
Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor)

5/21/19
Date

CITY OF BENTON HARBOR
LEAD PILOT GRANT PAY REQUEST 5
MEEKS CONSTRUCTION

	PAY REQUEST 4	CHANGES	PAY REQUEST 5
ORIGINAL CONTRACT	6,500.00		6,500.00
CHANGE ORDERS	94,950.00	(25,487.80)	69,462.20
CURRENT TOTAL CONTRACT AMOUNT	101,450.00	(25,487.80)	75,962.20
WORK COMPLETED	63,111.00	12,851.20	75,962.20
RETAINAGE	6,311.00	(3,311.00)	3,000.00
DUE LESS RETAINAGE	56,800.00		72,962.20
LESS PRIOR PAYMENTS	47,799.90		56,800.00
TOTAL PAYMENT	9,000.10		16,162.20

PAYING:	INVOICE 2150	591-571-977.000	5,200.00
	INVOICE 2151	591-571-977.000	7,651.20
	RELEASE RETAINAGE	591-000-212.000	3,311.00
	TOTAL DUE		**16,162.20**

TOTAL INVOICE	RETAINAGE	PAID
5,850.00	(585.00)	5,265.00
10,411.00	(1,041.10)	9,369.90
36,850.00	(3,685.00)	33,165.00
10,000.10	(1,000.00)	9,000.10
63,111.10	(6,311.10)	56,800.00

ABONMARCHE

Engineering • Architecture • Land Surveying

MAY 20, 2019

CHANGE ORDER NO. 3
LEAD WATER SERVICE VERIFICATION PROJECT
ACI JOB#: 18-0942

OWNER
City of Benton Harbor
200 E. Wall Street
Benton Harbor, MI 49022

CONTRACTOR
Meeks Contracting Services, LLC
271 West Market Street
Benton Harbor, MI 49022

RE: Final balancing and extras.

Original Contract Amount (20 verifications @ $325/EA)	$	6,500.00
Previous Change Orders (#1 & #2)	$	+94,950.00
Previous Contract Amount	$	101,450.00
Net Changes:		
1) Reduce - 5 Replacements @ $5,000/EA	$	-25,000.00
2) Reduce - 23 Verifications @ $325/EA	$	-7,475.00
3) Reduce - 1 Replacement @ $1,400 (805 McGuigan)	$	-1,400.00
4) Reduce - City Materials used	$	-239.00
5) Add – Labor, 13 hrs @ $75/HR	$	+975.00
6) Add - HMA Patching	$	+7,651.20
Current Contract Amount	$	75,962.20

RECOMMENDED BY: CONTRACTOR

Donnie Meeks (Meeks Contracting Services, LLC)

5-20-19
Date

RECOMMENDED BY: ENGINEER

Jason Marquardt, PE (Abonmarche)

5/21/19
Date

APPROVED BY: OWNER

Darwin Watson (Benton Harbor)

5/21/19
Date

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
5/9/2019	2151

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Invoice for Extra Asphalt road repairs		
16	Dump truck hours to haul asphalt	100.00	1,600.00
48	Labor Hours 3 Labors 12hrs each	60.00	2,880.00
20.16	Tons of asphalt	70.00	1,411.20
16	Asphalt roller	35.00	560.00
16	Skidsteer	75.00	1,200.00
		Total	$7,651.20

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

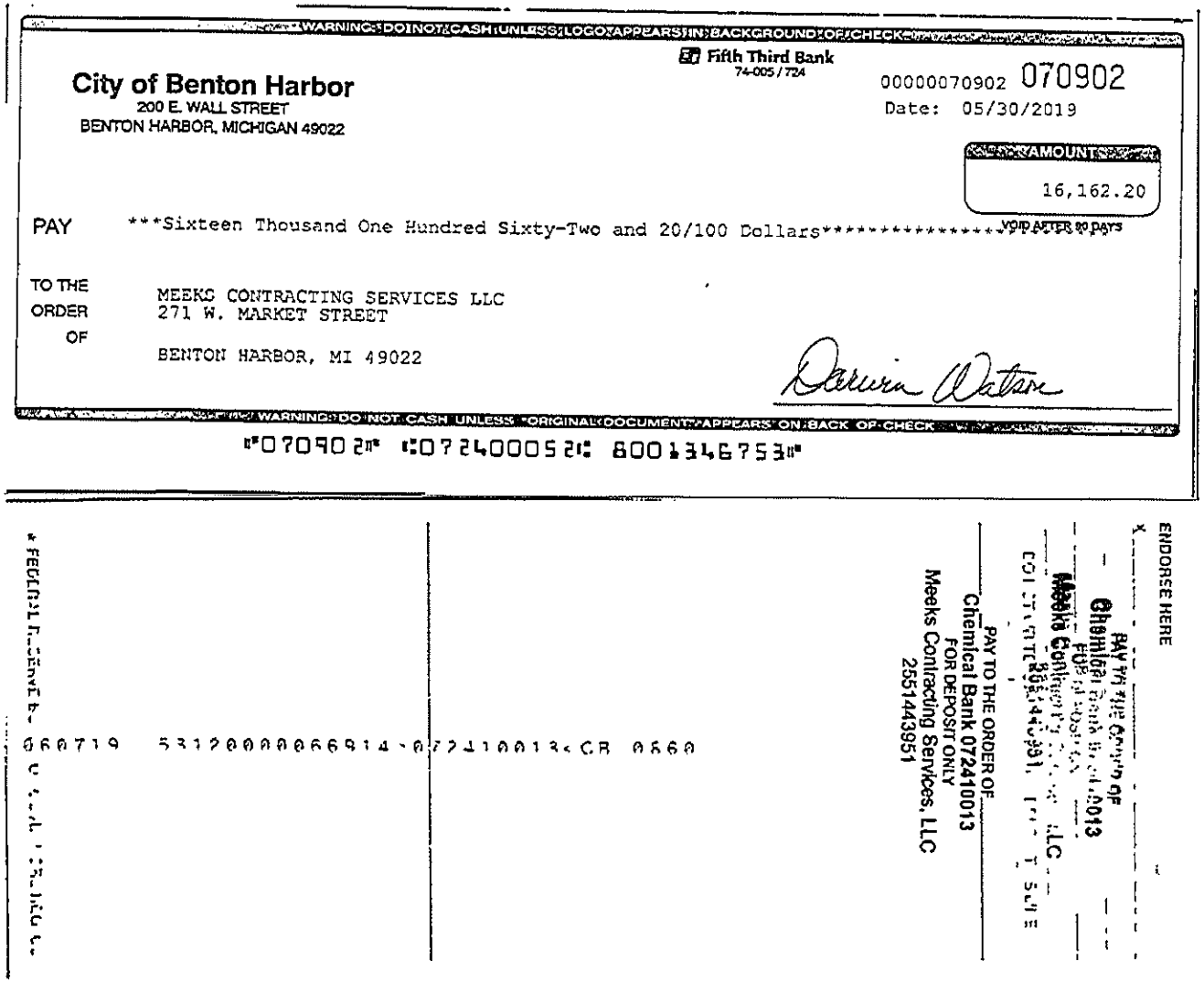
Invoice

Date	Invoice #
5/9/2019	2150

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Lead Verifications shut off		
1	696 Columbus	325.00	325.00
1	696 Columbus Additional Labor	75.00	75.00
1	831 E Britain	325.00	325.00
1	831 E Britain Additional Labor	75.00	75.00
1	652 E Empire	325.00	325.00
1	652 E Empire Additional Labor	75.00	75.00
1	487 E Britain	325.00	325.00
1	487 E Britain Additional Labor	75.00	75.00
1	463 Foster	325.00	325.00
1	463 Foster Additional Labor	75.00	75.00
1	836 Highland	325.00	325.00
1	836 Highland Additional Labor	75.00	75.00
1	742 LaSalle	325.00	325.00
1	742 LaSalle Additional Labor	75.00	75.00
1	366 Lincoln	325.00	325.00
1	366 Lincoln Additional Labor	75.00	75.00
1	235 Oden	325.00	325.00
1	235 Oden Additional Labor	75.00	75.00
1	1210 Ogden	325.00	325.00
1	1210 Ogden Additional Labor	75.00	75.00
1	275 Pipestone	325.00	325.00
1	275 Pipestone Additional Labor	75.00	75.00
1	1251 Superior	325.00	325.00
1	1251 Superior Additional Labor	75.00	75.00
1	817 Nate Wells	325.00	325.00
1	817 Nate Wells Additional Labor	75.00	75.00
		Total	$5,200.00



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005/724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070902 070902
Date: 05/30/2019

AMOUNT
16,162.20

PAY ***Sixteen Thousand One Hundred Sixty-Two and 20/100 Dollars**********

VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070902⑈ ⑆072400052⑆ 800134675 3⑈

ENDORSE HERE

PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
2551443951

Transaction Type: Check	Customer Reference #: 70902
Transaction Date: 2019-06-10	Bank Reference #: 600478195710
Amount: 16162.20	
Description:	

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
4/26/2019	190442

Bill To

City of Benton Harbor
Attn: Mike O'Malley
200 E. Wall St.
Benton Harbor, MI 49022

Phone	Fax

Job Name / Location
2" Tap Water Plant

P.O. No.	Project	Terms	Due Date
		Net 10	5/6/2019

Date	Item	Description	Quan.	Units	Rate	Amount
4/18/2019	Work Complete	2" tap at water plant	9	hrs	65.00	585.00

You may have this in drawer
Okay to pay
$585.00
Charge to
MDEQ Pilot Grant
5/14/19
BB

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases.

Total	$585.00
Payments/Credits	$0.00
Balance Due	**$585.00**

Phone #
269-925-6999

Fax #
269-925-0578

Vendor: 068[redacted] B & Z COMPANY Check #: 00000070881 05/28/2019

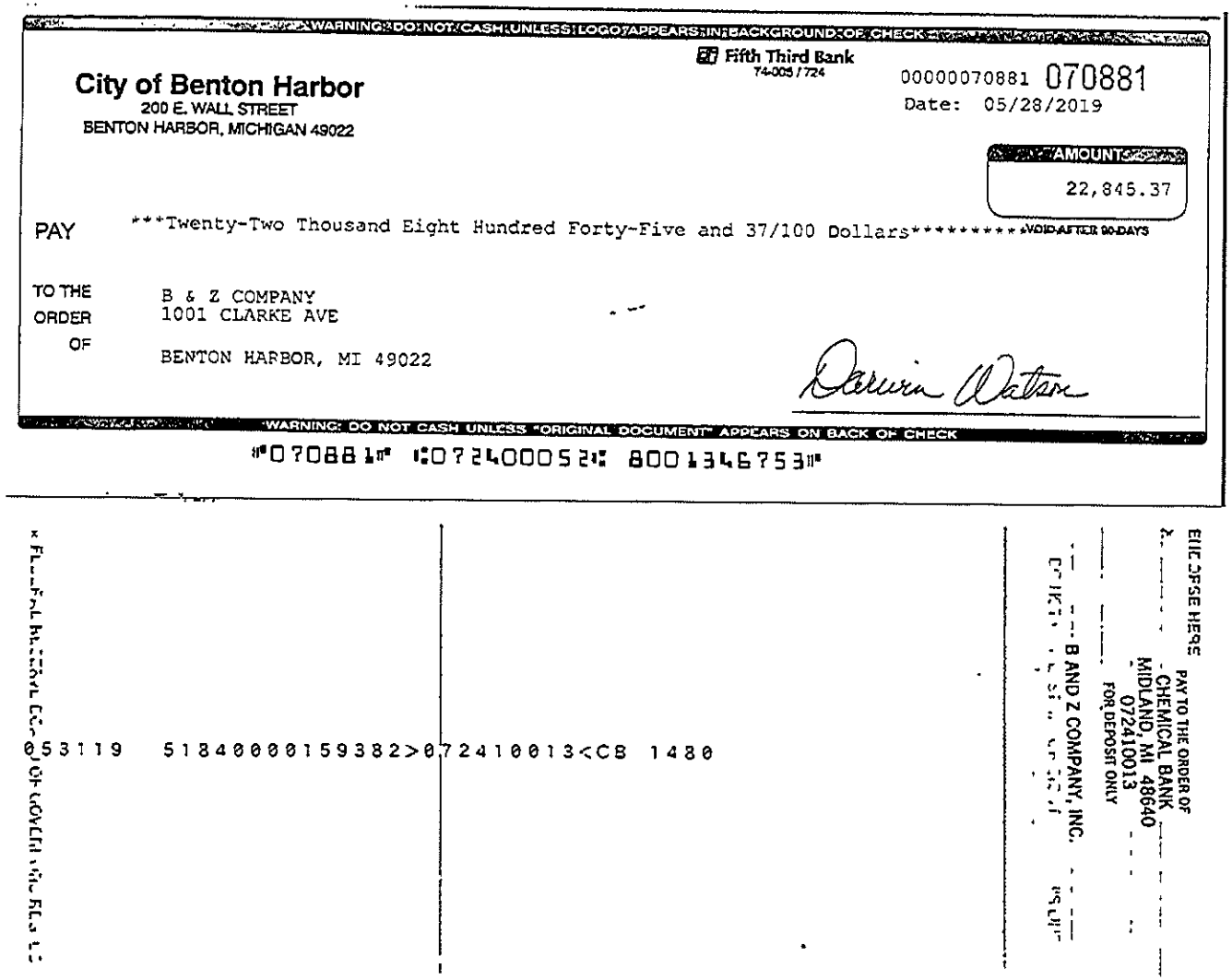
Date	Invoice	Description/Detail	Amount
04/18/19	190424	ROAD REPAIR - WAUCONDA-CONCRETE AT SAN S	9,830.59
04/19/19	190430	ROAD REPAIR-CONCRETE, MILTON-WM BREAK	1,505.50
04/26/19	190442	2" TAP AT WATER PLANT	585.00
05/06/19	190462	REPLACE WATER LINE AT BRITAIN & COLUMBUS	10,924.28

Total: 22,845.37

04/18/2019	190424	591-572-930.000	REPAIRS & MAINT	9,830.59

Entered By Mo. Day Yr.

Finance Approval Mo. Day Yr.



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070881 070881
Date: 05/28/2019

AMOUNT
22,845.37

PAY ***Twenty-Two Thousand Eight Hundred Forty-Five and 37/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
B & Z COMPANY
1001 CLARKE AVE
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070881⑈ ⑆072400052⑆ 800134675 3⑈

PAY TO THE ORDER OF
- CHEMICAL BANK
MIDLAND, MI 48640
072410013
FOR DEPOSIT ONLY

B AND Z COMPANY, INC.

053119 5184000015938 2>072410013<CB 1480

Transaction Type: Check	Customer Reference #: 70881
Transaction Date: 2019-06-03	Bank Reference #: 600479064452
Amount: 22845.37	
Description:	

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
5/9/2019	2155

Bill To
City of Benton Harbor Public Works 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Placing tap inside of water plant	275.00	275.00

Req S332832
5/9/19
#275.00

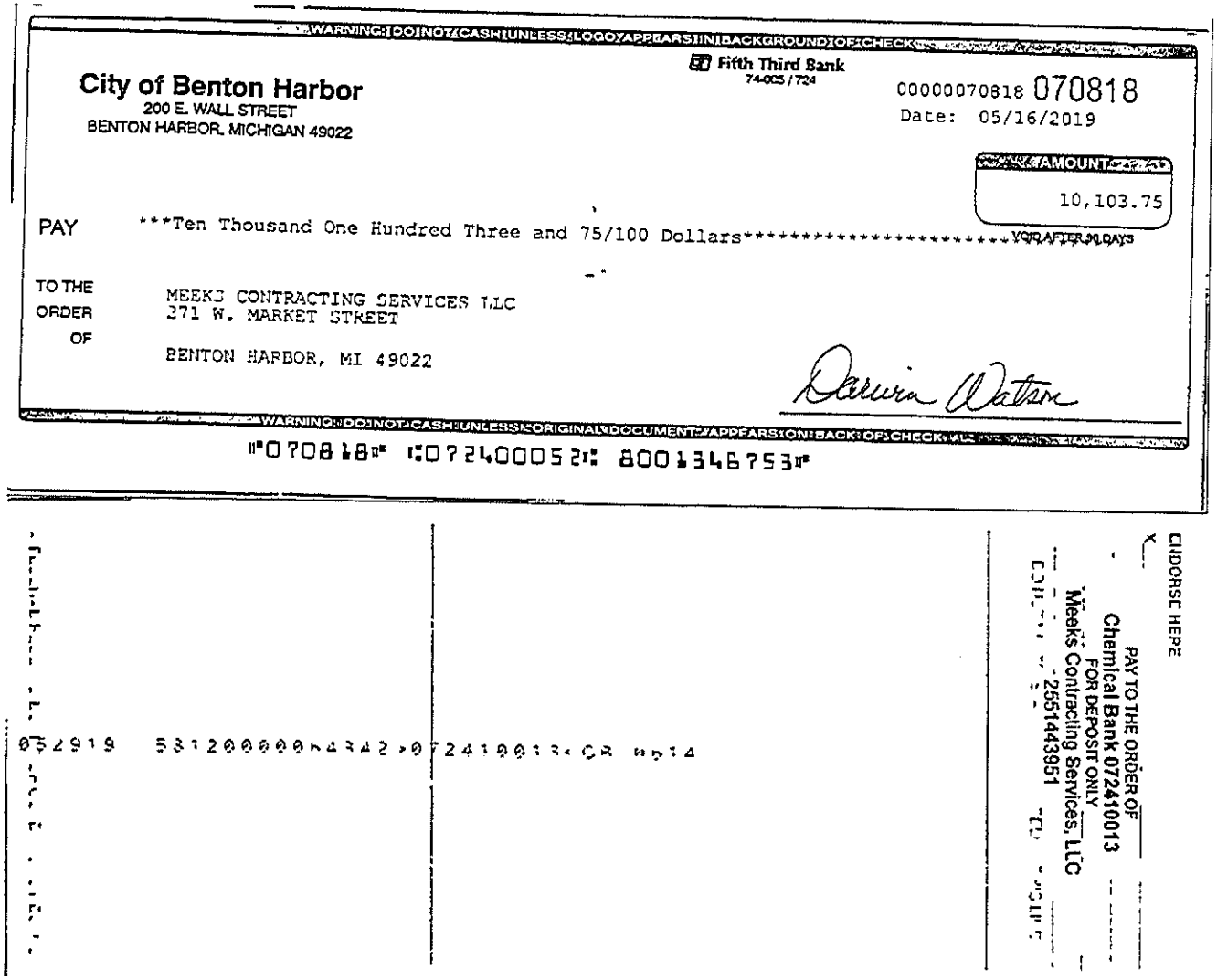
Tap on 30" suction line for Ortho Poly Phosphate ~~March~~ in time work done in for 3/26/19 start-up

	Total	$275.00

Vendor: 0798 MEEKS CONTRACTING SERVICES LLC Check #: 00000070818 05/16/2019

Date	Invoice	Description/Detail	Amount
05/09/19	2152	EMERGENCY SEWER REPAIR, DUMP TRUCK, LABO	3,903.75
05/09/19	2155	PLACING TAP INSIDE OF WATER PLANT	275.00
05/09/19	2154	WATERMAIN REPAIR ON HINKLEY NEAR WATER S	3,175.00
05/09/19	2153	WATER BOX EXCAVATION & SHUT OFF-808 BUSS	600.00
05/09/19	2156	REPLACING LEAD SERVICE LINE-1174 BROADWA	2,150.00

Total: 10,103.75



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005 / 724

00000070818 070818
Date: 05/16/2019

AMOUNT
10,103.75

PAY ***Ten Thousand One Hundred Three and 75/100 Dollars**********VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070818⑈ ⑆072400052⑆ 800134675 3⑈

ENDORSE HERE

PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
2551443951

Transaction Type: Check	Customer Reference #: 70818
Transaction Date: 2019-05-30	Bank Reference #: 600475794356
Amount: 10103.75	
Description:	

CORE & MAIN™

INVOICE

1830 Craig Park Court
St. Louis, MO 63146

Invoice #	J439198
Invoice Date	9/13/18
Account #	600720
Sales Rep	DAVID SYSON
Phone #	616-222-9500
Branch #259	Kentwood, MI
Total Amount Due	$11,646.00

Remit To:
CORE & MAIN LP
PO BOX 28330
ST LOUIS, MO 63146

CITY OF BENTON HARBOR
200 E WALL ST
BENTON HARBOR MI 49022 4430

000/0000
00000

Shipped To:
601 N RIDGEWAY
BENTON HARBOR, MI

3 lot

Thank you for the opportunity to serve you! We appreciate your prompt payment.

Date Ordered	Date Shipped	Customer PO #	Job Name	Job #	Bill of Lading	Shipped Via	Invoice#
8/31/18	9/12/18	S332475	S332475			CORE & MAIN LP	J439198

Product Code	Description	Quantity Ordered	Quantity Shipped	Quantity B/O	Price	UM	Extended Price
/20015429457	74776S-22 3/4 90 FEM FLR X -22 BID SEQ# 10	25	25		28.72000	EA	718.00
/20015429458	74701L 3/4 CC X FLR CORP BID SEQ# 20	25	25		25.92000	EA	648.00
0807S100K	3/4 SOFT K COPPER TUBE 100' BID SEQ# 30	2000	2000		2.83000	FT	5,660.00
59I95E	95E (I) CURB BOX CAST IRON BID SEQ# 40	60	60		55.92000	EA	3,355.20
37077610022	76100-22 3/4 CURB STOP COMP X COMP NO LEAD BID SEQ# 50	20	20		63.24000	EA	1,264.80

Freight	Delivery	Handling	Restock	Misc

Terms: NET 30

Subtotal:	11,646.00
Other:	.00
Tax:	.00
Invoice Total:	$11,646.00

This transaction is governed by and subject to Core & Main's standard terms and conditions, which are incorporated by reference and accepted.
To review these terms and conditions, please visit: http://tandc.coreandmain.com/

FIFTH THIRD BANK
(WESTERN MICHIGAN)
P.O. BOX 630900 CINCINNATI OH 45263-0900

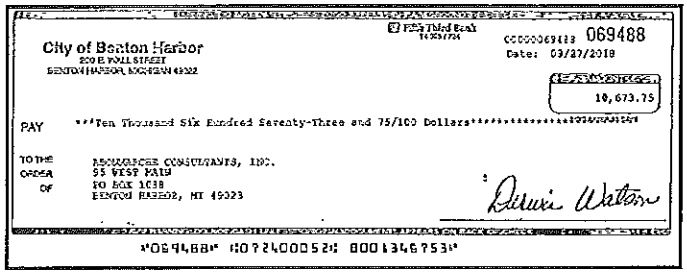
CITY OF BENTON HARBOR
GENERAL ACCT
ATTN FINANCE DIRECTOR
PO BOX 648
BENTON HARBOR MI 49023-0648

0

1560

Statement Period Date: 10/1/2018 - 10/31/2018
Account Type: COMM'L 53 ANALYZED
Account Number: 8001346753

Banking Center: St Joseph South
Banking Center Phone: 269-983-0983
Commercial Client Services: 866-475-0729


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

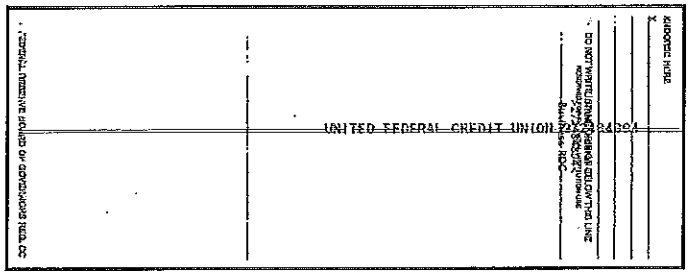
069488
Date: 09/27/2018

AMOUNT
10,673.75

PAY ***Ten Thousand Six Hundred Seventy-Three and 75/100 Dollars**********

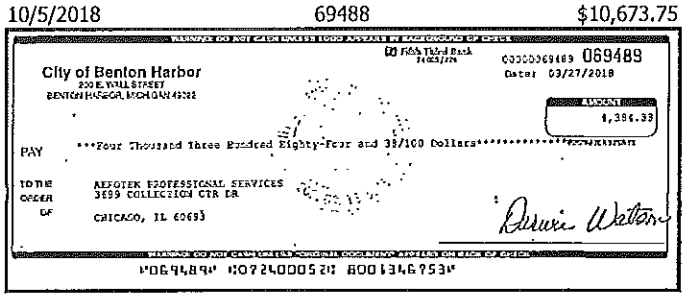
TO THE ORDER OF
ABSOLUTE CONSULTANTS, INC.
55 WEST MAIN
PO BOX 1038
BENTON HARBOR, MI 49023

⑈069488⑈ ⑆072400052⑆ 8001346753⑈


UNITED FEDERAL CREDIT UNION

10/5/2018 69488 $10,673.75

10/5/2018 69488 $10,673.75


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

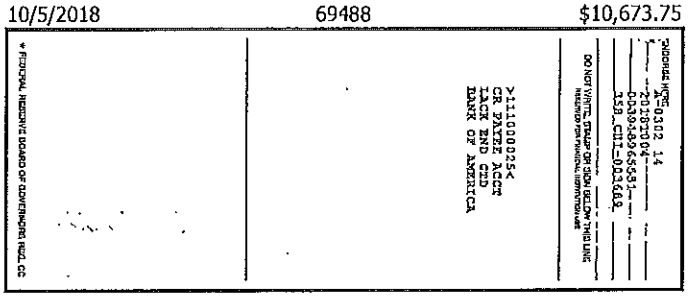
069489
Date: 09/27/2018

AMOUNT
4,384.38

PAY ***Four Thousand Three Hundred Eighty-Four and 38/100 Dollars**********

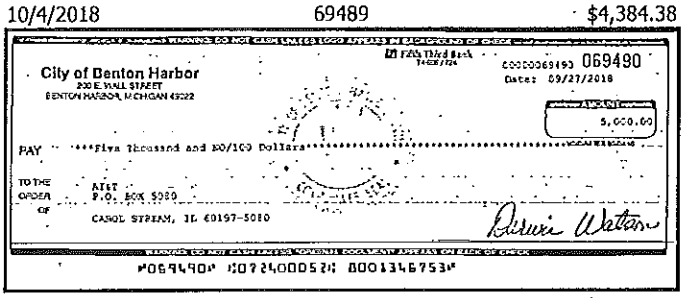
TO THE ORDER OF
AEROTEK PROFESSIONAL SERVICES
3699 COLLECTION CTR DR
CHICAGO, IL 60693

⑈069489⑈ ⑆072400052⑆ 8001346753⑈


>111000025<
CR PAYEE ACCT
BACK END GRD
BANK OF AMERICA

10/4/2018 69489 $4,384.38

10/4/2018 69489 $4,384.38


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

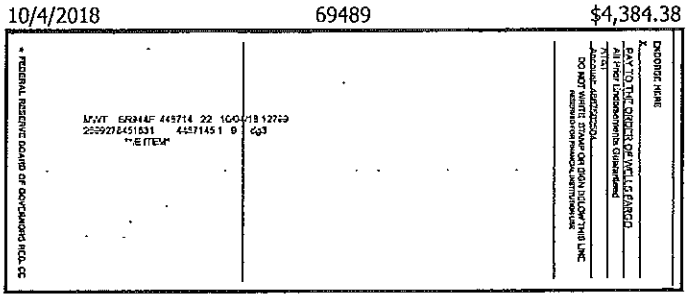
069490
Date: 09/27/2018

AMOUNT
5,000.00

PAY ***Five Thousand and 00/100 Dollars**********

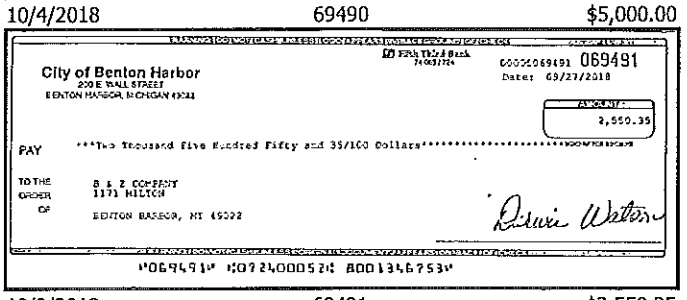
TO THE ORDER OF
AT&T
P.O. BOX 5080
CAROL STREAM, IL 60197-5080

⑈069490⑈ ⑆072400052⑆ 8001346753⑈


DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/4/2018 69490 $5,000.00

10/4/2018 69490 $5,000.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

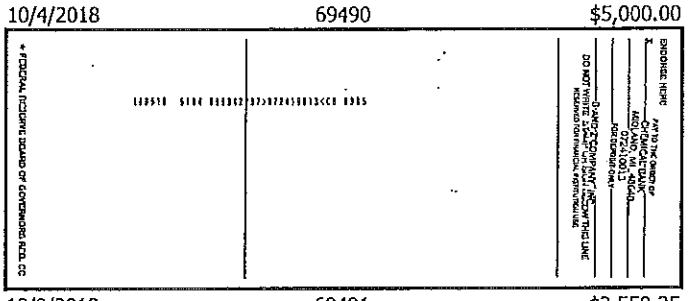
069491
Date: 09/27/2018

AMOUNT
2,550.35

PAY ***Two Thousand Five Hundred Fifty and 35/100 Dollars**********

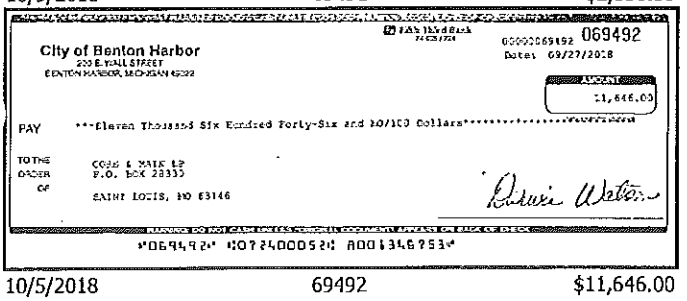
TO THE ORDER OF
B & Z COMFORT
1171 MILTON
BENTON HARBOR, MI 49022

⑈069491⑈ ⑆072400052⑆ 8001346753⑈


DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/9/2018 69491 $2,550.35

10/9/2018 69491 $2,550.35


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

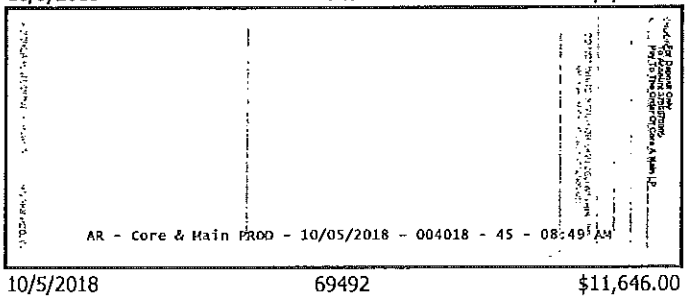
069492
Date: 09/27/2018

AMOUNT
11,646.00

PAY ***Eleven Thousand Six Hundred Forty-Six and 00/100 Dollars**********

TO THE ORDER OF
CORE & MAIN LP
P.O. BOX 28335
SAINT LOUIS, MO 63146

⑈069492⑈ ⑆072400052⑆ 8001346753⑈


AR - Core & Main PROD - 10/05/2018 - 004018 - 45 - 08:49:14 AM

10/5/2018 69492 $11,646.00

10/5/2018 69492 $11,646.00

INVOICE

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
2/18/19	277320	277320
PURCHASE ORDER NUMBER		DUE DATE
97179		3/20/19
TERMS		
NET 30 DAYS		3/20/19

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

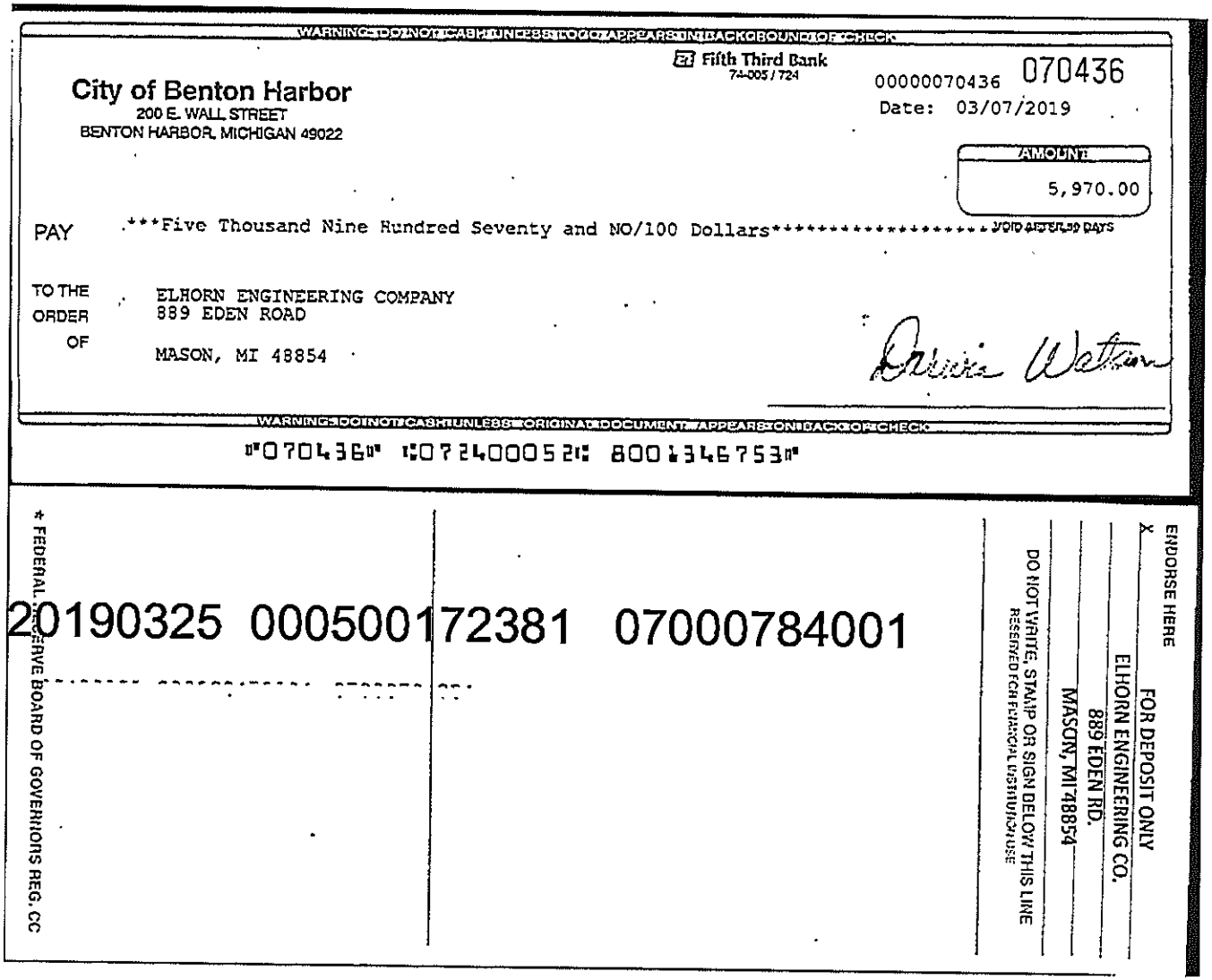
SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
1	XT600	FORCE FLOW CARBOY SCALE	2150.00	EA	$2,150.00
1	S3007	STENNER PUMP	980.00	EA	980.00
1	49287	3/4" NPT CORPORATION	290.00	EA	290.00
1	LABOR	INSTALL EQUIPMENT, TESTING	2550.00	EA	2,550.00
		TOTAL AMOUNT DUE.....			$5,970.00

Reg S 332721
3/4/19
Equipment needed for Start-up for new water treatment System @ water plant for Lead & Copper Control
Change to MDEQ Pilot Grant
$5,970

COMMENT
PLEASE INCLUDE INVOICE NUMBER WITH YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$5,970.00



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005 / 724

00000070436 070436
Date: 03/07/2019

AMOUNT
5,970.00

PAY ***Five Thousand Nine Hundred Seventy and NO/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
ELHORN ENGINEERING COMPANY
889 EDEN ROAD
MASON, MI 48854

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070436⑈ ⑆072400052⑆ 8001346753⑈

20190325 000500172381 07000784001

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

ENDORSE HERE
X FOR DEPOSIT ONLY
ELHORN ENGINEERING CO.
889 EDEN RD.
MASON, MI 48854

DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE

Transaction Type: Check	Customer Reference #: 70436
Transaction Date: 2019-03-25	Bank Reference #: 600471700241
Amount: 5970.00	
Description:	

INVOICE

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
3/12/19	277556	277556
PURCHASE ORDER NUMBER		DUE DATE
96065		4/11/19
TERMS		
NET 30 DAYS		4/11/19

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
		PO#S332722			
4	8600-55	CARUS 8600 LIQUID 55GAL	522.50	EA	2,090.00
1	EL1110	DELIVERY CHARGE	20.00	EA	20.00
		TOTAL AMOUNT DUE.....			$2,110.00

Ref S 332722

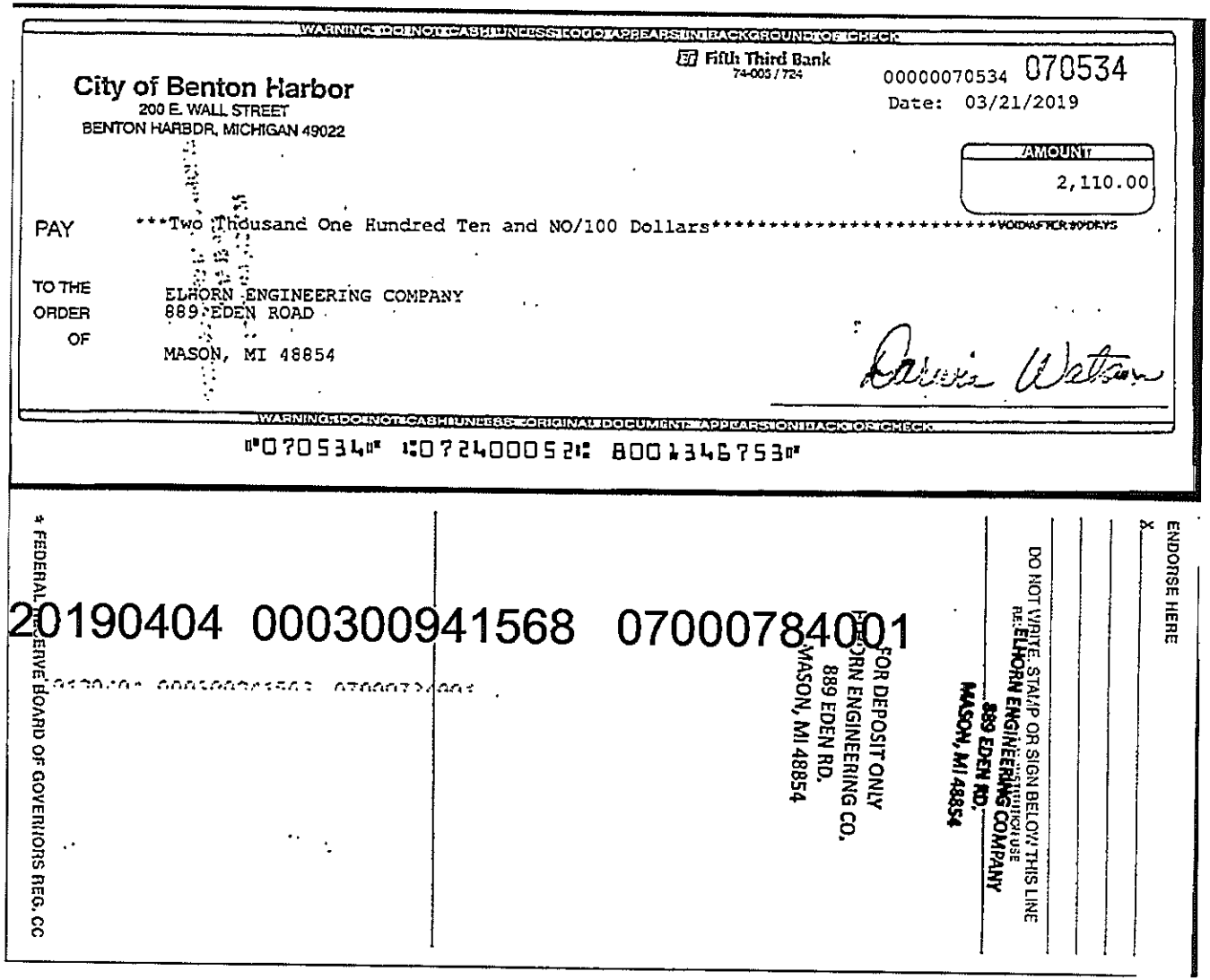
3/26/19

COMMENT

PLEASE INCLUDE INVOICE NUMBER WITH
YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$2,110.00

V 10534



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City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005/724

00000070534 070534
Date: 03/21/2019

AMOUNT
2,110.00

PAY ***Two Thousand One Hundred Ten and NO/100 Dollars**********VOID AFTER 90 DAYS

TO THE ORDER OF
ELHORN ENGINEERING COMPANY
889 EDEN ROAD
MASON, MI 48854

Patricia Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070534⑈ ⑆072400052⑆ 800134675 3⑈

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

20190404 000300941568 0700078401

FOR DEPOSIT ONLY
ELHORN ENGINEERING CO.
889 EDEN RD.
MASON, MI 48854

DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE
RE: ELHORN ENGINEERING COMPANY
889 EDEN RD.
MASON, MI 48854

ENDORSE HERE
X

Transaction Type: Check	Customer Reference #: 70534
Transaction Date: 2019-04-04	Bank Reference #: 600472890917
Amount: 2110.00	
Description:	

INVOICE

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
5/14/19	278419	278419
PURCHASE ORDER NUMBER		DUE DATE
96823		6/13/19
TERMS		
NET 30 DAYS		6/13/19

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
1	DR300P	POCKET COLORIMETER/PO4	490.00	EA	$490.00
2	2106069	PHOSVER 3 REAGENT 10ML SAMPLE	46.00	100	92.00
		TOTAL AMOUNT DUE.....			$582.00

Reg $332847
5/22/19
#582.00
Reimburse through MDEQ Pilot Grant

COMMENT

PLEASE INCLUDE INVOICE NUMBER WITH
YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$582.00

Vendor: 805362416 ELHORN ENGINEERING COMPANY Check #: 00000070896 05/30/2019

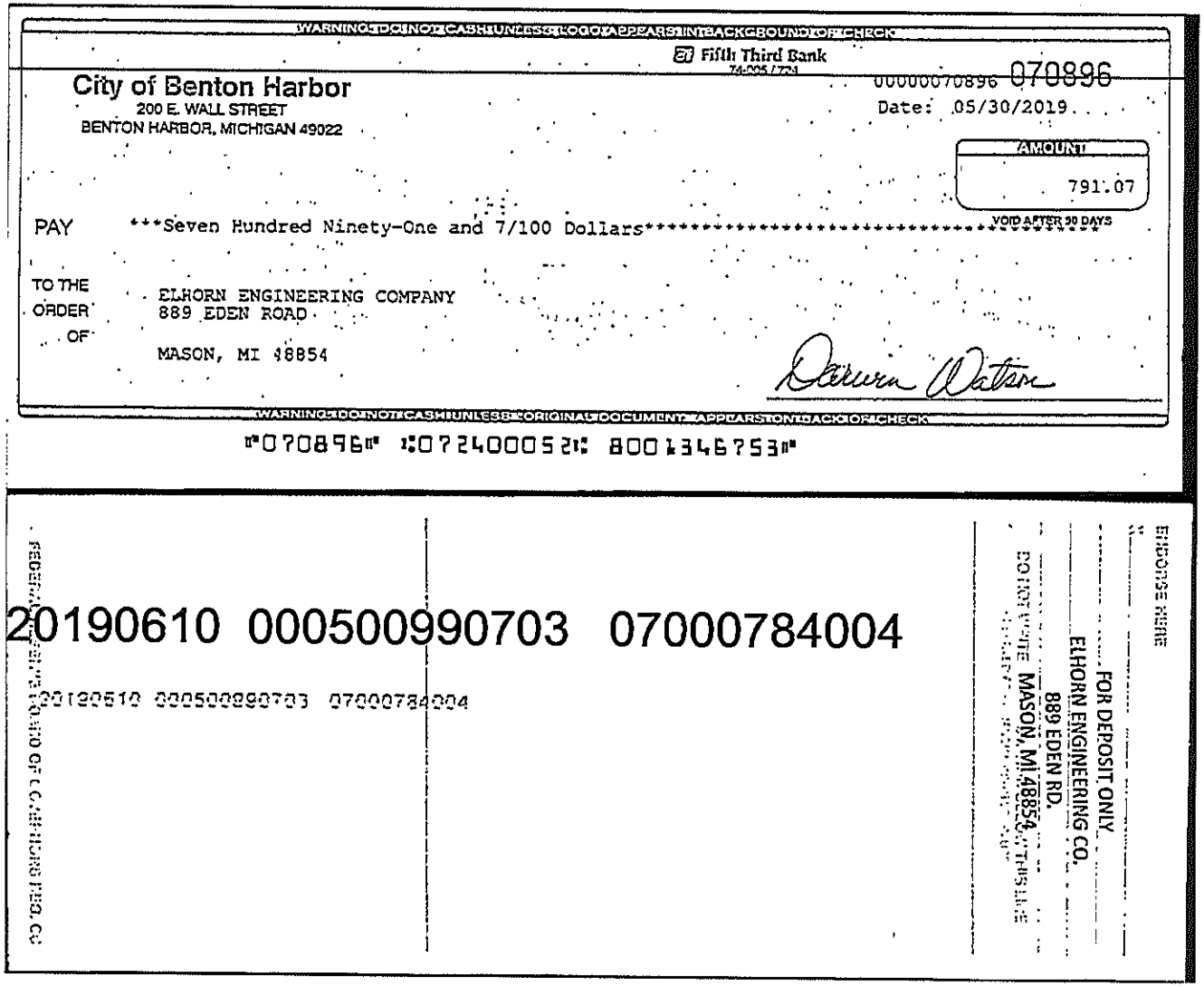
Date	Invoice	Description/Detail	Amount
05/14/19	278419	POCKET COLORIMETER, PHOSVER	582.00
05/17/19	278476	BAND SADDLE & FREIGHT	209.07

Total: 791.07

05/14/2019	278419	591-570-740.000	OPERATING SUPPLIES	582.00

Entered By Mo. Day Yr.

Finance Approval Mo. Day Yr.



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Fifth Third Bank
74-005/724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

0000070896 070896

Date: 05/30/2019

AMOUNT
791.07

VOID AFTER 90 DAYS

PAY ***Seven Hundred Ninety-One and 7/100 Dollars**********

TO THE ORDER OF
ELHORN ENGINEERING COMPANY
889 EDEN ROAD
MASON, MI 48854

Dawn Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070896⑈ ⑆072400052⑆ 800134675 3⑈

20190610 000500990703 07000784004

20190610 000500990703 07000784004

ENDORSE HERE

FOR DEPOSIT ONLY
ELHORN ENGINEERING CO.
889 EDEN RD.
MASON, MI 48854

Transaction Type: Check	Customer Reference #: 70896
Transaction Date: 2019-06-10	Bank Reference #: 600479236871
Amount: 791.07	
Description:	

Mead & White Electric, Inc.
and
Colip Electric, Inc.
Serving Indiana and Michigan

INVOICE #
B8044-4

SOLD TO
BENTON HARBOR WATER WORKS
200 E. WALL ST
ATTN: A/P WATER
BENTON HARBOR, MI 49022

JOB INFO
BH WATER WORKS - REMOTE PANEL
FOR NEW ALUM PUMP, CHECK SIZE
AND LOCATION

M&W ACCT NO	PO NUMBER			TERMS	INVOICE DATE	PAGE
BHWW10	MIKE O'MALLEY			Net 30	3/31/2019	1

Final invoice for work completed (3/1/19 - 3/31/19)

	QUANTITY	DESCRIPTION	TRADE UNIT	EXTENDED
	18.50	ELECTRICIAN LABOR HOURS	95.00	1,757.50*
	1	MATERIALS	516.92	516.92

* means item is non-taxable

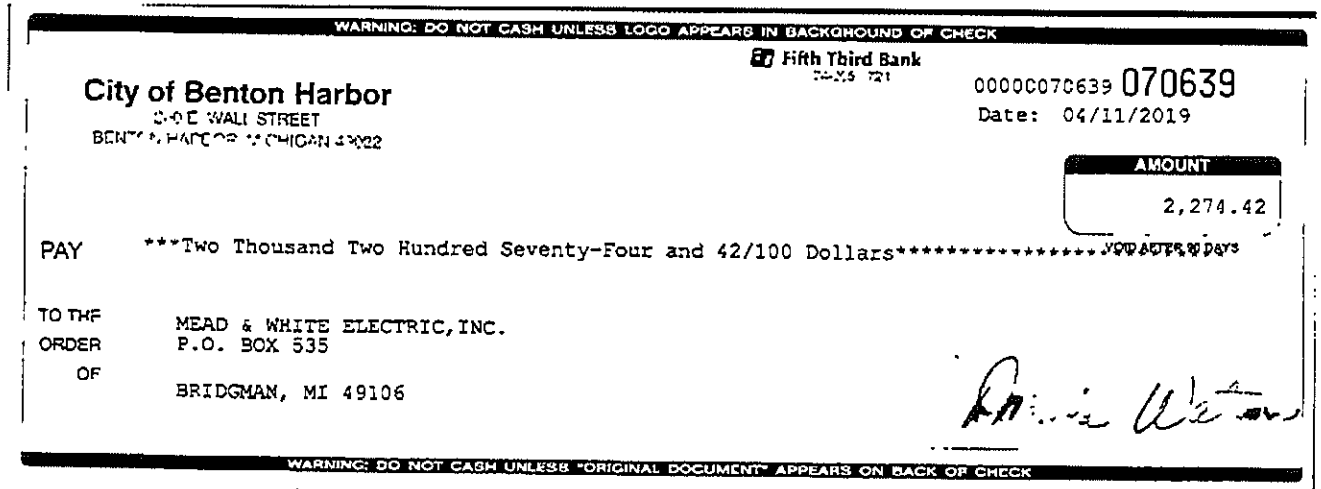
TOTAL AMOUNT **2,274.42**

Reg. 53327444
04.09.2019

Please Remit to: **Mead & White/Colip Electric, Inc.** ¤ **P.O. Box 535** ¤ **Bridgman, MI 49106**

Material furnished on this job is owned by Mead & White Electric until all payment for work performed has been paid in full; property is subject to contractors lien for nonpayment.

VISA DISCOVER MasterCard **Call (269) 465-6922 or (574) 288-4708 to pay by Credit Card**



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank

City of Benton Harbor
200 E WALL STREET
BENTON HARBOR MICHIGAN 49022

00000070639 070639
Date: 04/11/2019

AMOUNT
2,274.42

PAY ***Two Thousand Two Hundred Seventy-Four and 42/100 Dollars**********

TO THE ORDER OF
MEAD & WHITE ELECTRIC,INC.
P.O. BOX 535

BRIDGMAN, MI 49106

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070639⑈ ⑆072400052⑆ 800134675 3⑈

For Deposit Only - JPMC

for deposit only

Transaction Type: Check	Customer Reference #: 70639
Transaction Date: 2019-04-22	Bank Reference #: 600431472775
Amount: 2274.42	
Description:	

Mead & White Electric, Inc.
and
Colip Electric, Inc.
Serving Indiana and Michigan

INVOICE #
B8539

SOLD TO
BENTON HARBOR WATER WORKS
200 E. WALL ST
ATTN: A/P WATER
BENTON HARBOR, MI 49022

JOB INFO
BH WATER WORKS-LEAD PHOSPHATE
PUMP POWER INSTALLATION

M&W ACCT NO	PO NUMBER			TERMS	INVOICE DATE	PAGE
BHWW10	MIKE O'MALLEY			Net 30	3/14/2019	1

	QUANTITY	DESCRIPTION	TRADE UNIT	EXTENDED
	19.00	ELECTRICIAN LABOR HOURS	95.00	1,805.00*
	1	MATERIALS	307.92	307.92

* means item is non-taxable

TOTAL AMOUNT **2,112.92**

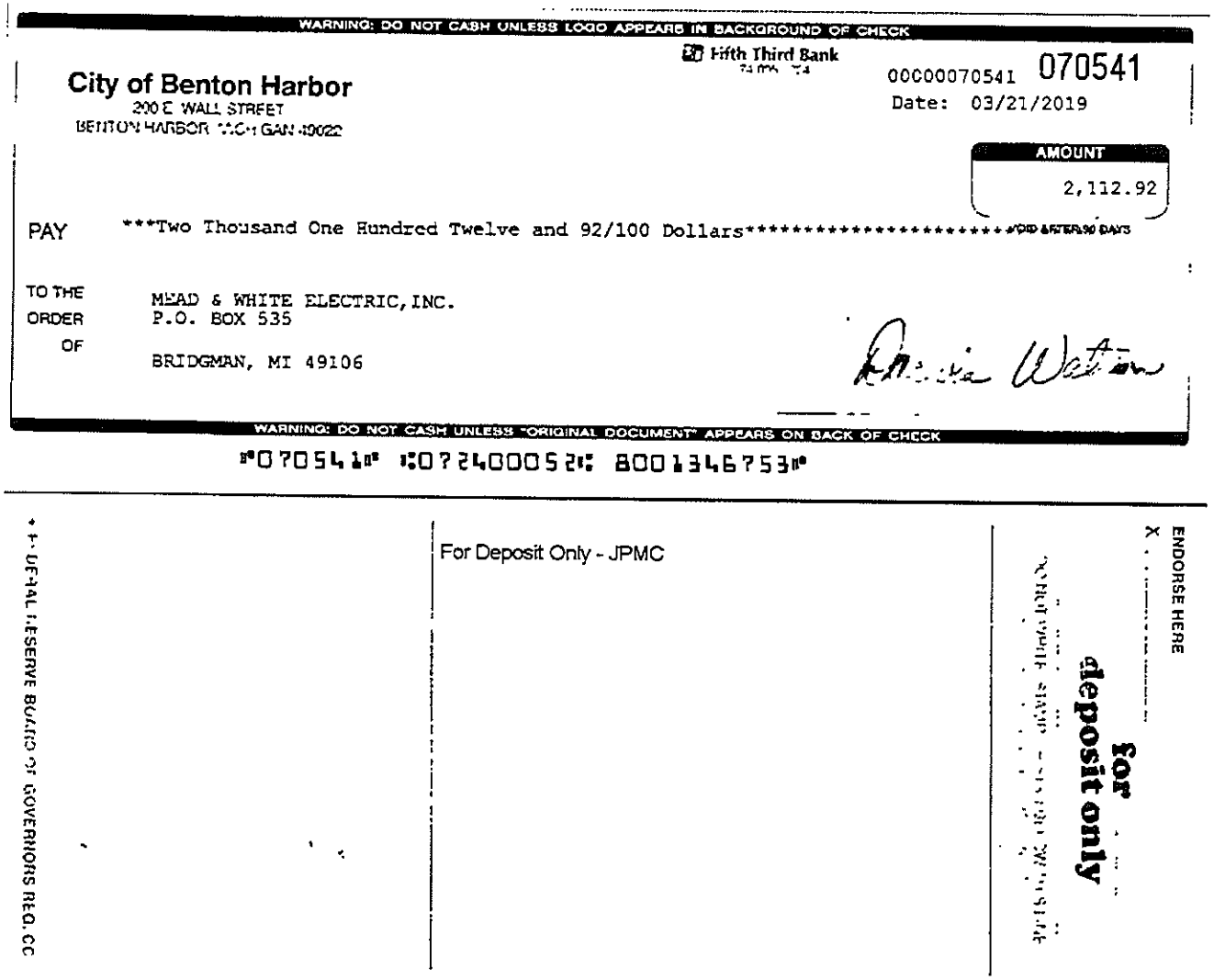
Ref # 332682
3/20/19 #2,112.92

Please Remit to: **Mead & White/Colip Electric, Inc.** ¤ **P.O. Box 535** ¤ **Bridgman, MI 49106**

Material furnished on this job is owned by Mead & White Electric until all payment for work performed has been paid in full; property is subject to contractors lien for nonpayment.

VISA DISCOVER

Call (269) 465-6922 or (574) 288-4708 to pay by Credit Card



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank

City of Benton Harbor
200 E WALL STREET
BENTON HARBOR MICHIGAN 49022

00000070541 070541
Date: 03/21/2019

AMOUNT
2,112.92

PAY ***Two Thousand One Hundred Twelve and 92/100 Dollars**********VOID AFTER 90 DAYS

TO THE ORDER OF
MEAD & WHITE ELECTRIC,INC.
P.O. BOX 535

BRIDGMAN, MI 49106

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070541⑈ ⑆072400052⑆ 800134675 3⑈

THE FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

For Deposit Only - JPMC

ENDORSE HERE
X

for deposit only

Transaction Type: Check	Customer Reference #: 70541
Transaction Date: 2019-04-08	Bank Reference #: 600476711145
Amount: 2112.92	
Description:	

From:	Bolt, Jennifer (EGLE)
To:	Oswald, Eric (EGLE); Lachance, Amy (DEQ); Thurston, Brian (EGLE); Philip, Kris (DEQ)
Cc:	McClellan, Michael (EGLE); Dean, Scott (EGLE); Boeskool, Travis (EGLE); Eickholt, Jay (EGLE); Strong, Regina (EGLE)
Subject:	FW: Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)
Date:	Wednesday, July 24, 2019 5:11:11 PM
Attachments:	0600_Benton Harbor_LCR_ALE letter 2019-1.pdf

Lead Action Level exceedance for the city of Benton Harbor. Benton Harbor is a municipal water supply in Berrien County with a population of 9970.
Please let me know if you have any questions.

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

Follow Us | **Michigan.gov/EGLE**

From: Bolt, Jennifer (EGLE)
Sent: Wednesday, July 24, 2019 4:31 PM
To: DARWIN WATSON <dwatson@cityofbentonharbormi.gov>
Cc: Vincent, Courtney (DEQ) <VincentC4@michigan.gov>; Mike O'Malley <momalley@cityofbentonharbormi.gov>; Marcus Muhammed <mmuhammad@cityofbentonharbormi.gov>; Antonyia Wade <awade@cityofbentonharbormi.gov>; kthompson@cityofbentonharbormi.gov; dharlan@fv-operations.com; nbritten@bchdmi.org; Nick Margaritis <nmargaritis@bchdmi.org>; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>; Walstrom, Kimberly (EGLE) <walstromK@michigan.gov>
Subject: Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)

Mr. Watson,
Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures.
Please note that a lead Action Level exceedance requires a Public Notice to your community within 3 business days of this email. This advisory must be distributed by July 29, 2019.
A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact me at your convenience.
Thank you,

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

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STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 24, 2019

VIA E-MAIL AND U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from January 1, 2019, through June 30, 2019, Benton Harbor community water supply's ninetieth percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	27 ppb	12	0 ppb – 59 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements, along with a sample copy of your consumer notice, 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format, visit Michigan.gov/LCR. Select the appropriate report form based on whether you are or are not collecting samples from sites with lead services lines.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and information about the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material, along with a PE distribution certification form, must be submitted to EGLE no later than ten days after the PE is due.

Conduct WQP Monitoring
As part of installing corrosion control treatment, you have been requested to collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your second AL exceedance. You recently installed corrosion control treatment using a phosphate product to reduce corrosion. As part of this installation, a coupon study was to be performed. Results from this study should be used to help identify the dosage necessary to sufficiently reduce corrosion rates in the distribution system. EGLE looks forward to receiving the study results and the recommendations based off those results.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between July 1 and December 31, 2019, and again between January 1 and June 30, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1, or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first liter and fifth liter sample from each sampling location.

Within 30 days of learning of results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks (Starting July 1st)	Collect WQP samples. (Entry Point)	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
August 29, 2019	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2019	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
September 28, 2019	For the January through June 2019 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2020	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
March 31, 2020	For the July through December 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
September 29, 2020	For the January through June 2020 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc: Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Ernie Sarkipato, Surface Water Specialist, EGLE
Mr. Jeremy Klein, District Analyst, EGLE
cc/enc: Mr. Mike O'Malley, City of Benton Harbor

From:	Bolt, Jennifer (EGLE)
To:	Oswald, Eric (EGLE); Krisztian, George (EGLE); Thurston, Brian (EGLE); Philip, Kris (DEQ) (PHILIPK@michigan.gov); Onan, Brandon (DEQ) (OnanB@michigan.gov); Crider, Steven (DHHS); Che, Xun (DHHS-Contractor)
Cc:	McClellan, Michael (EGLE); Dean, Scott (EGLE); Boeskool, Travis (EGLE); Eickholt, Jay (EGLE); Gohlke, Holly (EGLE); Padden, James (MDARD); "Sean Dunleavy (MDARD) (dunleavys@michigan.gov)"; Singh, Anita (EGLE); Czarnecki, Stephen (MDARD)
Subject:	FW: Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)
Date:	Thursday, January 16, 2020 6:45:20 PM
Attachments:	0600_Benton Harbor_LCR_ALE letter 2019-2_FINALIZED.pdf EQP6791_Public Advisory Distribution Checklist_EGLE.pdf PE Certificate -DRAFT 5 8 2019 NON-FACILITY 2.docx LCR_WQP_Report_ALE.docx Lead and Copper Tap Sample Site Selection Criteria.pdf

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Lead Action Level exceedance for the city of Benton Harbor. This Action Level exceedance is for the Jul-Dec 2019 monitoring period. This is a continuing ALE and not a new event. Benton Harbor installed corrosion control treatment in early 2019.
Benton Harbor is a municipal water supply in Berrien County with a population of 9970.
This community does have lead service lines. They collected samples from 39 sites. Ten sites had elevated lead levels. This community would have had a lead Action Level exceedance regardless of the $1^{st}/5^{th}$ liter sampling methodology. The 90th percentile calculation with the $1^{st}/5^{th}$ liter data is 32 parts per billion (ppb). The 90th percentile with only the 1st liter data is 23 ppb.
Please let me know if you have any questions.

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

Follow Us | **Michigan.gov/EGLE**

From: Vincent, Courtney (EGLE) <VincentC4@michigan.gov>
Sent: Thursday, January 16, 2020 4:36 PM
To: emitchell@cityofbentonharbormi.gov
Cc: momalley@cityofbentonharbormi.gov; nbritten@bchdmi.org; Nick Margaritis <nmargaritis@bchdmi.org>; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Walstrom, Kimberly (EGLE) <walstromK@michigan.gov>
Subject: Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)

Dear Mr. Mitchell,
Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead and Copper Monitoring – Lead Action Level Exceedance letter for the city of Benton Harbor (WSSN: 00600)

along with its corresponding enclosures. A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact Ms. Jeni Bolt, Environmental Quality Specialist, Lead and Copper Unit, Community Water Supply Section, Drinking Water and Environmental Health Division, by email at BoltJ@Michigan.gov or by phone at 517-331-5161.
Thank you,

Courtney Vincent
Unit Secretary
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-284-5424 | VincentC4@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

January 16, 2020

VIA E-MAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from July 1, 2019, through December 31, 2019, Benton Harbor community water supply's 90th percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	32 ppb	10	0 ppb – 72 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. As previously mentioned, it is your intent to develop and distribute the PE materials within three business days to fulfill both the PA and PE requirements simultaneously.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement timely. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your third AL exceedance. A letter regarding changes to your current corrosion control treatment will be sent under separate cover from Mr. Ernie Sarkipato, Surface Water Engineer, Engineering Unit, Environmental Health Section, Drinking Water and Environmental Health

Division (DWEHD); and Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, DWEHD.

Lead and Copper Monitoring
You have already increased your lead and copper monitoring. Please continue to collect samples from 60 sites between January 1 and June 30, 2020, and again between July 1 and December 31, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of the results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Every two weeks	Collect WQP samples. (Entry Point)	Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap). Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
February 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 10, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between January 1 and June 30, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 29, 2020	For the January through June 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2021	For the July through December 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

SUMMARY OF PUBLIC ADVISORY REQUIREMENTS AND DISTRIBUTION CHECKLIST FOR COMMUNITY WATER SUPPLIES THAT EXCEED THE LEAD ACTION LEVEL

Issued under the authority of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the Administrative Rules. Act 399, MCL 325.1019 et seq. requires that, if a water supply is found not to be compliant with the state drinking water standards, they shall be required to notify users of the extent and nature of the noncompliance. Complete and submit this form to EGLE

Act 399 requires that a Public Advisory (PA) must be issued within three business days after the Department of Environment, Great Lakes, and Energy (EGLE) notifies a water supply that an exceedance of the lead action level has occurred. To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation, to EGLE along with a sample copy of the issued PA.

START HERE (indicate one or more of the following activities)

☐ Issue the PA using appropriate broadcast media, such as radio and television.
Please list media outlets and date of broadcast: _____
_____

☐ Post the PA in conspicuous locations throughout the area served by the public water supply.
Locations posted and date of posting: _____
_____

☐ Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage. Date delivered: _____

☐ Use a communication method other than one listed, as approved in writing by EGLE.
Date delivered: _____

I affirm that the Public Advisory has been issued. I have enclosed a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	Date

Send this checklist to the appropriate EGLE district office. Contact information for the district offices can be found online at Michigan.gov/CommunityWater. Under Information, click on "District Offices Map and Contact Information."

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

WATER QUALITY PARAMETER DATA (when applicable):

System Name:_____ WSSN:_____

	Sample Location	Date	pH	Alk. (mg/L)	Ca as $CaCO_3$ (mg/L)	Cond. (umhos)	Temp (ºC)	Inhibitor (mg/L) ☐ Orthophosphate (PO_4) ☐ Silica (Si)	Chloride (mg/L)	Sulfate (mg/L)
Entry Point to the Distribution System (Plant Tap)										
Distribution System										

INSTRUCTIONS:

WATER QUALITY PARAMETER SAMPLING LOCATIONS:

- Point-of-entry sampling locations: Each point-of-entry location is a required sampling point for WQPs. Exceptions can be made for wells that are offline or standby, or consecutive connections without additional treatment. Review your supply's monitoring schedule for specific requirements.
- Distribution sampling locations: Distribution sampling locations should be representative locations throughout the distribution system. Established bacteriological sampling locations can be used for WQP sampling.

WATER QUALITY PARAMETER SAMPLING:

Sampling procedure: WQP sampling requirements are a combination of analytes and test codes. Double check your monitoring schedule and check with your certified lab to make sure you have the correct bottle types, number of bottles, or appropriate field test kits to have your water analyzed for all required WQP analytes.

Note: Unlike lead and copper sampling, WQP sampling does not need to be within a home, does not require a stagnation period and does not need to be a first draw sample.

EGLE Laboratory test codes for WQP samples:

Test Description	Analytes	Fee	Unit Number	Test Code	Hold Time	Thermal Preservation
Automated Partial Chemistry	Chloride and Sulfate	$18	32,33	R	48 hours	Yes
Corrosion	Conductivity, Alkalinity, Orthophosphate, and Calcium	$51	33	CORR	48 hours	Yes
Field tests (at the time of sample collection)	pH, Temperature	N/A	N/A	N/A	N/A	N/A

WATER QUALTIY PARAMETER REPORTING:

Enter the water supply name, WSSN and corresponding related information from the water quality parameter monitoring carried out, if applicable. Indicate the street address of the sampling point (and the site code for entry point sampling points), date of sample collection and the results of chemical analyses. Dosages for corrosion control inhibitors (orthophosphate, silicates and alkalinity) must be reported on your Monthly Operational Report (MOR), due to your local district office on the 10th of the following month. Note: alkalinity and calcium analyses should be reported as mg/l as CaCO3; conductivity should be reported in umhos; temperature in degrees Celsius; and where applicable, phosphate as PO_4 and Silica a Si.

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

MICHIGAN LEAD AND COPPER RULE
LEAD AND COPPER TAP SAMPLE SITE SELECTION CRITERIA

Community water supplies must identify a pool of lead and copper sampling sites containing **AT LEAST** the number of sites necessary to conduct **STANDARD** monitoring (see instructions for number of required sites). It is highly recommended that the sampling pool contain more sites than required incase routine sites are unavailable at time of sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites, unless …**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used, unless …
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES - Single family residences with either: o Lead service lines (LSL)***** o Interior lead plumbing Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.
TIER 2 SITES – Other buildings or multiple family residences with either: o Lead service lines***** o Interior lead plumbing
TIER 3 SITES - Single family residences with: o Copper plumbing with lead solder installed before July 1988
OTHER SITES o Sites representative of plumbing materials commonly found throughout the water supply.
*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the **SAME** sampling sites unless …
  - a site no longer meets tiering criteria (for example, a site is no longer Tier 1 after having the lead service line replaced); or
  - a site is unavailable (for example, a site has no water service, resident refuses to participate, etc.)
- **DO NOT** sample from outside hose spigots or utility sinks.
  - For residential sites, samples **MUST BE** collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples **MUST BE** collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as an iron removal filter, reverse osmosis system, or water softener.

From:	Bolt, Jennifer (EGLE)
To:	"emitchell@bhcity.us"; "gregan@fv-operations.com"; "rjones@fv-operations.com"; Walstrom, Kimberly (EGLE)
Cc:	Onan, Brandon (EGLE); Bolf, Michael (EGLE); Vincent, Courtney (EGLE); EGLE-DWEH-Grand-Rapids; "nbritten@bchdmi.org"; "nmargaritis@bchdmi.org"; Crider, Steven (DHHS); Klein, Jeremy (EGLE); Pavone, Anthony (DHHS); Sylvester, Matthew (EGLE)
Subject:	FW: Lead and Copper Monitoring - Lead Action Level Exceedance Letter for Benton Harbor (WSSN: 00600)
Date:	Thursday, February 4, 2021 4:33:00 PM
Attachments:	00600_BentonHarbor_LCR_ALELetter_2020-2_FINAL.pdf EQP6791_Public Advisory Distribution Checklist_EGLE.pdf Lead and Copper Tap Sample Site Selection Criteria.pdf image003.png PE Certificate -NON-FACILITY.docx

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Dear Mr. Ellis Mitchell,

Please see attached for the standard letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead and Copper Monitoring – Lead Action Level Exceedance letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures. A hard copy of this letter will be sent to you via U.S. Mail.

Templates for the Public Advisory and Public Education documents have already been provided to you under separate cover.

If you have any questions regarding this correspondence, please contact me.

Thank you,

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes,
and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

Follow Us | **Michigan.gov/EGLE**

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 4, 2021

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The Benton Harbor community water supply's 90th percentile value exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from July 1 to December 31, 2020, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	24 ppb	11	0 - 240 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.0	0	0 – 0.2 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadlines for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. A template has already been provided to you. Please contact EGLE if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL deliver PE materials to all consumers.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system.

The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Minimize Corrosion
Minimize lead in the drinking water by reducing corrosion of water pipes and household plumbing that contain lead. This is Benton Harbor's fifth AL exceedance. Benton Harbor has made corrective actions to the corrosion control treatment system per EGLE's

direction in a letter dated February 13, 2020. EGLE anticipates this change having a positive impact on the distribution system's corrosion rates and will assess the effectiveness of the current corrosion control treatment based on sequential sampling at homes in the distribution system and future rounds of compliance monitoring.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between January 1 and June 30, 2021, and again between July 1 and December 31, 2021. These sites should be selected from your Lead and Copper Sampling Plan.

If you need to select new sites, choose the highest Tier criteria available within your distribution system, giving Tier 1 sites first priority. Document any changes on your Lead and Copper Sample Site Plan and submit it to your local district office email address. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of results, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2021. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Continue	Collect WQP samples (entry point to the distribution system).	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
March 1, 2021	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 11, 2021	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required whenever PE required.
Between January 1 and June 30, 2021	Collect samples from 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2021.**
Between January 1 and June 30, 2021	Collect WQP samples (Distribution system).	Collect one set of WQP samples from 10 locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2021	Report the 2020 AL exceedances in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2021	Collect samples from 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2022.**
Between July 1 and December 31, 2021	Collect WQP samples (Distribution system).	Collect one set of WQP samples from 10 locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 30, 2021	For the January through June 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	For the July through December 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system, TP001 (Treatment Plant Tap).	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental Health Division
616-307-6736

Enclosures (PA Checklist, PE Distribution Check, WQP report form, Tier Criteria)
cc/enc: Mr. George Regan, F&V Operations
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Matt Sylvester, EGLE
Mr. Jeremy Klein, EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

SUMMARY OF PUBLIC ADVISORY REQUIREMENTS AND DISTRIBUTION CHECKLIST FOR COMMUNITY WATER SUPPLIES THAT EXCEED THE LEAD ACTION LEVEL

Issued under the authority of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the Administrative Rules. Act 399, MCL 325.1019 et seq. requires that, if a water supply is found not to be compliant with the state drinking water standards, they shall be required to notify users of the extent and nature of the noncompliance. Complete and submit this form to EGLE

Act 399 requires that a Public Advisory (PA) must be issued within three business days after the Department of Environment, Great Lakes, and Energy (EGLE) notifies a water supply that an exceedance of the lead action level has occurred. To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation, to EGLE along with a sample copy of the issued PA.

START HERE (indicate one or more of the following activities)

☐ Issue the PA using appropriate broadcast media, such as radio and television.
Please list media outlets and date of broadcast: _____
_____

☐ Post the PA in conspicuous locations throughout the area served by the public water supply.
Locations posted and date of posting: _____
_____

☐ Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage. Date delivered: _____

☐ Use a communication method other than one listed, as approved in writing by EGLE.
Date delivered: _____

I affirm that the Public Advisory has been issued. I have enclosed a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	Date

Send this checklist to the appropriate EGLE district office. Contact information for the district offices can be found online at Michigan.gov/CommunityWater. Under Information, click on "District Offices Map and Contact Information."

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

MICHIGAN LEAD AND COPPER RULE
LEAD AND COPPER TAP SAMPLE SITE SELECTION CRITERIA

Community water supplies must identify a pool of lead and copper sampling sites containing **AT LEAST** the number of sites necessary to conduct **STANDARD** monitoring (see instructions for number of required sites). It is highly recommended that the sampling pool contain more sites than required incase routine sites are unavailable at time of sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites, unless …**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used, unless …
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES - Single family residences with either: o Lead service lines (LSL)***** o Interior lead plumbing Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.
TIER 2 SITES – Other buildings or multiple family residences with either: o Lead service lines***** o Interior lead plumbing
TIER 3 SITES - Single family residences with: o Copper plumbing with lead solder installed before July 1988
OTHER SITES o Sites representative of plumbing materials commonly found throughout the water supply.
*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the **SAME** sampling sites unless …
  - a site no longer meets tiering criteria (for example, a site is no longer Tier 1 after having the lead service line replaced); or
  - a site is unavailable (for example, a site has no water service, resident refuses to participate, etc.)
- **DO NOT** sample from outside hose spigots or utility sinks.
  - For residential sites, samples **MUST BE** collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples **MUST BE** collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as an iron removal filter, reverse osmosis system, or water softener.

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

DRAFT

☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

DRAFT

DRAFT

From:	Sarkipato, Ernest (DEQ)
To:	Bolt, Jennifer (DEQ); Bolf, Michael (DEQ)
Subject:	FW: Lead levels in Benton Harbor
Date:	Friday, March 1, 2019 7:28:22 AM
Attachments:	2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf ACO-Benton Harbor-12-7-18.doc

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Just realized the ALE letter and the ACO compliance schedule both reference a deadline of 3/31/2019 for corrosion plan. The city and Elhorn are planning on doing this, but that date is non-existent. I guess this is just a heads up.

From: Sarkipato, Ernest (DEQ)
Sent: Thursday, February 28, 2019 4:13 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>
Subject: RE: Lead levels in Benton Harbor

Hi Eric, see below for a first crack.

-The city's regularly scheduled monitoring in 2018 for lead and copper found an increased number of elevated levels of lead, resulting in the 90th percentile for lead being 22 parts per billion (ppb). This is the city's first exceedance of the action level since the law was implemented in 1992.

-The city has complied with required public education and notification due to the ALE.

-The city offered bottled water to homes with high results.

-The city offered to conduct lead sampling for any resident. So far, about 300 samples have been taken, and the data support the initial 90th percentile of 22 ppb for lead.

-The city is also currently administering a DEQ Lead Pilot Grant to identify and remove lead service lines.

-The DEQ is working with the city to install phosphate chemical treatment to inhibit corrosion system-wide, utilizing the DEQ Grant

-DHHS and DEQ have coordinated with Berrien County Health to investigate the nature of lead in the system (sequential sampling, see attached summary)

-DHHS and DEQ have coordinated with Berrien County Health to provide alternate sources of water (filters).

Let me know if you were thinking of more/different info.

Ernie

From: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Sent: Thursday, February 28, 2019 3:55 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>
Subject: FW: Lead levels in Benton Harbor

Ernie – can you give me just a few bullets? Also, if you could attach the background documents (compliance history). Short and to the point. I plan to copy DHHS in my response so they can cover their issues.

Eric

From: Cook, Kara <CookK14@michigan.gov>

Sent: Thursday, February 28, 2019 3:42 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>; Seidel, Teresa (DEQ) <SEIDELT@michigan.gov>
Cc: Hernandez, Poppy <HernandezP3@michigan.gov>; Clark, Liesl (DEQ) <ClarkL20@michigan.gov>
Subject: Lead levels in Benton Harbor

Hi Eric and Teresa,

Our West Michigan Director, Poppy Hernandez (CC'd here), wanted more information on the lead situation in the Benton Harbor area. Could you point us in the right direction of who could provide her with some background and an update on the issue?

Thank you!

Kara Cook

Policy Advisor on Energy and Environmental Protection

Office of Governor Gretchen Whitmer
Cookk14@michigan.gov

***This email and any associated documents may contain information that is privileged, confidential, and exempt from disclosure. It is intended for use only by the person to whom it is addressed. If you have received this in error, please (1) do not forward or use this information in any way; and (2) contact me immediately.*

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION

ADMINISTRATIVE CONSENT ORDER

In the matter of: DWMAD Order No. ACO-399- -2019

SECTION I

FACILITY OWNER/OPERATOR

NAME	OWNER☒	OPERATOR☐
City of Benton Harbor		
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER		
ADDRESS 200 East Wall Street		
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022
CONTACT NAME/TITLE Darwin Watson, City Manager	PHONE # 269-927-8408	

FACILITY NAME AND LOCATION

FACILITY NAME		WATER SUPPLY SERIAL NUMBER
Benton Harbor Public Water Supply		00600
FACILITY OWNER IF NOT IDENTIFIED ABOVE		
ADDRESS 200 East Wall Street		
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022
COUNTY Berrien		
CONTACT NAME Darwin Watson	PHONE # 269-927-8408	

1.1 This document results from allegations by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ alleges that the City of Benton Harbor, owner/operator of the city's public water supply, is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder.

1.2 Specific violations are referenced in the DEQ Significant Deficiency Violation Notice (SDVN) attached to this Administrative Consent Order (Consent Order) as Exhibit A. The Owner/Operator and the DEQ agree to resolve the violations set forth therein through entry of this Consent Order. The Owner/Operator agrees to resolve all compliance issues set forth in Exhibit A in accordance with the requirements contained in this Consent Order. This Consent Order, in its entirety, shall consist of Section I, the attached Sections II, III, and IV, Exhibit A, and any other referenced attachments, exhibits, or appendices. This Consent Order shall be considered null and void if it does not include, at a minimum, Sections I, II, III, and IV and Exhibit A. The Owner/Operator further agrees that this Consent Order shall become effective on the date it is signed by the DWMAD Director, designee of the DEQ Director.

1.3 The Owner/Operator agrees to pay a civil fine of $500 per day for failure to complete corrective actions as specified in Section II, Compliance Schedule, unless an extension has been approved under Section 4.14. Failure to make a timely payment constitutes a violation of this Consent Order.

1.4 The Owner/Operator agrees to make payment of all funds due pursuant to this agreement by certified check made payable to the "State of Michigan" and mailed to the Accounting Services Division, Cashier's Office for the DEQ, P.O. Box 30657, Lansing, Michigan 48909-8157. To ensure proper credit, all payments made pursuant to this Consent Order must include "Payment Identification Number RMD90044" on the check. The Owner/Operator agrees not to contest the legality of the civil fine.

Signatories

DEPARTMENT OF ENVIRONMENTAL QUALITY

_____
Eric Oswald, Director
Drinking Water and Municipal Assistance Division

_____
Date

I undersigned CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

City of Benton Harbor

_____
Marcus Muhammad, Mayor

_____
Date

SECTION II - COMPLIANCE SCHEDULE

IT IS THEREFORE AGREED AND ORDERED THAT the Owner/Operator shall take the following actions to prevent further violations of Act 399 and the administrative rules promulgated thereunder and/or to correct the significant deficiencies identified in the SDVN attached to this Consent Order as Exhibit A.

2.1 Submit to the DWMAD a completed rate study from a qualified professional consultant, along with a plan to implement rate increases as recommended by the study, no later than April 1, 2019.

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water no later than April 1, 2019.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

2.7 Submit to the DWMAD an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process, no later than May 1, 2019.

2.8 Submit an updated cross connection program for DWMAD approval, incorporating the city's plan for implementing control of residential accounts, and for obtaining adequate personnel to implement the city's cross connection control program, no later than June 1, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

2.10 Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants, no later than June 1, 2019.

2.11 Conduct professional inspection of the elevated tank interior and exterior no later than June 30, 2019.

2.12 Install working mussel control system at the intake no later than June 30, 2019.

2.13 Repair filter to waste valves no later than January 1, 2020.

Sections III and IV of this Consent Order shall not be altered in any way, including adding or eliminating any language, striking terms or parts of terms, retyping in whole or in part, or using a different format. Any changes to this document without written approval from the DEQ renders the Consent Order null and void.

SECTION III - STIPULATIONS

The Owner/Operator and the DEQ stipulate as follows:

3.1 The DEQ is authorized to enter this Consent Order requiring the Owner/Operator to comply with state law under Section 15 of Act 399.

3.2 The Owner/Operator consents to the issuance and entry of this Consent Order and stipulates that the entry of this Consent Order constitutes a final order of the DEQ and is enforceable as such under the appropriate provisions of state law identified in this Consent Order. The Owner/Operator agrees not to contest the issuance of this Consent Order and that the resolution of this matter by the entry of this Consent Order is appropriate and acceptable.

3.3 The Owner/Operator and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Owner/Operator that the law has been violated.

3.4 The Signatory to this Consent Order on behalf of the Owner/Operator agrees and attests that he/she is fully authorized to ensure that the Owner/Operator will comply with all requirements under this Consent Order.

3.5 The Owner/Operator shall achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section II of this Consent Order.

SECTION IV - GENERAL PROVISIONS

The Owner/Operator and the DEQ further stipulate as follows:

4.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Owner/Operator to comply with the requirements of Act 399 and the administrative rules promulgated thereunder.

4.2 The DEQ and the Owner/Operator consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to the provisions of Act 399.

4.3 This Consent Order in no way affects the Owner/Operator's responsibility to comply with any other applicable local, state, or federal laws or regulations.

4.4 The DEQ reserves its right to pursue appropriate action, including injunctive relief to enforce the provisions of this Consent Order, and applicable statutory fines for any violation of this Consent Order.

4.5 Nothing in this Consent Order is or shall be considered to affect any liability the Owner/Operator may have for natural resource damages caused by the

Owner/Operator's acts or omissions at the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

4.6 In the event the Owner/Operator sells or transfers the facility, he/she shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the Owner/Operator shall also notify the DWMAD Engineering Unit, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be submitted to the DWMAD Engineering Unit within 30 days of assuming the obligations of this Consent Order.

4.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their successors and assigns.

4.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

Reporting

4.9 The Owner/Operator shall make all submittals and written notifications required by this Consent Order, to the DWMAD Engineering Unit, DEQ, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503. The cover letter with each submittal or notification shall identify the specific paragraph and requirement of this Consent Order that the submittal or notification is intended to satisfy.

4.10 The Owner/Operator shall verbally report any violation(s) of the terms and conditions of this Consent Order to the DWMAD Engineering Unit Supervisor at 231-590-3430 by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with submittal of a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The Owner/Operator shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

Retention of Records

4.11 Upon request by an authorized representative of the DEQ, the Owner/Operator shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to applicable laws or rules. All such documents shall be retained by the Owner/Operator for at least a period of three years from the date of generation of the record unless a longer period of record retention is required by the applicable law or its rules.

Right of Entry

4.12 The Owner/Operator shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all

reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to Act 399 and the administrative rules promulgated thereunder or any other applicable statutory provision.

DEQ Approval of Submittals

4.13 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Owner/Operator, the following process and terms of approval shall apply:

a. All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

b. In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the reasons for such disapproval. The Owner/Operator shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

c. In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Owner/Operator to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

d. Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

e. Failure by the Owner/Operator to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the Owner/Operator to the enforcement provisions of this Consent Order.

f. Any delays caused by the Owner/Operator's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Owner/Operator's responsibility to comply with any other deadline(s) specified in this Consent Order.

g. No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted

by the Owner/Operator will be construed as relieving the Owner/Operator of his/her obligation to obtain written approval, if and when required by this Consent Order.

Extensions

4.14 The Owner/Operator and the DEQ agree that the DEQ may grant the Owner/Operator a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request to the DWMAD Engineering Unit no later than ten business days prior to the pertinent deadline and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the Owner/Operator from meeting the deadline(s).

c. A description of the measures the Owner/Operator has taken and/or intends to take to meet the required deadline(s).

d. The length of the extension requested and the specific date on which the obligation will be met.

No change or modification to this Consent Order shall be valid unless in writing from the DEQ and, if applicable, signed by both parties.

Termination

4.15 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the Owner/Operator shall submit a request consisting of a written certification that the Owner/Operator has fully complied with the requirements of this Consent Order and has made payment of any fines required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section II of this Consent Order, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the DWMAD Engineering Unit.

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Exhibit A
Administrative Consent Order

Enforcement Type	Issue Date
Significant Deficiency Violation Notice	October 3, 2018

From:	Sarkipato, Ernest (DEQ)
To:	Bolt, Jennifer (DEQ); Bolf, Michael (DEQ)
Subject:	FW: Lead levels in Benton Harbor
Date:	Friday, March 1, 2019 7:28:22 AM
Attachments:	2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf ACO-Benton Harbor-12-7-18.doc

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Just realized the ALE letter and the ACO compliance schedule both reference a deadline of 3/31/2019 for corrosion plan. The city and Elhorn are planning on doing this, but that date is non-existent. I guess this is just a heads up.

From: Sarkipato, Ernest (DEQ)
Sent: Thursday, February 28, 2019 4:13 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>
Subject: RE: Lead levels in Benton Harbor

Hi Eric, see below for a first crack.

-The city's regularly scheduled monitoring in 2018 for lead and copper found an increased number of elevated levels of lead, resulting in the 90th percentile for lead being 22 parts per billion (ppb). This is the city's first exceedance of the action level since the law was implemented in 1992.

-The city has complied with required public education and notification due to the ALE.

-The city offered bottled water to homes with high results.

-The city offered to conduct lead sampling for any resident. So far, about 300 samples have been taken, and the data support the initial 90th percentile of 22 ppb for lead.

-The city is also currently administering a DEQ Lead Pilot Grant to identify and remove lead service lines.

-The DEQ is working with the city to install phosphate chemical treatment to inhibit corrosion system-wide, utilizing the DEQ Grant

-DHHS and DEQ have coordinated with Berrien County Health to investigate the nature of lead in the system (sequential sampling, see attached summary)

-DHHS and DEQ have coordinated with Berrien County Health to provide alternate sources of water (filters).

Let me know if you were thinking of more/different info.

Ernie

From: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Sent: Thursday, February 28, 2019 3:55 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>
Subject: FW: Lead levels in Benton Harbor

Ernie – can you give me just a few bullets? Also, if you could attach the background documents (compliance history). Short and to the point. I plan to copy DHHS in my response so they can cover their issues.

Eric

From: Cook, Kara <CookK14@michigan.gov>

Sent: Thursday, February 28, 2019 3:42 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>; Seidel, Teresa (DEQ) <SEIDELT@michigan.gov>
Cc: Hernandez, Poppy <HernandezP3@michigan.gov>; Clark, Liesl (DEQ) <ClarkL20@michigan.gov>
Subject: Lead levels in Benton Harbor

Hi Eric and Teresa,

Our West Michigan Director, Poppy Hernandez (CC'd here), wanted more information on the lead situation in the Benton Harbor area. Could you point us in the right direction of who could provide her with some background and an update on the issue?

Thank you!

Kara Cook

Policy Advisor on Energy and Environmental Protection

Office of Governor Gretchen Whitmer
Cookk14@michigan.gov

***This email and any associated documents may contain information that is privileged, confidential, and exempt from disclosure. It is intended for use only by the person to whom it is addressed. If you have received this in error, please (1) do not forward or use this information in any way; and (2) contact me immediately.*

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION

ADMINISTRATIVE CONSENT ORDER

In the matter of: DWMAD Order No. ACO-399- -2019

SECTION I

FACILITY OWNER/OPERATOR

NAME	OWNER☒	OPERATOR☐
City of Benton Harbor		
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER		
ADDRESS 200 East Wall Street		
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022
CONTACT NAME/TITLE Darwin Watson, City Manager	PHONE # 269-927-8408	

FACILITY NAME AND LOCATION

FACILITY NAME		WATER SUPPLY SERIAL NUMBER
Benton Harbor Public Water Supply		00600
FACILITY OWNER IF NOT IDENTIFIED ABOVE		
ADDRESS 200 East Wall Street		
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022
COUNTY Berrien		
CONTACT NAME Darwin Watson	PHONE # 269-927-8408	

1.1 This document results from allegations by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ alleges that the City of Benton Harbor, owner/operator of the city's public water supply, is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder.

1.2 Specific violations are referenced in the DEQ Significant Deficiency Violation Notice (SDVN) attached to this Administrative Consent Order (Consent Order) as Exhibit A. The Owner/Operator and the DEQ agree to resolve the violations set forth therein through entry of this Consent Order. The Owner/Operator agrees to resolve all compliance issues set forth in Exhibit A in accordance with the requirements contained in this Consent Order. This Consent Order, in its entirety, shall consist of Section I, the attached Sections II, III, and IV, Exhibit A, and any other referenced attachments, exhibits, or appendices. This Consent Order shall be considered null and void if it does not include, at a minimum, Sections I, II, III, and IV and Exhibit A. The Owner/Operator further agrees that this Consent Order shall become effective on the date it is signed by the DWMAD Director, designee of the DEQ Director.

1.3 The Owner/Operator agrees to pay a civil fine of $500 per day for failure to complete corrective actions as specified in Section II, Compliance Schedule, unless an extension has been approved under Section 4.14. Failure to make a timely payment constitutes a violation of this Consent Order.

1.4 The Owner/Operator agrees to make payment of all funds due pursuant to this agreement by certified check made payable to the "State of Michigan" and mailed to the Accounting Services Division, Cashier's Office for the DEQ, P.O. Box 30657, Lansing, Michigan 48909-8157. To ensure proper credit, all payments made pursuant to this Consent Order must include "Payment Identification Number RMD90044" on the check. The Owner/Operator agrees not to contest the legality of the civil fine.

Signatories

DEPARTMENT OF ENVIRONMENTAL QUALITY

_____
Eric Oswald, Director
Drinking Water and Municipal Assistance Division

_____
Date

I undersigned CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

City of Benton Harbor

_____
Marcus Muhammad, Mayor

_____
Date

SECTION II - COMPLIANCE SCHEDULE

IT IS THEREFORE AGREED AND ORDERED THAT the Owner/Operator shall take the following actions to prevent further violations of Act 399 and the administrative rules promulgated thereunder and/or to correct the significant deficiencies identified in the SDVN attached to this Consent Order as Exhibit A.

2.1 Submit to the DWMAD a completed rate study from a qualified professional consultant, along with a plan to implement rate increases as recommended by the study, no later than April 1, 2019.

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water no later than April 1, 2019.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

2.7 Submit to the DWMAD an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process, no later than May 1, 2019.

2.8 Submit an updated cross connection program for DWMAD approval, incorporating the city's plan for implementing control of residential accounts, and for obtaining adequate personnel to implement the city's cross connection control program, no later than June 1, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

2.10 Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants, no later than June 1, 2019.

2.11 Conduct professional inspection of the elevated tank interior and exterior no later than June 30, 2019.

2.12 Install working mussel control system at the intake no later than June 30, 2019.

2.13 Repair filter to waste valves no later than January 1, 2020.

Sections III and IV of this Consent Order shall not be altered in any way, including adding or eliminating any language, striking terms or parts of terms, retyping in whole or in part, or using a different format. Any changes to this document without written approval from the DEQ renders the Consent Order null and void.

SECTION III - STIPULATIONS

The Owner/Operator and the DEQ stipulate as follows:

3.1 The DEQ is authorized to enter this Consent Order requiring the Owner/Operator to comply with state law under Section 15 of Act 399.

3.2 The Owner/Operator consents to the issuance and entry of this Consent Order and stipulates that the entry of this Consent Order constitutes a final order of the DEQ and is enforceable as such under the appropriate provisions of state law identified in this Consent Order. The Owner/Operator agrees not to contest the issuance of this Consent Order and that the resolution of this matter by the entry of this Consent Order is appropriate and acceptable.

3.3 The Owner/Operator and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Owner/Operator that the law has been violated.

3.4 The Signatory to this Consent Order on behalf of the Owner/Operator agrees and attests that he/she is fully authorized to ensure that the Owner/Operator will comply with all requirements under this Consent Order.

3.5 The Owner/Operator shall achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section II of this Consent Order.

SECTION IV - GENERAL PROVISIONS

The Owner/Operator and the DEQ further stipulate as follows:

4.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Owner/Operator to comply with the requirements of Act 399 and the administrative rules promulgated thereunder.

4.2 The DEQ and the Owner/Operator consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to the provisions of Act 399.

4.3 This Consent Order in no way affects the Owner/Operator's responsibility to comply with any other applicable local, state, or federal laws or regulations.

4.4 The DEQ reserves its right to pursue appropriate action, including injunctive relief to enforce the provisions of this Consent Order, and applicable statutory fines for any violation of this Consent Order.

4.5 Nothing in this Consent Order is or shall be considered to affect any liability the Owner/Operator may have for natural resource damages caused by the

Owner/Operator's acts or omissions at the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

4.6 In the event the Owner/Operator sells or transfers the facility, he/she shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the Owner/Operator shall also notify the DWMAD Engineering Unit, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be submitted to the DWMAD Engineering Unit within 30 days of assuming the obligations of this Consent Order.

4.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their successors and assigns.

4.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

Reporting

4.9 The Owner/Operator shall make all submittals and written notifications required by this Consent Order, to the DWMAD Engineering Unit, DEQ, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503. The cover letter with each submittal or notification shall identify the specific paragraph and requirement of this Consent Order that the submittal or notification is intended to satisfy.

4.10 The Owner/Operator shall verbally report any violation(s) of the terms and conditions of this Consent Order to the DWMAD Engineering Unit Supervisor at 231-590-3430 by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with submittal of a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The Owner/Operator shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

Retention of Records

4.11 Upon request by an authorized representative of the DEQ, the Owner/Operator shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to applicable laws or rules. All such documents shall be retained by the Owner/Operator for at least a period of three years from the date of generation of the record unless a longer period of record retention is required by the applicable law or its rules.

Right of Entry

4.12 The Owner/Operator shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all

reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to Act 399 and the administrative rules promulgated thereunder or any other applicable statutory provision.

DEQ Approval of Submittals

4.13 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Owner/Operator, the following process and terms of approval shall apply:

a. All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

b. In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the reasons for such disapproval. The Owner/Operator shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

c. In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Owner/Operator to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

d. Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

e. Failure by the Owner/Operator to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the Owner/Operator to the enforcement provisions of this Consent Order.

f. Any delays caused by the Owner/Operator's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Owner/Operator's responsibility to comply with any other deadline(s) specified in this Consent Order.

g. No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted

by the Owner/Operator will be construed as relieving the Owner/Operator of his/her obligation to obtain written approval, if and when required by this Consent Order.

Extensions

4.14 The Owner/Operator and the DEQ agree that the DEQ may grant the Owner/Operator a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request to the DWMAD Engineering Unit no later than ten business days prior to the pertinent deadline and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the Owner/Operator from meeting the deadline(s).

c. A description of the measures the Owner/Operator has taken and/or intends to take to meet the required deadline(s).

d. The length of the extension requested and the specific date on which the obligation will be met.

No change or modification to this Consent Order shall be valid unless in writing from the DEQ and, if applicable, signed by both parties.

Termination

4.15 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the Owner/Operator shall submit a request consisting of a written certification that the Owner/Operator has fully complied with the requirements of this Consent Order and has made payment of any fines required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section II of this Consent Order, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the DWMAD Engineering Unit.

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Exhibit A
Administrative Consent Order

Enforcement Type	Issue Date
Significant Deficiency Violation Notice	October 3, 2018

From:	Sarkipato, Ernest (EGLE)
To:	Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject:	FW: MI 0600 Benton Harbor ACO Required Corrosion Study Packet
Date:	Thursday, October 8, 2020 12:03:27 PM
Attachments:	MI 0600 Benton Harbor Water Corrosion Plan for ACO.pdf

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I believe this email was the date we are looking for on the submission of the corrosion proposal.

From: Mike O'Malley <momalley@bhcity.us>
Sent: Tuesday, July 28, 2020 11:37 AM
To: EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>; emitchell <emitchell@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>
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Mike O'Malley
Benton Harbor Community Water Operator IN Charge

MI 0600 Benton Harbor ACO 8/14 Corrosion Study (1)

7/28/20

CITY OF BENTON HARBOR-CORROSION STUDY PLAN

Purpose:

The purpose of this study is to determine optimum corrosion control treatment for the City of Benton Harbor water treatment plant. This study will utilize harvested Lead & Galvanized service line material from the cities distribution system and new copper in order to replicate lead service line replacement activities. The study will focus on "not only Lead" but all aspects of optimum corrosion control treatment. The study will be ran for a minimum of 6 months for initial result data to be compiled and a treatment technic plan be developed. A additional 6 month period will follow.

Pipe Loops:

Example of pipe loops attached. Five Test Loops will utilized. Each pipe loop will consist of 36" sections of Lead, Galvanized & Copper pipe. A 3/4" flow meter, 24 hour timer, solenoid switch, phosphate feed pump w/injection, tubing, valves and sample taps.

Pipe Loop Operation:

Each pipe loop will be run from a 24 hour timer to be used for 6 hour on/ 6 hours off operation. Flow will be maintained using valving set to less than 0.5 gpm when solenoid valve is opened.

Source Water Feed:

The water used will be from the finished water clear well prior to any phosphate feed on (4)four of the test loops. The fifth test loop will test finished water with current phosphate feed.

Products to be Tested:

The products to be tested and there particular blends are as follows:

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Daily oversight will be provided by the City of Benton Harbor staff. Oversight should consist of checking test loops daily for proper operating conditions; leaks, pipe failure, pump failure, electrical problems etc. Any failures of operation should be reported directly to Elhorn Company @517-676-3786. Minor issue's can be discussed for correct repair instructions.
Weekly visits from Elhorn Staff will commence upon study system startup.

Sample/Testing Schedule:

Benton Harbor staff to provide daily PO4 residual testing on all test loops! Reagents will be provided by Elhorn Company for additional testing. Elhorn Company will collect weekly WQP samples & First Draw L/C samples from each test loop. Samples will be delivered to Carus Corporation for analysis. Each sample will be tested for: Hardness, Orhtophosphate, Iron, Manganese, pH, Langelier, Temperature, Alkalinity, Calcium, Chloride, Conductivity, TDS, Sulfate, Polyphosphate & Total phosphate, Lead, Copper.

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This same procedure will take place with the 2nd section piece of each material after a minimum of 180 days.

Completion of Results:

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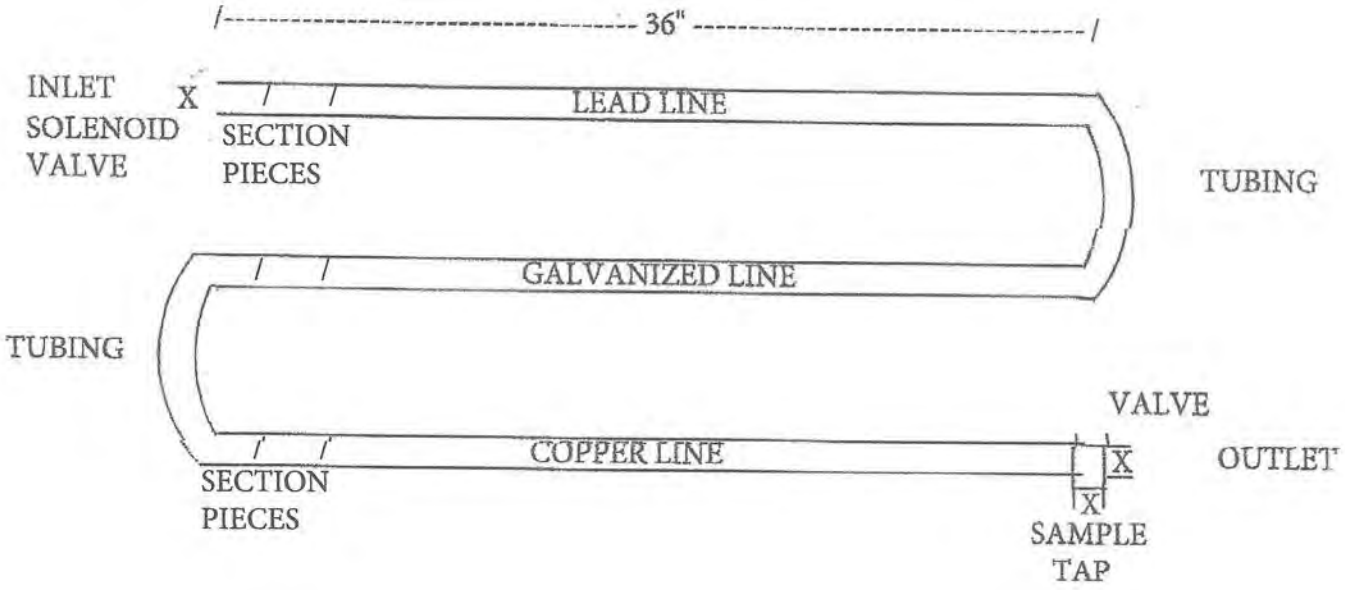
Acc Reply Corrosion study (3)

PIPE LOOP LAYOUT



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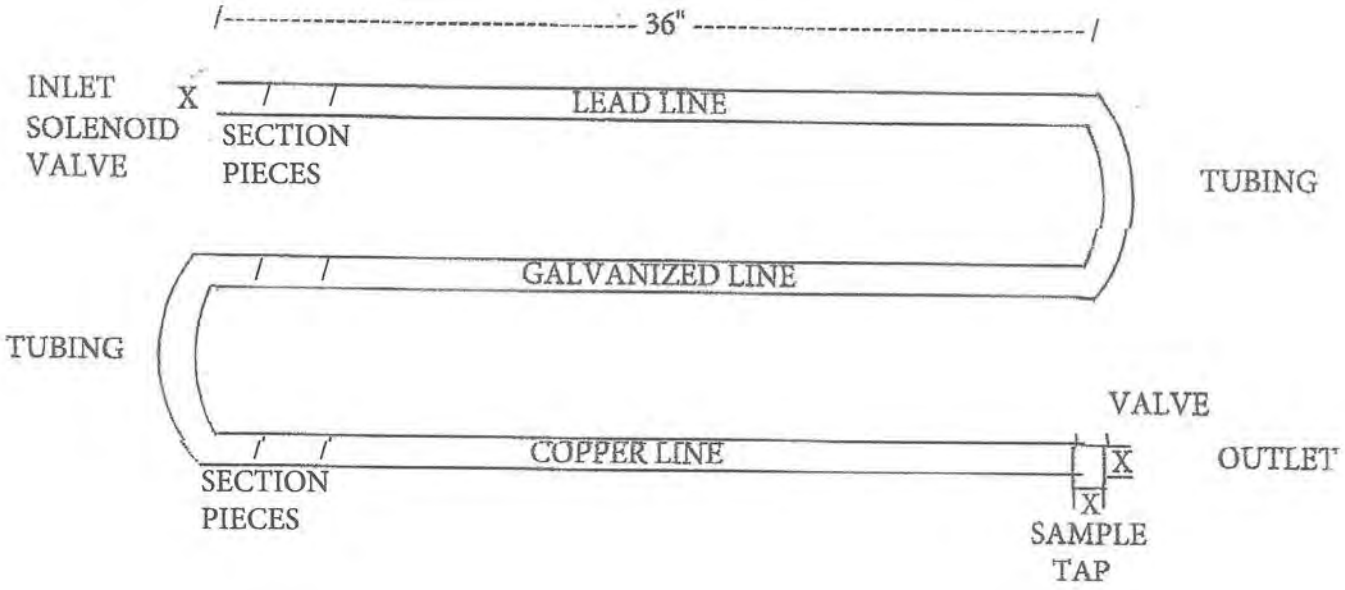

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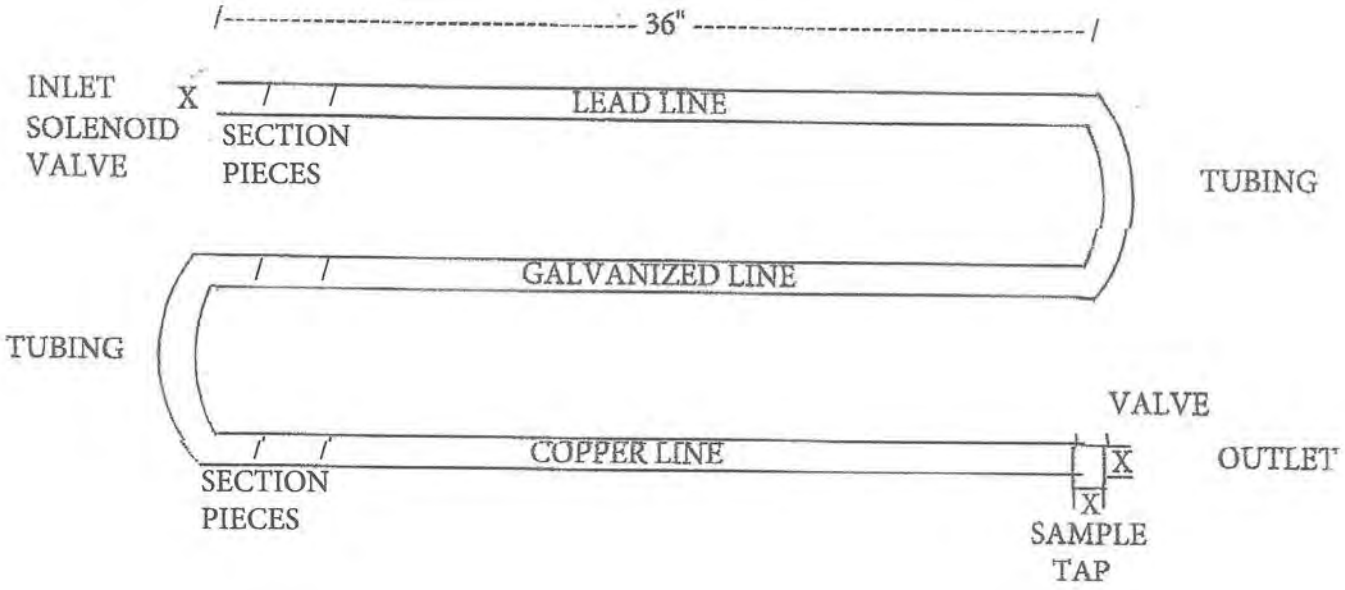

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From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Bolt, Jennifer (EGLE)
Subject:	FW: MI 0600 Benton Harbor Corrosion Treatment Plan
Date:	Friday, April 26, 2019 1:04:29 PM
Attachments:	MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

---

Should we discuss this plan?
Do we need to approve it (I assume)?
Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, April 23, 2019 8:28 AM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
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Please see attached: *MI 0600 Benton Harbor Corrosion Treatment Plan.pdf*
Thank you,
Mike O'Malley
Benton Harbor Water Superintendent

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE); "Todd Luks"; mike@michonline.net
Cc:	dwatson@cityofbentonharbormi.gov; Bolt, Jennifer (EGLE)
Subject:	FW: MI 0600 Benton Harbor Corrosion Treatment Plan
Date:	Friday, April 26, 2019 1:31:03 PM
Attachments:	MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

---

Hello Gentlemen,
Brandon and I would appreciate a chance to chat with you to discuss the corrosion treatment plan (attached).
Can you reply with your availability next week Monday afternoon or Tuesday afternoon?
I can set up a call-in number, so we can avoid a coordinated trip out to the water plant.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment Great Lakes and Energy
616-307-0261 mobile
www.michigan.gov/drinkingwater
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, April 23, 2019 8:28 AM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: MI 0600 Benton Harbor Corrosion Treatment Plan
Please see attached: *MI 0600 Benton Harbor Corrosion Treatment Plan.pdf*
Thank you,
Mike O'Malley
Benton Harbor Water Superintendent

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

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We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Bolt, Jennifer (DEQ)
To:	Sarkipato, Ernest (DEQ); Klein, Jeremy (DEQ)
Cc:	Onan, Brandon (DEQ)
Subject:	FW: Missing Lead and Copper Corrosion Control plan or study proposal DUE DATE reminder - 3/31/2019
Date:	Thursday, March 21, 2019 11:48:12 AM

Hi Ernie and Jeremy,
I know we've been having lots of discussions with Benton Harbor regarding their proposed treatment and installation. I did not send the reminder below to Mike or Darwin, but I do need something in my file for their ALE based requirement to submit for a study or proposal before March 31, 2019.
Can you please drop a copy of their final permit (any anything else you deem particularly relevant) into their PBCU folder on the t://?
S:\Drinking Water and Environmental Health\Community Drinking Water\District Offices\ALL STATE PbCu Reports_Ltrs_VNs\DISTRICT 9\00600_BentonHarbor\LCR
Thanks!
Jeni Bolt

From: Bolt, Jennifer (DEQ)
Sent: Thursday, March 21, 2019 11:18 AM
To: Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>
Cc: Aden, Joshua (DEQ) <AdenJ@michigan.gov>; Huttinger, Sue (DEQ) <HuttingerS@michigan.gov>; Kaiser, Rebecca (DEQ) <KaiserR@michigan.gov>; Klein, Jeremy (DEQ) <KLEINJ1@michigan.gov>; Robinson, Krista (DEQ) <RobinsonK24@michigan.gov>; Schultz, Lori (DEQ) <SchultzL4@michigan.gov>; Simon, Taryn (DEQ) <SimonT5@michigan.gov>; Vail, Amy (DEQ) <VailA@michigan.gov>; VanDerWoude, Ryan (DEQ) <VanDerWoudeR@michigan.gov>; Pennington, Stephen (DEQ) <PenningtonS1@michigan.gov>; Wilson, Stacy (DEQ) <WilsonS56@michigan.gov>; Jackson, Heather (DEQ) <JacksonH@michigan.gov>
Subject: Missing Lead and Copper Corrosion Control plan or study proposal DUE DATE reminder - 3/31/2019

You are receiving this email because you have a Corrosion Control plan or study proposal that has not yet been reported to the DEQ. This email is being sent to the administrative contact and certified operator of your water system.
We have no record of receiving your system's Corrosion Control plan or study proposal that is **due March 31, 2019**. This is an additional requirement because your community water system exceeded an Action Level for either lead or copper. This requirement was detailed in the Action Level Exceedance letter you already received.

Corrosion Control plan or study proposal

Per the Michigan Safe Drinking Water Act, systems that exceed an Action Level shall submit a plan to address corrosion or propose a corrosion control study to the DEQ within six months after the end of the monitoring period. This plan or proposal is due to the DEQ by **March 31, 2019**.
Because each water system is different, each plan or proposal will be different and vary in its complexity. However, each plan should detail how the water system will eliminate sources of lead and/or address control corrosion in the distribution system (i.e. replace fixtures, replace service lines, perform a corrosion control study with a consultant, employ additional treatment, etc.). Essentially, the plan is a written representation on how the supply plans to meet the Lead and Copper Action Levels during future sampling events. Your plan or proposal should not assume the next round of sampling will be below the

Action Levels without some action being taken. Make sure your plan includes contingencies if your system continues to exceed Action Levels.
If you have any questions regarding corrosion control, please contact Brandon Onan, onanb@michigan.gov, or 616-307-6736.
Thank you!

Jeni Bolt
Environmental Quality Specialist
Cell: 517-331-5161
Fax: 517-241-1328
www.michigan.gov/drinkingwater

From: Onan, Brandon (EGLE)
To: Phillip, Kris (EGLE); Phillip, Kris (EGLE); Thurston, Brian (EGLE)
Subject: FW: News" Benton Harbor story
Date: Friday, March 26, 2021 8:46:59 AM

FYI

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: McDiarmid Jr, Hugh (EGLE) <McDiarmidJrH@michigan.gov>
Sent: Friday, March 26, 2021 7:52 AM
To: Dean, Scott (EGLE) <DeanS4@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Keatley, Aaron (EGLE) <KeatleyA@michigan.gov>; Clift, James (EGLE) <CliftJ@michigan.gov>; Clark, Liesl (EGLE) <ClarkL20@michigan.gov>; Epkey, Amy (EGLE) <epkeya@michigan.gov>
Subject: News' Benton Harbor story

Benton Harbor doesn't want to be the next Flint. It's already worse

Leonard N. Fleming, The Detroit News
Published 10:35 PM EDT Mar. 25, 2021 **Updated 10:35 PM EDT Mar. 25, 2021**

Benton Harbor — Public officials and residents are grappling with three straight years of lead in their water that exceed state limits and the amounts of lead found in Flint before it became engulfed in its crisis in 2015.

The southwest Michigan city has surpassed the so-called action level of 15 parts per billion since 2018 — the level that is considered dangerous enough to public health that corrective actions need to be taken. This is longer than when Parchment, near Kalamazoo, had two straight years of excessive levels before its lead pipes were replaced last year.

The lead levels in this predominantly Black city of 9,700 people off Lake Michigan and home to Whirlpool Corp. have concerned the Michigan Department of Environment, Great Lakes and Energy, which is working with city officials on corrective actions. Benton Harbor officials blame the city's water problems on a nearly century-old water system with lead pipes and the slow arrival of federal funding to replace them.

By comparison, the water of neighboring St. Joseph, with a mostly White population whose residents average three times more in personal income than their neighboring residents, has not exceeded lead action levels.

One Benton Harbor civil rights and water activist argues the lead situation would not have been allowed to happen in St. Joseph because it has more money for infrastructure than an impoverished city like Benton Harbor. St. Joseph and Benton Harbor both draw their water from nearby Lake Michigan.

Lovelle Valentine, 43, and his fiancée, Kizzy Cornelius, 42, are so concerned that they will only drink bottled water. Fears about the long-term effects of contaminated water abound.

"It's not only us. What about the little ones growing up? You want them drinking the same water that we grew up on?" Valentine said. "Absolutely not. They don't care about us. We might be the next epidemic like Flint.

"... It affects people coming to visit. They've got to worry about using water here. There's been no explanation or where the problem started or what you're going to do to fix it."

While lead detected in the water system is due mostly to lead pipes that go back decades, Mayor Marcus Muhammad said comparing the lead issue in Benton Harbor to Flint's situation is a "colossal mischaracterization and exaggeration."

KIZZY CORNEILIUS, 42, LEFT, LISTENS TO LOVELL VALENTINE, 43, IN BENTON HARBOR. CHRIS DUMOND, SPECIAL TO THE DETROIT NEWS

COPY TEXT
TWEET
FACEBOOK
LINKEDIN
REDDIT
SHARE

Lovelle Valentine, 43, Benton Harbor resident

It's not only us. What about the little ones growing up? You want them drinking the same water that we grew up on? Absolutely not. They don't care about us. We might be the next epidemic like Flint.

"The issue of homeowners having old lead pipes is an issue that is nationwide. It's not just Benton Harbor," the mayor said. "And I feel personally and politically that Benton Harbor has been targeted by EGLE, by the media, to make it appear as if we have an issue like Flint, which is totally not the case."

The city also argues it's testing twice as many homes after action levels were exceeded and is doing so every six months instead of the former practice of every three years. The Berrien County Health Department has been distributing water filters to residents with state funding since 2019.

The reason that Benton Harbor began having elevated levels of lead starting with the 2018 monitoring period but not earlier is unknown, state officials said. But it was "likely a change in sampling protocols and locations by the city," they added. Lead pipes, they say, are the most significant source of lead in the water.

The state warns that low levels of lead in children can lower academic achievement, decrease hearing, harm kidney function and create more problems with behavior and attention-related disorders. They can also harm adults.

Michigan's environmental department, known as EGLE, has advised the city to install corrosion-control treatment and directed officials to perform an in-depth corrosion control study, manage records of service line materials and sample site addresses and adjust corrosion inhibitor doses as well as improve its sample record retention. It's also facilitating access to free filters for homes and communication with residents to hear their concerns.

Benton Harbor City Manager Ellis Mitchell declined repeated requests to comment. The leaders of F&V Operations, which is running the city's water treatment facility after Benton Harbor's longtime manager was recently removed by city officials after a missed treatment, also declined comment.

Ninah Sasy, the state environmental department's clean water public advocate, said officials are helping residents understand how they can get their lead service lines replaced.

Sasy said her role is to ensure "that people feel heard" and that residents have a "clear avenue for reporting those concerns but also making sure that we're held accountable."

How Benton Harbor compares

In 2018, Benton Harbor's lead in water was 22 ppb for the 90th percentile of samples compared with the federal action level of 15 ppb. It then jumped to 32 ppb in 2019 and fell to 24 last year. The city is sampling 66 homes out of nearly 5,900 water service lines.

Flint's lead levels were 20 ppb at the 90th percentile in the first half of 2016, fell below the action level to 12 ppb in the second half of 2016 and have remained at 6 ppb or lower since, according to state data. Flint was switched back to the Detroit area water system in October 2015 from the corrosive Flint River.

Critics have argued the state covered up excessive lead levels early in the water crisis after the city — run by state-appointed emergency managers — switched over to improperly treated Flint River water in April 2014. The Michigan Attorney General's Office has filed criminal charges against a former Department of Health and Human Services official for allegedly "concealing and later misrepresenting data related to elevated blood lead levels in

children in the city of Flint."

Most of Flint's residents have continued to rely on bottled water and faucet filters because of their mistrust of government. Almost all of the city's service lines have been replaced except for fewer than 500 service lines that are left to be checked, the U.S. Environmental Protection Agency's Region 5 said in December.

There was a point when Flint had catastrophic lead levels. Virginia Tech water expert Marc Edwards and his team in mid-2015 analyzed 30 water samples collected by residents from Flint homes and found the lowest lead level was 300 ppb, while the average was 2,000 ppb and the highest was more than 13,000 ppb.

Still, Benton Harbor's results that have ranged from 24 ppb to 32 ppb are a cause for concern even with a low sampling of homes that exceeded advisory lead levels, said Terese Olson, an associate professor in the department of civil and environmental engineering at the University of Michigan.

"No amount of lead is deemed safe and your vulnerability is often exaggerated by when in your life you're exposed to it," Olson said. "So if you are a young child that's going to have to live with the lead you're exposed to as a child if it's high, that's a far more worrisome problem."

Berrien County health officials said they have not seen alarming trends of Benton Harbor children affected by lead. Lead levels are measured for children enrolled in the Medicaid health program and sent to the state, said county spokeswoman Gillian Conrad.

Show caption
State of Michigan officials said they are working with Benton Harbor officials to implement corrosion control treatment. The state environmental department found compliance problems such...CHRIS DUMOND, SPECIAL TO THE DETROIT NEWS

Of the 66 Benton Harbor homes that were tested in December 2020, 11 exceeded the advisory lead amount, according to the state's data. It is unclear the exact number of the city's service lines that are lead. About 14% of the 5,877 lines are lead, 27% are made of an unknown material but are likely lead, almost 10% are galvanized pipes and there is no information at all about nearly half of the lines.

Neighboring St. Joseph, an 84% White community with more than 8,300 residents, has had 9 ppb the past three years. There are 106 lead pipes and 2,457 service lines of unknown composition that are likely lead with 193 lead pipes that have been replaced since 2018, city officials said.

Benton Harbor's higher lead levels could be due to water treatment and the kinds of chemicals and total water used by residents, said Greg Alimenti, the water plant superintendent in St. Joseph.

"I think there are a lot of factors in play," Alimenti said.

Using more than $200,000 in state funds awarded in recent years, Benton Harbor has replaced more than 20 residential lead lines of about 40 targeted. The city last year received $5.6 million in federal funds to replace lead pipes — money that was approved during the Barack Obama presidency but was not officially awarded to Benton Harbor until last year, Muhammad said.

The Rev. Edward Pinkney, a civil rights activist who leads the Benton Harbor Community Water Council, said he is concerned about the lead levels. He said he is glad city officials are taking it seriously, "but it took them a couple of years to get on board and actually want to fight this problem."

"They didn't take it seriously and they weren't telling residents the truth," said Pinkney, whose organization teamed with a testing facility to measure lead in the water.

Pinkney said the lead problem was allowed to "get out of control," but the public is more engaged and demanding action. This would not have been allowed to happen in nearby St. Joseph, he contended.

"I think that's where race comes into play. They (St. Joseph) have the resources to do what needs to be done to make sure they have less in their water than everybody else," he said. "That's the No. 1 issue, resources."

Benton Harbor was run by a state-appointed emergency manager from 2010-14 after city officials overspent their budgets and ran up debt.

Show caption
The Rev. Edward Pinkney stands in front of the Benton Harbor Water Filtration Plant. Pinkney said the lead problem was allowed to "get out of...CHRIS DUMOND, SPECIAL TO THE DETROIT NEWS

But Pinkney placed blame on city leaders, too, arguing, "they never really cared that the water was bad."

State finds compliance issues

Benton Harbor has a multifaceted problem that goes beyond lead pipes, said Brandon Onan, who leads the state Department of Environment, Great Lakes and Energy's lead and copper unit in the drinking water and environmental health division.

"Lead pipes definitely are the primary source of lead that we're seeing in the community, and it's where we are getting the elevated levels from," Onan said. "With that, the removal of that source is the ultimate cure. But there are time and money constraints there."

The state is working with the city to "implement corrosion control treatment," he said. The water is now being treated, he said, with a phosphorus-based inhibitor "and the numbers are coming down."

EGLE found compliance problems such as monitoring and reporting violations with the city's water treatment facility, Onan said.

View 116 Photos
Benton Harbor deals with high lead levels in water
Benton Harbor deals with high lead levels in water

"There was just some inconsistency in operation so we've been working very tightly with the city to try to rectify any of those types of problems," he said. "I don't believe that any of those issues were anything that resulted in some of these releases in lead."

State officials said the U.S. Environmental Protection Agency is aware of Benton Harbor's lead levels.

Corrosion control treatment was put in place in March 2019 and has since been adjusted to be more effective as of last month, EGLE officials said. Without performing scale analyses on pipes, state officials said they have no way of knowing what type of barrier may have existed.

Stagnant water is a concern in all drinking water systems, state officials said.

But Muhammad, who admitted the city had water treatment problems, argued there has been no spike in lead cases, "no one has been hospitalized due to lead issues" or died.

Olson countered lead exposure can be damaging over time and doesn't normally result in immediate deaths.

The mayor contended the issue is "very complex" and boils down to "old infrastructure" from homes built in the 1920s, '30s and '40s.

"You can't tell me one city in Michigan where there's not lead in the water," Muhammad said. "Benton Harbor has just become the poster child for that issue because EGLE failed in Flint, and now everybody wants to right the wrong and act as if they're trying to address the issue by making Benton Harbor the city that's bullied."

Emma Kinnard, 77, a longtime resident of Benton Harbor, said she first noticed her water turn a dark color.

"Something is definitely wrong if this water's brown," she said.

Last month, Kinnard said she received a letter from city officials saying in November the water system "violated a drinking water treatment requirement." This development and three years of lead violations have her furious at elected officials.

CHRIS DUMOND, SPECIAL TO THE DETROIT NEWS

Emma Kinnard, 77, longtime Benton Harbor resident

It's just a failure altogether because they should have someone to keep a watch on our water who knows what they are doing.

"It's just a failure altogether because they should have someone to keep a watch on our water who knows what they are doing," Kinnard said. "They are still not getting the results of getting clean water ... water that wouldn't harm our children as well as adults."

Muhammad said Benton Harbor will eventually get the lead lines replaced with federal funding and investment. He said he is taking the issue seriously.

"Not to minimize the issue of lead, which is a lifelong debilitating effect, but one household that exceeds the lead limit is one too many," the mayor said. "We have inherited old infrastructure and old homes."

lfleming@detroitnews.com

(313) 222-2620

Twitter: @leonardnfleming

From:	Jason Marquardt
To:	Ellis Mitchell (emitchell@bhcity.us)
Cc:	Roena Rice (rrice@bhcity.us); Chris Cook; Tim Drews; Joelle Regovich; Rhonda Hildebrand (Rhonda.Hildebrand@plantemoran.com); Sarkipato, Ernest (EGLE)
Subject:	FW: Notice of EPA Assistance Agreement: City of Benton Harbor L9 00E02969
Date:	Tuesday, June 15, 2021 3:02:24 PM
Attachments:	image003.wmz image001.png image002.png image001.wmz L900E02969.pdf
Importance:	High

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Mr. Mitchell,

Please see below and the attached good news. The EPA grant agreement has been completed and work can get underway.

Immediate expected work is as follows:

- Award the consultant contract for the corrosion study in July
- Finalize coordination with Blue Conduit on their Phase I services providing potential dig sites (potholing) for verification of service materials
- Start preparing bidding documents in August for lead service replacements (50 scheduled for the first phase)
- Award construction contracts for contractor's to replace scheduled lead services (fall)

Each phase will include some public outreach and individual discussions with property owners for right of entry easements.

I will plan to provide a brief update on this along with the corrosion study consultant award and potholing update at the next public safety and recreation committee scheduled for July 14th.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Samiei, Layla <Samiei.Layla@epa.gov>
Sent: Tuesday, June 15, 2021 8:43 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Galvin, Krista <Galvin.Krista@epa.gov>; Sykes, Karen <Sykes.Karen@epa.gov>; Bielanski, Andrew <bielanski.andrew@epa.gov>
Subject: Notice of EPA Assistance Agreement: City of Benton Harbor L9 00E02969
Importance: High

Recipient: City of Benton Harbor	**Assistance Number: L9 00E02969**
Notice of New or Supplemental Assistance Agreement	
Attached is a copy of an Assistance Agreement from the U.S. Environmental Protection Agency.	
Recipient's signature is not required on this agreement. The recipient demonstrates its commitment to carry out this award by either: 1) drawing down funds within 21 days after the EPA award or amendment mailing date; or 2) not filing a notice of disagreement with the award terms and conditions within 21 days after the EPA award or amendment mailing date. If the recipient disagrees with the terms and conditions specified in this award, the authorized representative of the recipient must furnish a notice of disagreement to the EPA Award Official within 21 days after the EPA award or amendment mailing date. In case of disagreement, and until the disagreement is resolved, the recipient should not draw down on the funds provided by this award/amendment, and any costs incurred by the recipient are at its own risk.	
Please reference the EPA Assistance Number on all future correspondence regarding this Assistance Agreement. If you have any questions, you may contact the Project Officer (programmatic concerns) or the Grant Specialist (administrative concerns), as identified on page one of the Assistance Agreement.	

U.S. Environmental Protection Agency
Region 5
Assistance Section

*****Please do not reply to this email. For any and all questions related to your identified Grant, please contact your designated Grants Specialist. This will ensure an appropriate, timely, and efficient response to your inquiry. Thank you!*****

CONFIDENTIALITY NOTICE: This e-mail and any attachments are for the exclusive and confidential use of the intended recipient. If you are not the intended recipient, please do not read, distribute or take action in reliance upon this message. If you have received this e-mail in

error, please notify us immediately and promptly delete this message and its attachments from your computer system. We do not waive any work product privilege by the transmission of this message.

U. S. ENVIRONMENTAL PROTECTION AGENCY
ASSISTANCE AGREEMENT NOTICE

U.S. ENVIRONMENTAL PROTECTION AGENCY

Grant Agreement

GRANT NUMBER (FAIN): 00E02969 **MODIFICATION NUMBER:** 0 **PROGRAM CODE:** L9	**DATE OF AWARD** 06/07/2021
TYPE OF ACTION New	**MAILING DATE** 06/14/2021
PAYMENT METHOD: ASAP	**ACH#** 50040

RECIPIENT TYPE:
Municipal

Send Payment Request to:
Contact EPA RTPFC at: rtpfc-grants@epa.gov

RECIPIENT:
CTY BEN HAR - City of Benton Harbor
200 East Wall Street
Benton Harbor, MI 49022
EIN: 38-6004537

PAYEE:
City of Benton Harbor
200 East Wall Street
Benton Harbor, MI 49022

PROJECT MANAGER	EPA PROJECT OFFICER	EPA GRANT SPECIALIST
Jason Marquardt	Andrew Bielanski	Karen Sykes
95 West Main Street	77 West Jackson Blvd., WS-15J	Assistance Section, MA-10J
Benton Harbor, MI 49022	Chicago, IL 60604	**E-Mail:** Sykes.Karen@epa.gov
E-Mail: jmarquardt@abonmarche.com	**E-Mail:** Bielanski.Andrew@epa.gov	**Phone:** 312-886-7571
Phone: 269-926-4565	**Phone:** 312-886-0208	

PROJECT TITLE AND DESCRIPTION

City of Benton Harbor Lead Service Lines Replacement Project

The agreement assists Benton Harbor, Michigan to develop and implement improvement investments through projects that will reduce lead exposure in drinking water by replacing hundreds of lead service lines in Benton Harbor, Michigan.

BUDGET PERIOD	PROJECT PERIOD	TOTAL BUDGET PERIOD COST	TOTAL PROJECT PERIOD COST
04/01/2021 - 04/01/2025	04/01/2021 - 04/01/2025	$6,174,444.00	$6,174,444.00

NOTICE OF AWARD

Based on your Application dated 03/23/2021 including all modifications and amendments, the United States acting by and through the US Environmental Protection Agency (EPA) hereby awards $5,557,000.00. EPA agrees to cost-share 90.00% of all approved budget period costs incurred, up to and not exceeding total federal funding of $5,557,000.00. Recipient's signature is not required on this agreement. The recipient demonstrates its commitment to carry out this award by either: 1) drawing down funds within 21 days after the EPA award or amendment mailing date; or 2) not filing a notice of disagreement with the award terms and conditions within 21 days after the EPA award or amendment mailing date. If the recipient disagrees with the terms and conditions specified in this award, the authorized representative of the recipient must furnish a notice of disagreement to the EPA Award Official within 21 days after the EPA award or amendment mailing date. In case of disagreement, and until the disagreement is resolved, the recipient should not draw down on the funds provided by this award/amendment, and any costs incurred by the recipient are at its own risk. This agreement is subject to applicable EPA regulatory and statutory provisions, all terms and conditions of this agreement and any attachments.

ISSUING OFFICE (GRANTS MANAGEMENT OFFICE)	AWARD APPROVAL OFFICE
ORGANIZATION / ADDRESS	**ORGANIZATION / ADDRESS**
U.S. EPA Region 5 Mail Code MCG10J 77 West Jackson Blvd. Chicago, IL 60604-3507	EPA R5, Water Division R5 - Region 5 77 West Jackson Blvd., W-15J Chicago, IL 60604-3507

THE UNITED STATES OF AMERICA BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Digital signature applied by EPA Award Official William Massie - Chief, Acquisition and Assistance Branch	**DATE** 06/07/2021

EPA Funding Information

FUNDS	FORMER AWARD	THIS ACTION	AMENDED TOTAL
EPA Amount This Action	$0	$5,557,000	$5,557,000
EPA In-Kind Amount	$0	$0	$0
Unexpended Prior Year Balance	$0	$0	$0
Other Federal Funds	$0	$0	$0
Recipient Contribution	$0	$617,444	$617,444
State Contribution	$0	$0	$0
Local Contribution	$0	$0	$0
Other Contribution	$0	$0	$0
Allowable Project Cost	$0	$6,174,444	$6,174,444

Assistance Program (CFDA)	Statutory Authority	Regulatory Authority
66.443 - Reducing Lead in Drinking Water (SDWA 1459B)	Safe Drinking Water Act: Sec. 1459B	2 CFR 200, 2 CFR 1500 and 40 CFR 33

Fiscal									
Site Name	Req No	FY	Approp. Code	Budget Oganization	PRC	Object Class	Site/Project	Cost Organization	Obligation / Deobligation
-	2105PKX003	20	E4	05P3	000BL9	4102	-	-	$5,557,000
									$5,557,000

Budget Summary Page

Table A - Object Class Category (Non-Construction)	Total Approved Allowable Budget Period Cost
1. Personnel	$0
2. Fringe Benefits	$0
3. Travel	$0
4. Equipment	$0
5. Supplies	$0
6. Contractual	$6,174,444
7. Construction	$0
8. Other	$0
9. Total Direct Charges	$6,174,444
10. Indirect Costs: 0.00 % Base null	$0
11. Total (Share: Recipient 10.00 % Federal 90.00 %)	$6,174,444
12. Total Approved Assistance Amount	$5,557,000
13. Program Income	$0
14. Total EPA Amount Awarded This Action	$5,557,000
15. Total EPA Amount Awarded To Date	$5,557,000

Administrative Conditions

National Administrative Terms and Conditions

General Terms and Conditions

The recipient agrees to comply with the current EPA general terms and conditions available at: https://www.epa.gov/grants/epa-general-terms-and-conditions-effective-november-12-2020-or-later.

These terms and conditions are in addition to the assurances and certifications made as a part of the award and the terms, conditions, or restrictions cited throughout the award.

The EPA repository for the general terms and conditions by year can be found at: https://www.epa.gov/grants/grant-terms-and-conditions#general.

A. Correspondence Condition

The terms and conditions of this agreement require the submittal of reports, specific requests for approval, or notifications to EPA. Unless otherwise noted, all such correspondence should be sent to the following email addresses:

- Federal Financial Reports (SF-425): rtpfc-grants@epa.gov and Karen Sykes @ region5closeouts@epa.gov
- MBE/WBE reports (EPA Form 5700-52A): Krista Galvin @ region5closeouts@epa.gov
- All other forms/certifications/assurances, Indirect Cost Rate Agreements, Requests for Extensions of the Budget and Project Period, Amendment Requests, Requests for other Prior Approvals, updates to recipient information (including email addresses, changes in contact information or changes in authorized representatives) and other notifications: **Andrew Bielanski - bielanski.andrew@epa.gov**

B. Pre-Award Costs

In accordance with 2 CFR 1500.9, the recipient may charge otherwise allowable pre-award costs (both Federal and non-Federal matching shares) incurred from **April 1, 2021** to the actual award date provided that such costs were contained in the approved application and all costs are incurred within the approved budget period.

Programmatic Conditions

A. PERFORMANCE REPORTING AND FINAL PERFORMANCE REPORT

In accordance with 2 CFR 200.329, the recipient agrees to submit performance reports that include brief information on each of the following areas: 1) A comparison of actual accomplishments to the outputs/outcomes established in the assistance agreement work plan for the period; 2) The reasons why established outputs/outcomes were not met; and 3) Additional pertinent information, including, when appropriate, analysis and explanation of cost overruns or high-unit costs. Additionally, the recipient agrees to inform EPA as soon as problems, delays, or adverse conditions which will materially impair the ability to meet the outputs/outcomes specified in the assistance agreement work plan are known.

Project Officers will provide an outline of the semi-annual and final report requirements regarding performance and progress.

If a project start date falls within a defined reporting period the recipient must report for that period by the given due date. This semi-annual reporting schedule shall be repeated for the duration of the award agreement.

Requests for extensions of reporting requirements must be managed in a manner so as to ensure that Federal funding is expended, and associated programs are implemented in full accordance with U.S. statutory and public policy requirements under 2 CFR 200.300 – 200.309. Requests are to be made to the Project Officer in writing at least 14 days prior to when the report is due.

Project Officers will provide a sample of reporting measures and/or elements 45 days after the final award package and 45 days after all applicable quality assurance measures have been met and approved.

The final project report will include all categories of information required for semi-annual reporting, including a final remediation/replacement and follow-up monitoring actions description. The final project report will also include: a narrative summary of the project or activity, the successes and lessons learned for the entire project. Results including specific outputs and outcomes detailed in the project workplan (including any sustainability commitments), and final replacement/remediation results and improvements as calculations. To the extent possible, final calculations should be based on the actual number and types of remediations/replacements completed under the implementation of the award. This description should include a measurement on population impact using a framework that demonstrate resource allocation measures and the extent in which they directly and indirectly contribute to the reduction in lead exposure via drinking water to the community. The final report shall be submitted to the EPA Project Officer within 120 days after the project period end date or termination of the assistance agreement. A template for the final report is available through the regional points of contact.

Frequency of Performance Reports

The recipient agrees to submit, semi-annually, performance reports electronically to the EPA

Project Officer within 30 days after the reporting period (every six-month period).

The reporting periods are June 30th and December 31st.

B. CYBERSECURITY GRANT CONDITION FOR OTHER RECIPIENTS

(a) The recipient agrees that when collecting and managing environmental data under this assistance agreement, it will protect the data by following all applicable State or Tribal law cybersecurity requirements.

(b) (1) EPA must ensure that any connections between the recipient's network or information system and EPA networks used by the recipient to transfer data under this agreement, are secure. For purposes of this Section, a connection is defined as a dedicated persistent interface between an Agency IT system and an external IT system for the purpose of transferring information. Transitory, user-controlled connections such as website browsing are excluded from this definition. If the recipient's connections as defined above do not go through the Environmental Information Exchange Network or EPA's Central Data Exchange, the recipient agrees to contact the EPA Project Officer (PO) no later than 90 days after the date of this award and work with the designated Regional/Headquarters Information Security Officer to ensure that the connections meet EPA security requirements, including entering into Interconnection Service Agreements as appropriate. This condition does not apply to manual entry of data by the recipient into systems operated and used by EPA's regulatory programs for the submission of reporting and/or compliance data.

(2) The recipient agrees that any subawards it makes under this agreement will require the subrecipient to comply with the requirements in (b)(1) if the subrecipient's network or information system is connected to EPA networks to transfer data to the Agency using systems other than the Environmental Information Exchange Network or EPA's Central Data Exchange. The recipient will be in compliance with this condition: by including this requirement in subaward agreements; and during subrecipient monitoring deemed necessary by the recipient under 2 CFR 200.332(d), by inquiring whether the subrecipient has contacted the EPA Project Officer. Nothing in this condition requires the recipient to contact the EPA Project Officer on behalf of a subrecipient or to be involved in the negotiation of an Interconnection Service Agreement between the subrecipient and EPA.

C. FINAL APPROVED WORKPLANS AND MODIFICATIONS

Recipient agrees to carry out the project in accordance with the final approved workplan. Recipients are required to report deviations from budget or project scope or objective and must request prior written approval from the EPA Award Official or Grants Management Officer.

D. DAVIS-BACON (DB)

For the purposes of this term and condition, each recipient of the grant award under SDWA 1459B shall provide reasonable assurance that all laborers and mechanics employed in the performance of the project for which the assistance is provided, including those employed by contractors or subcontractors, will be paid wages at rates not less than those prevailing on

similar work in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of part A of subtitle II of title 40, United States Code (commonly referred to as the `Davis-Bacon Act'). Recipients with questions regarding when DB applies, obtaining the correct DB wage determinations, DB contract provisions, or DB compliance monitoring, should contact the EPA Project Officer for guidance.

E. SIGNAGE REQUIRED

Signage Requirements

The recipient is required to place a sign at construction sites supported under this award displaying the EPA logo in a manner that informs the public that the project is funded in part or wholly by the EPA. The sign must be placed in a visible location that can be directly linked to the work taking place and must be maintained in good condition throughout the construction period.

Recipients are required to comply with the sign specifications provided by the EPA Office of Public Affairs (OPA) available at: https://www.epa.gov/grants/epa-logo-seal-specifications-signage-produced-epa-assistance-agreement-recipients. If the EPA logo is displayed along with the logos of other participating entities, the EPA logo must not be displayed in a manner that implies that EPA itself is conducting the project. Instead, the EPA logo must be accompanied with a statement indicating that the recipient received financial assistance from EPA for the project. As provided in the sign specifications from OPA, the EPA logo is the preferred identifier for assistance agreement projects and use of the EPA seal requires prior approval from the EPA. To obtain the appropriate EPA logo or seal graphic file, the recipient should send a request directly to OPA and include the EPA Project Officer in the communication. Instructions for contacting OPA is available at: https://www.epa.gov/stylebook/using-epa-seal-and-logo.

State agencies and agencies of political subdivisions of states must comply with 2 CFR 200.323, Procurement of recovered materials when procuring signage for projects funded by EPA assistance agreement. EPA encourages other recipients to use recycled or recovered materials when procuring signs.

Signage costs are considered an allowable cost under this assistance agreement provided that the costs associated with signage are reasonable. Additionally, to increase public awareness of projects serving communities where English is not the predominant language, recipients are encouraged to translate the language on signs (excluding the EPA logo or seal) into the appropriate non-English language(s). The costs of such translation are allowable, provided the costs are reasonable.

Public or Media Events

The Recipient agrees to notify the EPA Project Officer listed in this award document of public or media events publicizing the accomplishment of significant events related to construction projects as a result of this agreement, and provide the opportunity for attendance and participation by federal representatives with at least ten (10) working days'

notice.

F. USE OF LOGOS

If the EPA logo is appearing along with logos from other participating entities on websites, outreach materials, or reports, it must not be prominently displayed to imply that any of the recipient or subrecipient's activities are being conducted by the EPA. Instead, the EPA logo should be accompanied with a statement indicating that the **City of Benton Harbor** received financial support from the EPA under an Assistance Agreement. More information is available at: https://www.epa.gov/stylebook/using-epa-seal-and-logo#policy

From:	Oswald, Eric (EGLE)
To:	Krisztian, George (EGLE)
Subject:	FW: Review of draft letter: Benton Harbor ACO
Date:	Wednesday, January 8, 2020 2:34:53 PM
Attachments:	es benton harbor ACO extensions_mn.docx exhibit a - progress summary.pdf

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George, don't know why you didn't receive this but I am forwarding to you.
Eric

From: Oswald, Eric (EGLE)
Sent: Wednesday, January 8, 2020 9:21 AM
To: Strong, Regina (EGLE) <StrongR1@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Finnell, Emily (EGLE) <FinnellE@michigan.gov>
Cc: Krisztian, George (EGLE) <krisztiang@michigan.gov>
Subject: FW: Review of draft letter: Benton Harbor ACO
All, just FYI on where we are headed. I will be discussing our strategy with Aaron shortly. Let me know if you have any comments on the attached.
Eric

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, January 8, 2020 8:56 AM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO
Eric & Brian - Please find attached a draft letter w/ attachment for your review, to address ongoing extensions and two past-due items on the ACO compliance schedule for Benton Harbor. As you share/discuss with the front office for coordination with other actions in BH, consider also Regina, Ninah, and Emily Finnell as follow-up to our meeting in December.
Brandon – FYI, as I am sure you will have communications with the city shortly as well regarding monitoring for lead copper and possibly a continued ALE.
Ernie

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Tuesday, January 7, 2020 4:51 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO
OK. I didn't have much time to focus on this today, but my changes have been made.
I also told Eric and Brian that we will be sending it their way.
Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, January 06, 2020 1:55 PM

To: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO
Good comments. Mike, you're next!!

From: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Sent: Monday, January 6, 2020 11:52 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO
Happy new year to you too!
Thanks for the opportunity to review the letter. I think the general approach is appropriate for the situation. My revisions are mostly for clarification and to emphasize a couple points. I saved it back in the same location with my comments in track changes.
One thought for the Exhibit, is to include another column that indicates which paragraph in the ACO each item is associated. My reasoning is that this letter is addressed to the mayor who may not be as versed as the operator and other individuals with whom you have been working.
Let me know if you have any questions.
Thanks again,
Maureen

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, January 6, 2020 10:46 AM
To: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Review of draft letter: Benton Harbor ACO
Hi Maureen, and happy new year!
Could you review the draft letter below, focusing on our proposed strategy regarding compliance with the ACO? This was my off-the-cuff take on next steps to help ensure timely completion of these items…if you have other ideas we'd love to hear them!
Attached is the extension summary sheet referenced in the letter.
\\Hct084vsnbpf011\egle\DWMAD\SHARED\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\District 93\Benton Harbor\Communication\es benton harbor ACO extensions.docx
Thanks in advance,
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile
www.michigan.gov/drinkingwater

DATE

Mr. Marcus Muhammad, Mayor
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600

Dear Mayor:

SUBJECT: **Water System ACO Progress, Failure to Meet Deadlines**

The City of Benton Harbor (city) entered into an administrative consent order (ACO) with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on March 5, 2019 as a result of findings by EGLE's sanitary survey of the city's water system in 2018. The findings described numerous deficiencies and significant deficiencies according to the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and noted a lack of financial and managerial capacity to maintain a water system according to the requirements of Act 399. Section II – Compliance Schedule, of the ACO contains 13 action items and a schedule for completion of these items, which you agreed to upon entering the ACO. As the signator of the ACO for the city, this letter provides an update on the city's progress on meeting the compliance requirements.

As shown in the attached Exhibit A - ACO Compliance Timeline Progress Summary, six of 13 items have been completed. This progress is a result of significant effort and funding required to make these necessary improvements. Among the items completed are hiring a distribution operator, installing a chlorine analyzer, and moving the feedpoint location of a critical treatment chemical (coagulant). These items have direct and indirect impact to the protection of public health in the city's drinking water system.

Many of the items have also been delayed, and seven remain incomplete. We understand the need for extensions, and have given city staff ample opportunity for input to the compliance schedule. Extensions of the timeline are allowed under Section 4.14 of the ACO, which outlines the process for requesting extensions. The remaining items range from rate increases and collections, installation of a flow meter at the water plant, cross connection control, and general maintenance of the water system.

These items also have significant implications on public health protection efforts. For example, the city's cross connection control program was found by EGLE to be marginal in 2011, deficient in 2015, and significantly deficient in 2018. There has not been adequate progress in this program to protect public health or to meet Act 399 requirements. As another example, a meter to measure water flow and volume is required, and is particularly important with respect to the new corrosion control feed system. However, this item has been delayed three times and was recently requested again for extension.

In order to provide protection of public health, and restore the necessary technical and managerial capacity to operate the water system , **we are requesting the city submit a final compliance timeline for EGLE approval by [DATE].** The timeline must be adopted by resolution of the city commission to ensure full disclosure and support from all city officials. Please accept our offer to present information to the city commission as necessary to support this effort. Until a resolution is passed and the associated compliance schedule is proposed, no further extensions will be granted.

There are presently two items past the deadline set by the compliance schedule. The city recently requested a fourth extension of the finished water flow meter which is hereby denied, and also missed

Commented [NM(1]: I know it will be difficult to nail down a deadline for this because it has to be approved and adopted by city commission, but I think it's very important to give them a timeframe for submitting the final compliance timeline.

Commented [SE(2R1]: I agree…With the below addition, the city will be motivated by the lack of future extensions as well

a twice-extended deadline for submittal of a rate collections plan by 12/31/2019. As a result, **the city is being assessed a civil fine of $500 under Section 1.3 of the ACO for failure to complete corrective actions.** Please note failure to make a timely payment will constitute a violation of the ACO. Payment information may be found in Section 1.4 of the ACO.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this letter, please contact me below, or contact Ernie Sarkipato by telephone at 616-307-0261; by e-mail at sarkipatoe@michigan.gov; or EGLE-DWEHD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Eric J. Oswald, Director
Drinking Water & Environmental Health Division
Department of Environment, Great Lakes, and Energy
517-284-6524
oswalde1@michigan.gov

cc: Mr. Mike O'Malley, Water Superintendent, City of Benton Harbor (via email)
Mr. Ellis Mitchell, City Manager, City of Benton Harbor (via email)
Mr. Darold Harlan, Distribution Operator, Fleis & Vandenbrink (via email)
Mr. Ernie Sarkipato, Surface Water Treatment Specialist, EGLE (via email)
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE (via email)
Ms. Maureen Nelson, Enforcement Specialist, EGLE (via email)
Ms. Nicki Britten, Health Officer, Berrien County Health Department (via email)
Ms. Ninah Sasy, Clean Water Public Advocate (via email)
Ms. Regina Strong, Environmental Justice Public Advocate (via email)

Commented [MB3]: If fines are assessed, they should be placed in some type of escrow to be used solely for the necessary water system improvements.

Commented [SE(4R3]: Agree in concept, although for this amount it doesn't seem quite worth the effort?

EXHIBIT A

ACO Compliance Timeline Progress Summary for City of Benton Harbor

Item	Initial Deadline	Extended Deadline	Extension History
Submit a rate study	4/1/19	(completed)	
Upgrade SCADA system for data access and storage	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Install continuous chlorine analyzer on WTP tap	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Corrosion Treatment Study	4/1/19	(completed)	
Distribution Operator in charge	4/1/19	(completed)	1-from 4/1/19 to 5/1/19 2-from 5/1/19 to 5/22/19
Permit and Construct coagulant feed to existing rapid mix	6/1/19	(completed)	1-from 6/1/19 to 8/2/19
Submit plan to implement rate increases	4/1/19	7/1/20	1-from 4/1/19 to 9/30/19 2-from 9/30/19 to 7/1/20
Install flow meter on finished water	4/1/19	12/15/19	1-from 4/1/19 to 6/15/19 2-from 6/15/19 to 9/30/19 3-from 9/30/19 to 12/15/19 ***4-request not granted***
Submit updated rate collections plan	5/1/19	12/31/19	1-from 5/1/19 to 9/30/19 2-from 9/30/19 to 12/31/19 ***Deadline not met***
Updated cross connection program including residential accounts	6/1/19	3/31/20	1-from 6/1/19 to 12/31/19
Submit maintenance plan for valves and hydrants	6/1/19	6/30/20	1-from 6/1/19 to 9/30/19 2-from 9/30/19 to 6/30/20
Conduct professional inspection of water tower, or conduct cleaning and repaint interior	6/30/19	12/31/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 12/31/20
Install/repair mussel control system at intake	6/30/19	4/1/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 3/1/20
Repair filter to waste valves	1/31/20	9/1/20	1-from 1/31/20 to 9/1/20

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE)
Cc:	Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Subject:	FW: mi 0600 benton harbor ACO corrosion control study EGLE response
Date:	Tuesday, June 9, 2020 9:05:25 AM

A response letter to the BH Corrosion Study Proposal is below, with comments from myself and Brandon.

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Monday, June 8, 2020 11:59 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: mi 0600 benton harbor ACO corrosion control study EGLE response

Here are my initial thoughts. I saved a draft here: T:\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\District 93\Benton Harbor\Communication
Titled: DRAFT_mi 0600 benton harbor ACO corrosion control study EGLE response_BMO comments_20200608

Thanks,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, June 5, 2020 8:14 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: mi 0600 benton harbor ACO corrosion control study EGLE response

Please rip this letter apart!
Two things; the letter from Elhorn states they will submit a detailed plan, so my letter references this.
Second, I'm concerned about shifting the daily work to BH operators.

From:	Bielanski, Andrew
To:	Jason Marquardt; Joelle Regovich
Cc:	Worthington, David (EGLE); Sarkipato, Ernest (EGLE)
Subject:	Follow-up on Benton Harbor, MI Environmental Crosscutter Review
Date:	Thursday, April 29, 2021 9:39:38 AM

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hi Joelle and Jason,
I have some follow-up from our March 24, 2021 meeting when I talked about NEPA and the environmental crosscutter review. Again, NEPA review is not required but our Region 5 NEPA experts did look at your work plan and a memo to the file was created stating that even if a NEPA review was needed then the project would have been categorically excluded regardless. The corrosion control study by itself does not require NEPA review while the lead service line replacement work was deemed a functional replacement of existing equipment, and there were no extraordinary circumstances that would prevent the use of a categorical exclusion for the project. The only feedback we received is that whatever lead is removed during the course of the project be properly disposed of or recycled. Please follow any Michigan requirements for the disposal and/or recycling of the lead material.
The environmental crosscutter review took a little longer to complete due to the number of crosscutters – these were listed in Attachment A that was supplied during the March 24 meeting. Almost every crosscutter was deemed either not applicable and/or had no impact due to the location or scope of the project. A few crosscutters were deemed as having no impact but did warrant some advisement of certain items which I have listed in the bullets below. Due to the no impacts we did not seek consultation with other agencies such as the Michigan State Historic Preservation Officer (SHPO) or the U.S. Fish and Wildlife Service.

- For the National Historic Preservation Act (NHPA) I did a search of historical sites within the general city boundaries of Benton Harbor. I did get a few sites to pop up from my search which are listed below. You should consult with your SHPO if you are working near these sites or if any issues involving historic sites arise. I do realize that your work plan included larger geographic areas and that the lead service line removal may occur far from these historic sites.
    - Shiloh House
    - Fidelity Building
    - Wendell P. Robbins and Harriet Rounds House
- For the Native American Graves Protection and Repatriation Act it was determined that it was highly unlikely that buried remains be present due to the high degree of prior disturbance within the urbanized area. However, if any buried remains are discovered then you should contact your SHPO immediately.
- For the Endangered Species Act, the Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act we are advising you of a few recommended measures to implement to minimize the impacts on birds and their habitats. They are as follows:
    - Provide enclosed solid waste receptacles at all project areas. Non-hazardous solid waste (trash) would be collected and deposited in on-site receptacles. Solid waste would be collected and disposed of by a local waste disposal contractor. For more information about solid waste and how to properly dispose of it; please see the EPA Non-Hazardous Waste website.
    - For habitat protection please take the following actions:
        - Minimize project creep by clearly delineating and maintaining project boundaries (including staging areas). Staging should not impact wooded areas.
        - Maximize use of disturbed land for all project activities (i.e., siting, lay-down areas,

and construction).

- Implement standard soil erosion and dust control measures. For example: establish vegetation cover to stabilize soil and/or use erosion blankets to prevent soil loss; water bare soil to prevent wind erosion and dust issues.
- Consult all local, State, and Federal regulations for the development of an appropriate buffer distance between development site and any wetland or waterway. For more information on wetland protection regulations see the Clean Water Act sections 401 and 404.

Apart from the recommendations actions mentioned above you should comply with any state environmental requirements that apply. I have copied both David Worthington and Ernie Sarkipato from Michigan EGLE to let them know of the results of our environmental crosscutter review and coordinate efforts with state requirements.

Once your grant is awarded I also plan to work with you on the reporting requirements. We are currently working on project reporting elements so we'll cross that reporting bridge when we get there.

If you have any questions or concerns regarding this update then please do not hesitate to contact me.

Thanks!

Andy

Andrew J. Bielanski
Environmental Engineer
State Revolving Fund -- State &Tribal Programs & Support Branch
Phone: (312) 886-0208
Fax: (312) 980-8709

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); Bolf, Michael (EGLE); Bolt, Jennifer (EGLE)
Subject:	Fwd: ACO Deadline Reminder: 12/15/2019, finished water meter
Date:	Monday, December 9, 2019 9:35:09 PM

FYI, an O'MALLEY email dive is below and contains some interesting tidbits. It would appear we are headed for another monitoring violation of the LCR in Benton Harbor, and Mike has doubts about the corrosion treatment. I wish there was something we could do to help them get samples taken in town.

I also think we need to take another hard look at the population and monitoring requirements for next year.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>

Sent: Monday, December 9, 2019 9:31 PM

To: Mike O'Malley

Subject: Re: ACO Deadline Reminder: 12/15/2019, finished water meter

Mike, if you would like to propose a different way to add phosphate, please go ahead but until that is approved then that valve cannot be opened. It would allow high service water to bypass the po4, absolutely unacceptable.

Not sure what words Kevin K put in my mouth, but if it had to do with relaxing the 60 sample requirement it doesn't appear to be open to negotiation at this time.

The webinar I forwarded appeared to be geared towards water operators, and I would very much encourage you to 'attend'. In particular, I'm concerned about benton harbors preliminary DSMI, and the requirement to notify all the residents who have or are presumed to have LSL's.

Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>

Sent: Monday, December 9, 2019 4:54 PM

To: Sarkipato, Ernest (EGLE)

Subject: Re: ACO Deadline Reminder: 12/15/2019, finished water meter

No, that is not what I said.

We do not know. It is a good possibility the valve is broken. And we do not know that even. I am to the point of opening it all the way, praying it is all the way open and leaving everything alone.

And by the way, we have been out soliciting Sampling sites since the **1st of October**. I waited a couple of months for more production out of the OPP treatment.
When you heard about stuff (in the Herald Palladium) we were on the 3rd iteration, with only 7 samples recieved.
We have had so much interest now, we are up to about 15!
And, Kevin has scored 5-8 of those, and Toni got 2 more from her neighbors over the weekend.

Kevin told me what you said. I am looking forward to our ***Notice of Violation*** to open up a brand New Year 2020.

Oh quick like. Is this coming webinar another "tell the general Public of the State what lead and copper is", like the last 2; or is it geared to Actual Water Professional Operators?

Mike O'Malley

On Mon, Dec 9, 2019 at 4:32 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Thank you for your feedback, Mike. Is it the case the 30" valve actuator no longer works at all?
>
> ---
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Monday, December 9, 2019 3:47:31 PM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
> **Cc:** rrice@cityofbentonharbormi.gov <rrice@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** Re: ACO Deadline Reminder: 12/15/2019, finished water meter
> Roena, could you please make sure that Mr. Mitchell will follow up with this email as soon as he can?
>
> City Manager Ellis Mitchell,
>
> At this late date, I need you to ask for an extension of the Administrative Consent Order that requires a meter on the suction line of the High Lift Pumps that deliver water to the community.
>
> Even though, I believe that the Benton Harbor Water Plant presently provides a means to measure the volume of finished water produced.
> And finished water is defined in the regulations as Water Distributed to a Community Water Supply (tap water).
>
> Rule 1008
>
> (9) Each complete treatment system shall be provided with a means to measure the volume and rate of ***raw water*** supplied and finished water produced.
>
> (Note, this definition stated in Ernie's email above, differs from the actual text he referenced in a previous email.)
>
> The water plant has always been fully equipped with metering of the raw water.
> And as for finished water produced, the water plant does not have a meter but has a reliable

"means to measure' and has been supplying that value to the MDEQ as a written-in value in the Required State of MI Monthly Operations Report (MOR) And has provided the State of MIchigan with that value written into the MOR since the January 2019 MOR.

I had the Corrosion Expert who set up the suction line meter. He stated, and I know believe that the meter that he installed will measure flow and does not have a feedback to interfere with its ability to do so.
The problem now is solely the fact that the State told us to close the west suction line on the high lift pumps. Leaving open, only the east suction line where the meter was placed and the Orthopolyphosphate injection is made.

When they 1st proposed this manipulation of a massive 30-inch suction well valve, I was worried but went ahead and did it anyway.
I am now, absolutely unsure on the idea of doing such a task and cannot figure out how to get it right.
We will try again, but I am afraid we are now at the worst case scenario; that being, we have broken the valve and it will not open or close at all.

Every scenario I know to do now will take a great deal of time to execute.

Please solicit a request from EGLE and it's Administrative Consent Order council, to extend the dead-line from December 15, 2019 to June 15, 2020.
If you do not, The City will likely face a serious fine from EGLE.

Sincerely,

Mike O'Malley
Benton Harbor Water Superintendent

On Mon, Dec 9, 2019 at 1:27 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Gentlemen – we recognize that Mike is presently putting his efforts into collecting lead and copper samples before 12/31/19, and appreciate those efforts now. We regret this effort began so late in the monitoring period, as samples collected in July, August, September, October, and November would all be valid for compliance purposes. Regardless, right now the city's primary goal needs to be getting 60 samples by the end of the year. From talking with Kevin Kasischke at DHHS who was working with Mike, we understand that going door to door is proving ineffective. I encourage you to work with city employees, friends, neighborhood contacts, and churches to get volunteers. Also consider handing out bottle sets at the Health Department when they distribute filters & replacement cartridges.
>
> Given this huge effort and distraction, I wanted to remind you of the next ACO deadline, which is to have the finished water meter working and totalizing. If you are looking for another extension for this, **please provide a proposed date and state a reason**.
>
> For discussion's sake, here is the reference in the rule for the metering of finished water:
>
> Rule 1008

(9) Each complete treatment system shall be provided with a means to measure the volume and rate of raw water supplied and finished water produced.

Call or email any time,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE)
To: Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Subject: Fwd: Benton Harbor Corrosion Treatment Check-in
Date: Monday, April 20, 2020 8:07:15 AM

FYI response from Mr Mitchell

From: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Sent: Sunday, April 19, 2020 1:52:50 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; rrice <rrice@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Corrosion Treatment Check-in

Good morning all. Ernie, you have said a lot in this email, and before any reply, I will meet with the City Water Team, discuss each item, develop a Team consensus, and get our reply to you as soon as possible.

Please let me know if you questions or concerns.

Ellis

On Fri, Apr 17, 2020, 5:03 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Recently we received the March Operation Report from Operator In Charge Mr. O'Malley for the City of Benton Harbor's water treatment plant. This is the first full month of treatment after changing to the new phosphate chemical as directed by our letter dated February 13, 2020, attached. The increase in phosphate in the distribution system is notable in the samples collected by Mr. O'Malley and staff, and we appreciate the time and effort to steer the corrosion treatment in this direction. The purpose of our request and our shared goal continues to be an expedited path to minimizing impacts to public health from lead in drinking water.
>
> Based on the operational data in March, we had some observations for the city:
>
> 1. The target orthophosphate residual is 3.0 mg/L as PO4 *in the distribution system*. While the phosphate levels at the water plant exceed this level on 17 out of 31 days, the *distribution residual* has not yet reached 3.0 mg/L as directed.
> 2. There is variation in the amount of phosphate being added each day, which is to be expected as operators must adapt to a new treatment chemical and target.
>
> Again, we fully understand there is time needed to work out the kinks of a new chemical and new target. To help the city achieve the target dose consistently, the following are some suggestions:
>
> A. It appears the pump may be undersized and unable to meet the higher treatment target. This was stated by Mr. O'Malley previously (attached

email), and independent calculations support his claim. *We recommend doing a pump test* (i.e. drawdown test) with the existing chemical pump to measure the flow rate at max setting. If found inadequate, *please explore improvements to increase pump output*. This might include *increasing the pump tubing size* or it may be necessary to *install a larger pump*.

B. The variability of the chemical treatment may be reduced by *implementing the full functionality of the pump and insertion meter* (i.e. flow-pacing the pump). This system was intended to function independently, basing the chemical added on the presence and amount of water flow through high service pumping. I believe this could be done by a *qualified instrumentation/controls integrator*.
C. We would like to offer assistance in continuing the conversation regarding a corrosion study. While the new treatment chemical and higher target is based on analogous systems with success in curbing lead release, it is necessary to select the best treatment for the City of Benton Harbor. An initial conversation has been held with Dr. Dave Cornwell, and a follow-up call can also be arranged at the city's request.

All in all, we would like to thank the city and Mr. O'Malley for the progress thus far, and hope to offer our assistance in keeping that momentum. I have drafted this email on behalf of our team at EGLE, in an attempt to respect Mr. Mitchell's request that communication from our department funnel through me to the extent practical. If you would like to arrange a discussion of this email and the corrosion treatment, I would be very happy to arrange that.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

---------- Forwarded message ----------
From: "Mike O'Malley" <momalley@cityofbentonharbormi.gov>
To: "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov>, "Onan, Brandon (EGLE)" <OnanB@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>, Darold Harlan <dharlan@fv-

operations.com>, emitchell <emitchell@cityofbentonharbormi.gov>, Daniel McGinnis <dmcginnis@cityofbentonharbormi.gov>, Michael Clark <mclark@cityofbentonharbormi.gov>, Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>, "Dr R. Johansen" <rjohansen@bchdmi.org>, Nicki Britten <nbritten@bchdmi.org>
Bcc:
Date: Mon, 24 Feb 2020 23:02:38 +0000
Subject: Re: What constitutes "Gentle Flushing"
Thanks for the info.

Some of you may wonder why you are on the copy line. I believe if I reference someone or something done by someone, I add them to the copy line.
If you read through this, you will see where you fit in to this email.
Dr. Johanson, Nicki Britten, Chief McGinnis, and Deputy Police Chief Michael Clark.

Unfortunately this email is from Mike O'Malley, Operator IN Charge and not by the City Manager, Mr. Ellis Mitchell.
This is my take on the situation, and may not be Ellis Mitchell's opinion, but he is copied (as agreed) on this email.

The switch over from 70/30 OPP to 90/10 OPP was Friday 02 21 2020 in the morning.
It took Darold all day Thursday and me all day Friday to get the West Suction Line closed nearly 100%
Proof for this valve being closed; was a flow through the new meter of 2,604 gpm which is roughly equal to 3.75 MGD, which is very close to what the High Service pump is expected to deliver.
Unfortunately, the new demanded feed rate of 3.0 mg/L as P requires the pump to function at Top Speed, (100%) speed the original Pump is designed for.

The Permit Change is something different and will take me awhile to properly fill out. I propose the permit that exists is still in force and has only been altered by the type of Chemical Make Up percentages "ORTHO"
I am working on it today. Maybe, you can send me a blank form of the one you used and I can copy/paste the appropriate existing conditions and basically only to add the new chemical treatment.

As you know the Orthopolyphosphate treatment scheme was decided upon by the EGLE staff with the recommendation of Elhorn Engineering.
The State also agreed to allow Benton Harbor to use the MDEQ Pilot Grant Funding to reimburse the expenditures that were incurred, Thank You.
EGLE pushed to have the OPP treatment in place before the proposed Suction Line Meter was installed, due to its long lead time.
Elhorn Engineering delivered the 1st set of 55-gallon barrels; set up the pump and injection point, and put in a Rack of various metals to determine the rate of decay.
This all started to take effect 3/26/2019.
A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.

With no background data, the results are not really worth noticing, just yet. But the Mild Steel decay was most troublesome at the Outside location. The lead result was pretty small, as well as the copper at both locations.

Hence, your letter drove us to remove the 2nd Rack on 2/17/2020 and send the coupons in for analysis.
If, you had requested, or If you had waited a bit longer with the NOTICE; we may have seen results that indicated that the original corrosion treatment program was working enough to wait out the 18-Month time frame that we were told would be when a relatively full exchange would be evident.
Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."

To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " *The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years*". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!

As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio. *It was probably written before EPA knew about this chemical blend. And, before the Dramatic Change in the Lead Rules.

I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).

And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; **and should not be**, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.

As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product.
However either one of the treatment chemicals they supply is the same price but different results. Unfortunately, some would see this as a conflict of interest.

And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.

If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about

Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.

It appeared in your letter, that other systems have been involved in this type of corrosion treatment. Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.

Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with high water levels, the residential portions of Benton Harbor are on top of the hills. However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions.,
And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.

At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.
After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.

Sincerely,

Mike O'Malley
Benton Harbor Water Operator IN Charge.

On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike,
>
> Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:
>
> -The goal is to bring the newly treated water throughout the distribution system
>
> -The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.
>
> -It’s best to start at the water plant and move to the ends of the system
>
> -For example, on a 6” pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it’s a dead end run. As you can see, it can be easy to get into the scouring velocity range.

-At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing level. Then, next day, move further into the system.

I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.

Hopefully that is helpful information,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, February 21, 2020 4:56 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: What constitutes "Gentle Flushing"

From:	Curtis Brzyski
To:	Sarkipato, Ernest (DEQ); ron
Subject:	Fwd: Benton Harbor FPI application
Date:	Tuesday, February 5, 2019 5:00:08 PM
Attachments:	lower level drawing.pdf

Good application per factory

Get Outlook for Android

From: Clements, Joe <JoeC@mccrometer.com>
Sent: Tuesday, February 5, 2019 1:42:43 PM
To: 'Curtis Brzyski (cbrzyskimmi@msn.com)'
Cc: Spiegel, Barry S; James; Colon, Jose M
Subject: Benton Harbor FPI application

Curtis,
Feeding from a tank is like having an unlimited straight run. The gate valve should be 100% open. I would mount the FPI sensor in the 12:00 position close to the gate valve. The Phosphate Injection should be as far downstream of the sensor as posable which will still be pretty close.
Looks like a good application.
Thanks for getting the details worked out up front.

JOE CLEMENTS | **Application Engineer – Water Market**
Cell 717-372-4095 | joec@mccrometer.com
McCrometer, Inc. | www.mccrometer.com

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 04, 2019 1:43 PM
To: Clements, Joe <JoeC@mccrometer.com>; Spiegel, Barry S <barrys@mccrometer.com>
Cc: jmommersmmi@msn.com
Subject: Fw: Benton Harbor job

Joe
recommendations
flow in 1 direction 30 inch line
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com
----- Original Message -----
From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski ; jmommersmmiinc@gmail.com
Cc: momalley@cityofbentonharbormi.gov ; roudbier@fnwusers.com ; ron@oudbierinst.com
Sent: Monday, February 4, 2019 1:22 PM
Subject: RE: Benton Harbor job

Thank you very much!
Hopefully this drawing and photos help with the lay of the land.
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** Sarkipato, Ernest (DEQ)
> **To:** Curtis Brzyski ; James Mommers
> **Cc:** momalley@cityofbentonharbormi.gov
> **Sent:** Monday, February 4, 2019 10:29 AM
> **Subject:** RE: Benton Harbor job
>
> City is going to have a local contractor tap the main and install the meter.
> Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
> We probably need 40' of cable.
> Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
> Ernie
>
> ---
>
> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
> **Sent:** Tuesday, January 29, 2019 9:36 AM
> **To:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
> **Subject:** RE: Benton Harbor job
>
> Its included in the cost of the flowmeter
> $13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
> Freight , installation and startup are not included
> Freight around $300.00
> Installation ??
> Startup by Oudbier ??
> Curtis
> Sent from Mail for Windows 10
>
> ---
>
> **From:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>

Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.
Ernie
From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead.

> Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

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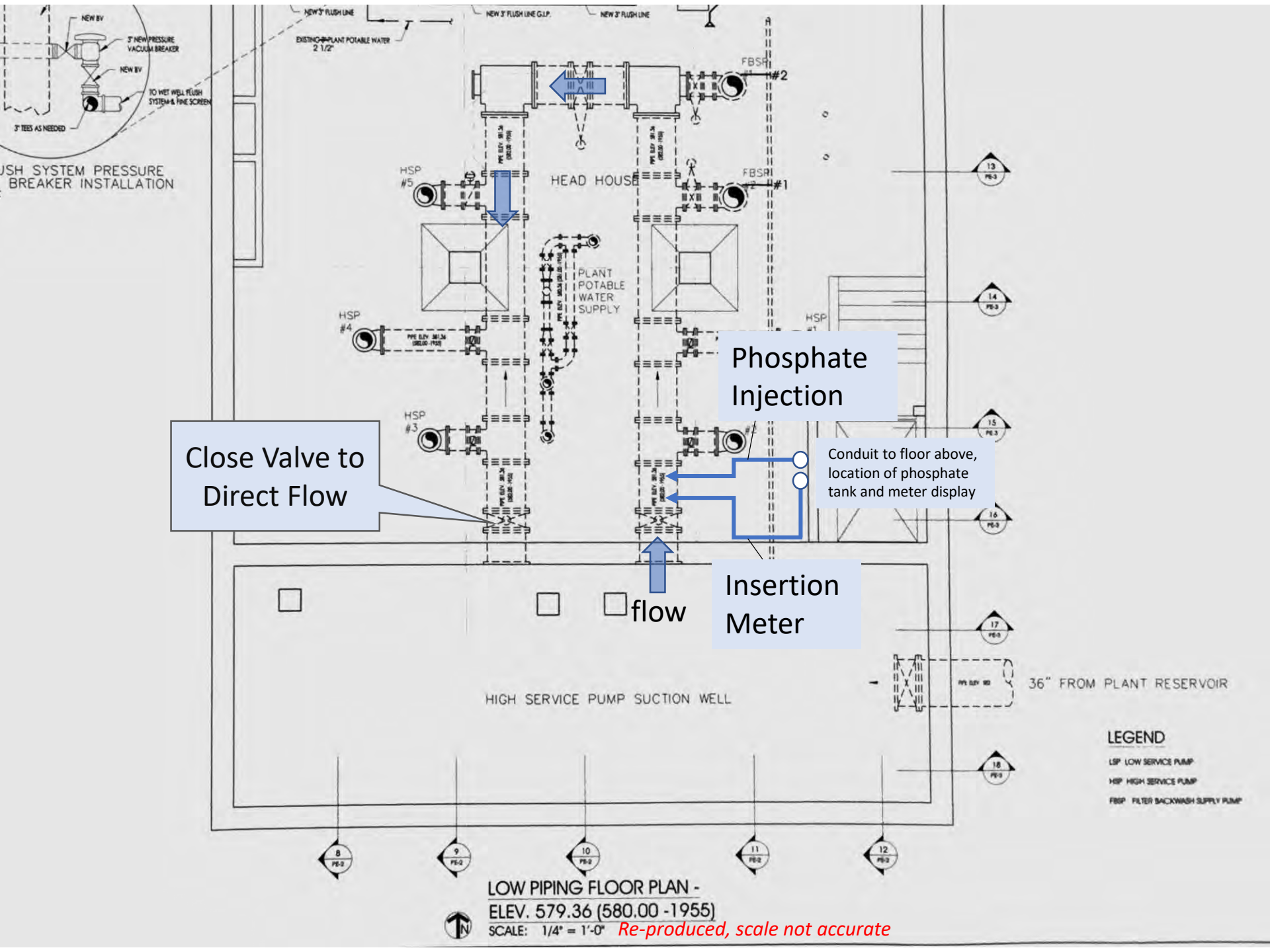
NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

From:	Sarkipato, Ernest (DEQ)
To:	MICHAEL O"MALLEY
Subject:	Fwd: Benton Harbor job
Date:	Friday, February 1, 2019 8:56:46 AM

See below - cheaper through MMI!!

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

Begin forwarded message:

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Date: January 29, 2019 at 9:35:46 AM EST
To: "Sarkipato, Ernest (DEQ)" <SARKIPATOE@michigan.gov>, James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job

Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here…how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.

Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job

Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost…
Ernie

From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job

Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation – we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration – we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Mike Enlow; Todd Luks
Subject:	Fwd: Corrosion Plan update, and miscellaneous
Date:	Friday, August 9, 2019 1:11:11 PM
Attachments:	ATT00001.htm MI 0600 Benton Harbor Corrosion Treatment Plan.pdf ATT00002.htm

---

Do you guys plan on following up on the coupons at BH?

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
EGLE-Drinking Water and Environmental Health
616-307-0261

Begin forwarded message:

From: "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov>
Date: July 29, 2019 at 11:53:42 AM EDT
To: "momalley@cityofbentonharbormi.gov" <momalley@cityofbentonharbormi.gov>, "elhorneng@aol.com" <elhorneng@aol.com>, "Onan, Brandon (EGLE)" <OnanB@michigan.gov>
Cc: "Thurston, Brian (EGLE)" <THURSTONB@michigan.gov>, "dwatson@cityofbentonharbormi.gov" <dwatson@cityofbentonharbormi.gov>, "Bolf, Michael (EGLE)" <BOLFM@michigan.gov>, "mike@michonline.net" <mike@michonline.net>, "Bolt, Jennifer (EGLE)" <BOLTJ@michigan.gov>, "Crider, Steven (DHHS)" <CriderS1@michigan.gov>
Subject: RE: Corrosion Plan update, and miscellaneous

All,
By my calculations it is nearing time to pull the first round of coupons and get a baseline for corrosion rates in the system. Please indicate the plan for the next pull (another 90 days?), which is our next opportunity to draw some conclusions on the efficacy of the corrosion inhibitor treatment.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE)
Sent: Tuesday, April 30, 2019 7:46 AM
To: momalley@cityofbentonharbormi.gov; elhorneng@aol.com; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; mike@michonline.net; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Subject: Corrosion Plan update, and miscellaneous

Thank you for the quick phone call yesterday to discuss Elhorn's proposed corrosion control treatment plan for Benton Harbor (attached). Here's a summary of that, and the rest of our chat:

Corrosion Plan: Todd mentioned the attached corrosion treatment plan is a generic version he uses. We talked through the proposed series of events. Soon, sampling for water quality and lead and copper will begin at the racks. The next step is, the coupons will be pulled and tested after 90 days. Treatment adjustments will be made in-situ based on these initial results (assuming a good enough baseline is established), and this process should repeat for continued optimization. Currently, coupon racks are installed at the water plant and at city hall, both of which are treated tap water. We identified the benefit of having a treated water, pre-phosphate addition baseline rack installed at the water plant. Todd will look at options on Friday of this week when he is at the water plant. There was agreement on the phone this plan is acceptable.

Test Kit: Mike had inadvertently ordered a color wheel phosphate test kit, which is far too subjective. Todd mentioned he ordered an extra and will bring that Friday to the plant. We very much agree the city should not be using test equipment based on color comparators. *SIDE NOTE: If you guys could confirm what the ortho reading is at the plant tap (with high service running), as well as at city hall on Friday, that would be a really good data point.*

Meter Install: there are more delays in the McCrometer insertion meter, which is intended to measure HS flow and also pace the phosphate pump. We will keep pursuing that project to help with optimization of corrosion treatment.

Compliance Testing: We will not be reducing the city's required lead and copper sampling from 60 to 40 as requested by Mike O'Malley, based on population. This may occur in future years, particularly with another census around the corner. For this year, the additional sampling is needed to be most protective of public health and make well informed decisions regarding the treatment optimization. We recommend using the attached infographics to help residents sample the 5th liter correctly.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment Great Lakes and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

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Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

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MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

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Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject:	Fwd: MI 0600 Benton Harbor MOR for April 2019
Date:	Monday, May 13, 2019 8:51:57 AM
Attachments:	MI 0600 Benton Harbor MOR April 2019.pdf ATT00001.htm

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See page 6, for phosphate data. I'm taking the residuals with a grain of salt, as they were measured with a color wheel. The city is getting a Hach DR unit soon.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
EGLE-Drinking Water and Environmental Health
616-307-0261

Begin forwarded message:

From: "Mike O'Malley" <momalley@cityofbentonharbormi.gov>
To: "EGLE-DWMA-Kalamazoo" <EGLE-DWMA-Kalamazoo@michigan.gov>, "EGLE-DWMA-Grand-Rapids" <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov>, "Mike OMalley" <momalley@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR for April 2019

Please see attached: *MI 0600 Benton Harbor MOR April 2019.pdf*

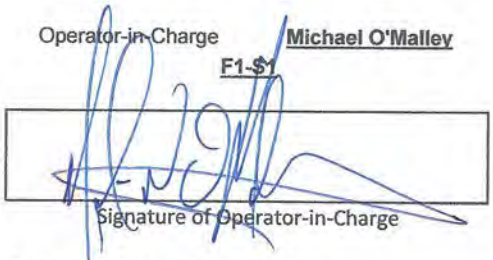
Thank you
Mike O'Malley
Benton Harbor Water Superintendent

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1



Signature of Operator-in-Charge

Month/Year **April-19** F1-S2

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.145	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	257.25	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.98	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.40	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.89%	Percent of Treated Water

Chemical Data

Chlorine on hand:	27775	lb.	Est. supply:	371 days
Primary Coagulant (Alum (Al3+)) on hand:	90947	lb.	Est. supply:	93 days
Cost of All Chemicals per Million Gallons:	$67.29	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	89	89
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	26.890474	Avg	0.9254891	Max	1.06516	Min	0.79744

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
Page 6 modified to show Calculated Distribution Flows and Corrosion Control Treatment

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **April-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.65	0.25	0.63		0	0.00	148	2.19	22	0.33	170	2.90	1.01	1.70	1.89
2	0.61	0.19	0.63		0	0.00	275	4.55	111	1.84	386	6.12	3.48	2.39	2.64
3	0.51	0.31	0.69	0.56	0	0.00	354	5.09	4	0.06	358	5.92	4.23	1.42	1.69
4	0.39	0.27	0.69		0	0.00	290	3.94	7	0.09	297	4.89	2.83	1.84	2.06
5	0.39	0.33	0.59		0	0.00	293	4.26	5	0.07	298	4.59	2.39	1.99	2.20
6	0.59	0.25	0.53		0	0.00	234	3.92	20	0.34	254	4.02	1.59	2.19	2.43
7	0.50	0.28	0.63		0	0.00	253	3.86	8	0.12	261	4.25	1.91	2.11	2.34
8	0.52	0.28	0.42		0	0.00	224	3.54	14	0.22	238	3.87	1.08	2.54	2.79
9	0.60	0.21	0.57		0	0.00	221	3.34	0	0.00	221	3.63	1.47	1.94	2.16
10	0.84	0.36	0.42	0.53	0	0.00	231	3.42	0	0.00	231	3.75	1.77	1.75	1.98
11	0.60	0.26	0.47		0	0.00	223	3.44	0	0.00	223	3.59	1.77	1.63	1.82
12	0.76	0.23	0.42		0	0.00	216	3.32	0	0.00	216	3.21	1.26	1.74	1.95
13	0.56	0.37	0.58		0	0.00	245	3.53	20	0.29	265	4.13	2.12	1.88	2.01
14	0.57	0.39	0.63		0	0.00	199	3.60	18	0.33	217	3.51	1.61	1.73	1.90
15	0.51	0.33	0.62		0	0.00	258	3.55	17	0.23	275	3.85	1.95	1.68	1.90
16	0.65	0.32	0.74		0	0.00	230	3.52	21	0.32	251	4.17	2.21	1.75	1.96
17	0.45	0.55	0.74		0	0.00	246	3.64	15	0.22	261	4.35	2.53	1.62	1.82
18	0.69	0.36	0.74	0.65	0	0.00	259	3.99	54	0.83	313	5.22	3.41	1.60	1.81
19	0.61	0.39	0.86		0	0.00	226	3.53	13	0.20	239	3.86	2.09	1.62	1.77
20	0.53	0.35	0.83		0	0.00	199	3.59	17	0.31	216	3.93	2.22	1.55	1.71
21	0.60	0.40	0.84		0	0.00	231	3.56	22	0.34	253	4.02	2.11	1.71	1.91
22	0.49	0.35	0.78		0	0.00	231	3.58	19	0.29	250	3.75	1.80	1.67	1.95
23	0.67	0.26	0.70		0	0.00	242	3.55	16	0.23	258	4.83	2.94	1.70	1.89
24	0.55	0.40	0.80	0.76	0	0.00	282	3.68	16	0.21	298	4.36	2.60	1.56	1.76
25	0.53	0.43	0.77		0	0.00	261	3.66	10	0.14	271	4.22	2.46	1.61	1.76
26	0.65	0.50	0.83		0	0.00	253	3.67	12	0.17	265	4.41	2.46	1.76	1.95
27	0.56	0.34	0.66		0	0.00	218	3.57	48	0.79	266	4.75	2.16	2.37	2.59
28	0.74	0.23	0.65		0	0.00	217	3.41	26	0.41	243	3.83	1.78	1.84	2.05
29	0.52	0.40	0.74		0	0.00	217	3.31	14	0.21	231	3.74	1.65	1.89	2.09
30	0.45	0.28	0.81		0	0.00	229	3.34	13	0.19	242	3.82	1.79	1.87	2.03
Tot.							7,057		540		7,767				
Avg.	0.58	0.33	0.67	0.63	0.00	0.00	240.17	3.64	18.73	0.29	258.90	4.18	2.16	1.82	2.03
Max	0.84	0.55	0.86	0.76	0.00	0.00	354.00	5.09	111.00	1.84	386.00	6.12	4.23	2.54	2.79
Min.	0.39	0.19	0.42	0.53	0.00	0.00	148.00	2.19	0.00	0.00	170.00	2.90	1.01	1.42	1.69

WSSN 0600 City of Benton Harbor Month/Year April-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	1.0100	329.00	1.71	4.10	4.40	0.51	3	0.07	0.08	3	0.07	0.08	6	0	0
2	0.9028	317.00	1.85	10.00	11.60	1.10	3	0.07	0.08	3	0.08	0.08	5	0	0
3	1.0375	330.00	1.67	5.10	5.90	0.84	3	0.08	0.10	3	0.10	0.10	3	0	0
4	1.1000	297.00	1.42	4.60	4.70	0.70	3	0.08	0.09	3	0.11	0.11	6	0	0
5	1.0275	323.00	1.65	3.00	4.80	0.55	3	0.07	0.07	3	0.08	0.08	6	0	0
6	0.8900	281.00	1.91	2.10	2.50	0.52	3	0.10	0.11	3	0.10	0.11	6	0	0
7	0.9775	302.00	1.63	2.00	2.60	0.46	3	0.11	0.16	3	0.09	0.09	6	0	0
8	0.9450	292.00	1.63	2.40	3.60	0.43	3	0.08	0.09	3	0.07	0.08	6	0	0
9	0.9875	310.00	1.65	2.00	2.10	0.45	3	0.08	0.08	3	0.08	0.09	6	0	0
10	1.0075	316.00	1.65	3.10	3.70	0.47	3	0.07	0.08	3	0.08	0.08	6	0	0
11	0.9675	282.00	1.53	2.10	2.60	0.39	3	0.07	0.07	3	0.09	0.10	6	0	0
12	0.9725	294.00	1.59	2.80	5.30	0.95	3	0.09	0.09	3	0.12	0.16	6	0	0
13	1.0350	324.00	1.65	4.40	4.80	0.48	3	0.06	0.06	3	0.07	0.08	6	0	0
14	0.8250	261.00	1.66	1.90	2.00	0.41	3	0.07	0.07	2	0.10	0.10	4	0	0
15	1.0850	337.00	1.63	3.20	3.60	0.44	3	0.06	0.07	3	0.07	0.09	6	0	0
16	0.9750	309.00	1.67	6.70	9.70	0.61	3	0.06	0.06	3	0.08	0.08	6	0	0
17	1.0075	322.00	1.68	5.20	8.60	0.64	3	0.08	0.09	3	0.09	0.10	6	0	0
18	0.9700	303.00	1.64	4.30	4.80	0.48	3	0.08	0.09	3	0.09	0.11	6	0	0
19	0.9550	298.00	1.64	5.70	6.00	0.55	3	0.06	0.06	3	0.07	0.08	6	0	0
20	0.8275	260.00	1.65	4.70	6.70	0.42	3	0.06	0.06	3	0.07	0.07	6	0	0
21	0.9675	301.00	1.64	2.80	3.40	0.37	3	0.06	0.07	3	0.07	0.07	6	0	0
22	0.9625	301.00	1.65	3.40	3.70	0.35	3	0.06	0.06	3	0.07	0.08	6	0	0
23	1.0175	317.00	1.64	3.90	5.00	0.48	3	0.07	0.08	3	0.08	0.08	6	0	0
24	1.1450	356.00	1.64	2.20	2.60	0.38	3	0.08	0.09	3	0.09	0.11	6	0	0
25	1.0650	332.00	1.64	1.80	2.60	0.26	3	0.07	0.07	3	0.07	0.07	6	0	0
26	1.0300	321.00	1.64	3.60	5.10	0.29	3	0.06	0.06	3	0.08	0.09	6	0	0
27	0.9125	290.00	1.67	3.30	5.70	0.37	3	0.07	0.07	3	0.06	0.07	6	0	0
28	0.9500	304.00	1.68	3.30	5.60	0.26	3	0.08	0.09	3	0.07	0.07	6	0	0
29	0.9775	303.00	1.63	2.50	4.30	0.22	3	0.06	0.06	3	0.07	0.07	6	0	0
30	1.0250	325.00	1.67	2.00	2.90	0.26	3	0.07	0.07	3	0.07	0.08	6	0	0
31															
Total	29.5578	9237.00					90			89			174	0	0
Avg.	0.9853	307.90	1.65	3.61	4.70	0.49		0.07	0.08		0.08		Total	Total	Total
Max	1.1450	356.00	1.91	10.00	11.60	1.10		0.11	0.16		0.12	0.16	6	0	0
Min.	0.8250	260.00	1.42	1.80	2.00	0.22		0.06	0.06		0.06				

WSSN 0600 | MONTH/YEAR | April-19 |

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
D	pH													
A														
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	7.9	7.9	188	176	122	117	66	59	49	44	16	16		
2	7.9	8.0	212	192	163	119	49	73	47	52	23	15		
3	8.0	7.8	172	176	133	139	39	37	49	54	12	10	22.0	24.0
4	8.2	8.0	178	170	141	128	37	42	51	50	12	11		
5	7.9	7.9	170	176	121	127	49	49	53	59	9	7		
6	8.1	8.0	186	190	124	131	62	59	46	48	17	17		
7	8.2	8.1	172	168	129	127	43	41	51	51	11	10		
8	8.0	8.0	186	178	126	124	60	54	50	47	15	15		
9	8.1	8.1	190	178	138	128	52	50	50	47	16	15		
10	8.2	8.1	190	192	125	126	65	66	49	50	17	17		
11	7.8	7.8	186	192	125	122	61	70	46	51	17	16		
12	7.9	8.0	164	176	110	117	54	59	42	49	14	13	19.0	24.0
13	8.2	8.1	182	158	147	119	35	39	55	50	11	8		
14	8.2	7.9	174	164	135	122	39	42	58	53	7	8	20.5	23.0
15	8.1	8.0	164	158	131	129	33	29	51	50	9	8		
16	8.1	8.0	178	168	137	128	41	40	53	50	11	11		
17	8.0	8.0	192	174	139	124	53	50	50	46	17	14		
18	8.0	8.0	194	180	137	128	57	52	51	47	16	15		
19	8.0	8.0	186	174	139	128	47	46	55	51	12	12		
20	8.2	8.2	182	172	138	133	44	39	59	58	8	7		
21	8.1	8.1	172	176	121	129	51	47	47	54	13	10	21.5	26.0
22	8.2	8.0	164	164	124	123	40	41	47	49	11	10		
23	8.1	8.0	174	168	135	124	39	44	55	55	9	7		
24	8.1	8.0	162	166	119	125	43	41	45	46	12	12		
25	8.2	7.9	154	158	119	124	35	34	46	54	10	6		
26	8.1	8.2	174	164	119	120	55	44	57	51	8	9		
27	8.1	8.0	174	166	123	112	51	54	42	40	17	16		
28	8.2	8.0	170	164	121	114	49	50	43	42	15	15	18.5	22.0
29	8.0	7.9	152	154	113	114	39	40	46	47	9	9	18.5	21.0
30	8.1	8.0	164	146	112	111	52	35	46	46	12	8		
Avg.	8.1	8.0	176.9	171.3	128.9	123.7	48.0	47.5	49.6	49.7	12.9	11.6	20.0	23.3
Max	8.2	8.2	212.0	192.0	163.0	139.0	66.0	73.0	59.0	59.0	23.0	17.0	22.0	26.0
Min.	7.8	7.8	152.0	146.0	110.0	111.0	33.0	29.0	42.0	40.0	7.0	6.0	18.5	21.0

WSSN 0600 MONTH/YEAR April-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS DISTRIBUTION METER; CORROSION CONTROL FEED OPP

	RAW		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	No. of	Colilert	No. of	Colilert			TEMP.	TEMP.				
A	Samples	P/A	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T					Raw	Tap			To	Lbs PO4	Treatment	Residual
E									Distribution		mg/L	mg/L
1			1	A	55	0	4	5.5	0.8742	6	0.57	
2			1	A	29	0	5	5.0	0.9413	13	1.16	
3			1	A	51	0	5	6.0	0.9030	12	1.11	
4			1	A	75	2	6	7.0	0.9069	12	1.11	
5			1	A	67	0	5	7.0	0.9684	12	1.05	1.57
6			1	A	65	0	6	5.5	0.9443	11	0.99	1.43
7			1	A	61	0	6	7.0	0.9163	13	1.15	1.71
8			1	A	34	0	6	6.0	0.9184	13	1.20	0.29
9			1	A	69	0	7	6.5	0.9078	12	1.11	0.29
10			1	A	36	1	6	7.0	0.9203	14	1.24	0.43
11			1	A	34	3	6	7.0	0.9260	12	1.10	1.00
12			1	A	57	1	6	6.5	1.0049	14	1.20	1.14
13			1	A	23	0	6	7.0	0.9567	13	1.10	1.29
14			1	A	24	0	8	8.0	0.9222	12	1.06	1.86
15			1	A	29	3	7	8.0	1.0652	14	1.12	0.57
16			1	A	76	2	8	9.0	0.8992	13	1.24	1.29
17			1	A	25	0	7	7.5	0.8961	12	1.16	1.00
18			1	A	17	0	8	8.0	0.8944	14	1.27	2.00
19			1	A	65	0	9	9.5	0.9240	12	1.12	1.14
20			1	A	58	0	8	9.5	0.8195	12	1.27	1.29
21			1	A	32	0	8	9.0	0.9384	12	1.11	0.57
22			1	A	17	0	8	10.0	0.9943	14	1.22	1.57
23			1	A	29	0	9	9.5	0.7974	10	1.07	0.57
24			1	A	38	0	8	9.0	1.0202	13	1.09	0.29
25			1	A	29	0	8	9.0	0.9578	14	1.20	0.57
26			1	A	30	4	8	9.0	0.8971	12	1.14	0.71
27			1	A	30	0	7.8	8.0	0.8358	11	1.11	2.43
28			1	A	23	0	9.0	12.0	0.9462	14	1.23	2.14
29			1	A	21	1	8.7	8.5	0.9230	12	1.13	1.43
30			1	A	75	1	8.5	9.5	0.9453	14	1.22	1.71
TOTAL								TOTALS	27.7647	373		
AVG.			1	A	42	1	7	8	0.9255	12	1.13	1.16
Max					76	4	9	12	1.0652	14	1.27	2.43
Min					17	0	4	5	0.7974	6	0.57	0.29

DISTRIBUTION SYSTEM MONITORING WSSN 0600 April-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3	1.00		0.80	1.11	1.16		1.29			
4										
5										
6										
7										
8										
9										
10	1.29		1.34	1.17	0.92		1.42			
11										
12										
13										
14										
15										
16										
17										
18	0.94		0.66	0.84	1.13		0.82			
19										
20										
21										
22										
23										
24	0.82		1.16	0.49	0.87		0.77			
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	20		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.00	1.42	0.49
Total number of check samples	0600			
Total number of positive check samples	0600			

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); David A. Cornwell; Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject:	Hold - City of Benton Harbor Corrosion Treatment Discussion
Start:	Friday, March 6, 2020 2:30:00 PM
End:	Friday, March 6, 2020 3:30:00 PM
Location:	Conference Call

Putting a hold on your calendar for a conference call with City of Benton Harbor

Call-in Number : 888-273-3658

Access Code: 1348701

Host Pwd: 4683 (Ernie)

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Ellis Mitchell
Cc:	Mike OMalley; Marcus Muhammed
Subject:	I updated the Administrative Consent Order (ACO) table for Information for Ellis Mitchell and Update to you and Mayor Marcus Muhammed
Date:	Wednesday, August 28, 2019 4:02:09 PM
Attachments:	MO Response to Compliance from ES and Interum City Manager Ellis Mitchell 08 28 2019.xlsx

Mr. Sarkipato,

I have been busy working with our new interim City Manager to help him see what we have been doing and have to finish.

The 2 big issues to start with were the DWRLF and SRF Loan applications by Benton Harbor through Abonmarche.
We dealt with many more Items that Darwin had arranged for as additional projects underway but not completed with Abonmarce.
Mostly things, that Darwin did not necessarily share with staff.

And, since you chose to place other items I note in the table as: not in the ACO; and then recently chose to reference many of those items in the 8/23/2019 Notice Of Violation (NOV) including stiff penalties; as evidence for those penalties.

So, I thought he should be up on our progress and lack of some progress in our ACO, using a revised time-line table from previous correspondence between you and I.

Attached: *MO Response to Compliance from ES and Interim City Manager Ellis Mitchell 08 28 2019.pdf*

MI 0600 Benton Harbor ACO Reply 08 28 2019 Added the New Interim City Manager Mr. Ellis Mitchell to help get him up to speed.

	DEQ Project	DEQ Due Dates	DEQ Notes Mike Comment; those NOT in ACO!	Mike Date	Mike Notes as of 8/28/2019
Completed?	Project Details	Due By	Notes	MO date	MO Notes 04 12 2019
	Propose optimal corrosion control treatment, or a corrosion study	**3/31/19**	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	3/25/2019 and 08/28/2019	Not in ACO completed in fast rated even without meter but added HS Pump On control as requested by MDEQ. Metering continues to be a failure, works very well in Manual ONLY.
	Submit rate study to DEQ with implementation plan	4/1/19	Still need a plan to implement rate increases as recommended by the study		Do not know if Darwin Watson, former City Manager did this. If he did, and like I believe he did, he did not document it with me. I have seen copies of the Funding Plan written by experts and shared with Abonmarche and probably MDEQ.
	Obtain licensed operator in charge of water distribution system	5/1/19		5/1/19	Darold Harlan Licensed Water operator of F & V Contract Operators is under a signed contract and comes week days.
	Submit plan to streamline the rate collection process	5/1/19		6/1/19	Darold Harlan worked out a plan and it has some good effect. I am not entirely sure as we are not informed of any increase of Collections from the Water Payment Center.
	Upgrade existing SCADA system to have historian and alarm capabilities	5/15/19		5/15/19	Historian Computer and software arrive mid March. Technician in and set up 4/1/2019 & 4/2/2019
	Fix continuous chlorine analyzer	5/15/19		5/15/19	Replaced it in the Laboratory where it should have gone in the DWRLF; Up and Running, pretty excellent.
	Data store continuous chlorine analyzer Mike Adds to line 7	5/15/19	MO Added to go along with Above SCADA	5/15/19	Done and working like a charm.
	Submit updated cross connection control program, staffing support	6/1/19		6/1/19	I've started and I sent the necessary report on time for last year. Darold will take an active role in this.
	Submit plan to inventory valves, and plan for ongoing maintenance	6/1/19			This item was never part of the Sanitary Survey. I had advised you long ago that there are many records, both paper and digital. The digital was done by Abonmarche. The paper was done eon's ago. I have updated those paper and some digital records extensivly in 2008 to 2012 and again in 2016 to on-going. Well into 2019. Moving along easier with Darold around. Benton Harbor will need an extention.
	Install coagulant feed to rapid mix	6/1/19		8/27/2019	Alum supply to repurposed Polymer Day tank completed with pump control, piping and check for proper operation. All plumbing and electrical work completed. Need to get operators trainned and put it ON-Line 1st week of September.
	Install metering capabilities	6/15/19		as of 8/28/2019	2" meter tap is in. It worked well for about 10 days. We were thinkng that this flow meter can be used for Distrbution flow. When we tried, the meter and the Wonderware counter part no longer works as intended. And, as you know, I had already begun calculatculating flow as of 1/1/2019. Several days of flows were actually part of the July MOR but no longer, I will have to return to calculating flows. As for your language in determining CT calculations, THE FINISHED WATER is very reliable as calculated based upon Metering: 1) Raw; 2) minus House water; 3) minus Backwash; 4) minus waste water. = Water Produced, which is Always in the Daily Records and subsequent MORs.
	Collect 60 samples for lead and copper, remembering 1st/5th liter	6/30/19	**Action Level Exceedance (ALE) Requirement: Not in ACO!**	6/30/2019	Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.

MI 0600 Benton Harbor ACO Reply 08 28 2019 Added the New Interim City Manager Mr. Ellis Mitchell to help get him up to speed.

	DEQ Project	DEQ Due Dates	DEQ Notes Mike Comment; those NOT in ACO!	Mike Date	Mike Notes as of 8/28/2019
	Collect WQP as required by ALE letter	6/30/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	6/30/2019	Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.
	Conduct professional inspection of water tower	6/30/19		Early Fall 2020 or 2021	Stopped working on that with contractor. Please note, that the Benton Harbor Water Distribution System CANNOT function with direct pressure. I am looking for ways to take the water tower out of service and not run the system without it (direct pressure). The City applied for a DWRLF to meet this requirement. It is in the EGLE possible funding program. We expect to hear about the Award some time soon. We request that the Deadline be extended until auch time that the project can be completed with those DWRLF monies.
	Install working mussel feed control system at the raw water intake	6/30/19		Hopefully before it gets too cold on the Lake.	Trying my best. Even you told me to hold off as other more pressing needs required my attention. The Diver has a Purchase Order. We need them to clean off the Halo again in the riser. It is plugged and our attempts to blow it clear have not worked. Benton Harbor will need an extention to such time the diver clears it and treatment can begin again.
	Report 2018 ALE in the consumer confidence Report	7/1/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	5/31/2019	Done and even though you did not like the way I wrote it.
	For first round of 2019, this is the due date for reporting to DEQ	9/28/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	6/30/2019	Not in ACO. 1st round was done. We had 60 households that agreed to sample and only 47 actually did. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: and this also was mentioned in the EGLE NOV 08/23/2019. It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.
	Collect 60 samples for lead and copper, remembering 1st/5th liter	12/31/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**		Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.
	Collect WQP as required by ALE letter	12/31/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**		Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.

MI 0600 Benton Harbor ACO Reply 08 28 2019 Added the New Interim City Manager Mr. Ellis Mitchell to help get him up to speed.

	DEQ Project	DEQ Due Dates	DEQ Notes Mike Comment; those NOT in ACO!	Mike Date	Mike Notes as of 8/28/2019
	Repair filter to waste valves	1/1/20		Going to need an extention based on the massive volume of work.	This will be a massive undertaking. We 1st have to determine why the 2011 DWRLF Installation project failed so very completely. Then figure out what to do to get both systems operating: Filters 5,6,7,& 8 are hydraulic and Filters 9,10,11 & 12 are electric. None of these valves work. How can that be! I believe that common practice after I was thrown out to be; If it is broken and we don't need it; then turn it off. I've been working really hard to correct all of those types of mistakes. And probably the MOST EXPENSIVE TASK TO RESOLVE THE FAILURES OF THE 2011 DWRLF.
	For second round of 2019, this is the due date for reporting to DEQ	3/31/20	**Action Level Exceedance (ALE) Requirement NOT in ACO!**		Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened as did every other requirement was reduced in 2012 (Stage 2; DMR). All of my requests to MDEQ are going un-answered. This needs to be rectified by the MDEQ without question.
	Collect one LCR sample from entry point to distribution	3/31/2022	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	8/28/2019	Stupid test, as it will never be positive for Lead. But DONE Your new Lead and Copper Rules have changed this. Thus it was ADDED to the EGLE NOV 08/23/2019.

From:	Sarkipato, Ernest (EGLE)
To:	emitchell@bhcity.us; Mike O"Malley; Darold Harlan; drice@bhcity.us
Cc:	Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE); Vincent, Courtney (EGLE); EGLE-DWEH-Grand-Rapids; nbritten@bchdmi.org; nmargaritis@bchdmi.org; Crider, Steven (DHHS); Klein, Jeremy (EGLE)
Subject:	Lead Action Level Exceedance - City of Benton Harbor
Date:	Wednesday, July 15, 2020 3:52:22 PM
Attachments:	Public Advisory Distribution Checklist.docx PE Certificate -DRAFT 5 8 2019 NON-FACILITY 2.docx LCR_WQP_Report_Without_CCT_657149_7 (5).docx deq-dwmad-cw-tsu-LCR_Sample_Site_Selection_Criteria_643514_7.pdf 00600_BentonHarbor_LCR_ALELetter_2020-1_FINALIZED.pdf

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Dear Mr. Ellis Mitchell,

Please see attached for the standard letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead and Copper Monitoring – Lead Action Level Exceedance letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures. A hard copy of this letter will be sent to you via U.S. Mail.

Templates for the Public Advisory and Public Education documents have already been provided to you under separate cover.

If you have any questions regarding this correspondence, please contact myself or Jeni Bolt.

Thank you,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
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Michigan.gov/LCR | **Michigan.gov/drinkingwater**

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Summary of Public Advisory (PA) Requirements and Distribution Checklist

For Community Water Supplies that Exceed the Lead Action Level

A Public Advisory (PA) must be issued within three business days after the Department of Environmental Quality (DEQ) notifies a water supply that an exceedance of the lead action level has occurred, per the Michigan Safe Drinking Water Act, 1976 PA 399, as amended.

To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation to the DEQ along with a sample copy of the PA that was issued.

Start Here (indicate one or more of the following activities)

1. Issue the PA using appropriate broadcast media, such as radio and television.
   Please list media outlets and date of broadcast: _____

2. Post the PA in conspicuous locations throughout the area served by the public water supply.
   Locations posted and date of posting: _____

3. Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage.
   Date delivered: _____

4. Use a communication method other than one listed, as approved in writing by the DEQ.
   Date delivered: _____

I affirm that the Public Advisory has been issued. I am enclosing a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

Send this checklist to the appropriate DEQ district office at http://michigan.gov/deq. Click Contacts, click on Environmental Contacts, click on District.

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

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☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

DRAFT

DRAFT

WATER QUALITY PARAMETER DATA (when applicable):

System Name:_____ WSSN:_____

	Sample Location	Date	pH	Alk. (mg/L)	Ca as $CaCO_3$ (mg/L)	Cond. (umhos)	Temp (ºC)	Inhibitor (mg/L) ☐ Orthophosphate (PO_4) ☐ Silica (Si)	Chloride (mg/L)	Sulfate (mg/L)
Entry Point to the Distribution System (Plant Tap)										
Distribution System										

INSTRUCTIONS:

WATER QUALITY PARAMETER SAMPLING LOCATIONS:

- Point-of-entry sampling locations: Each point-of-entry location is a required sampling point for WQPs. Exceptions can be made for wells that are offline or standby, or consecutive connections without additional treatment. Review your supply's monitoring schedule for specific requirements.
- Distribution sampling locations: Distribution sampling locations should be representative locations throughout the distribution system. Established bacteriological sampling locations can be used for WQP sampling.

WATER QUALITY PARAMETER SAMPLING:

Sampling procedure: WQP sampling requirements are a combination of analytes and test codes. Double check your monitoring schedule and check with your certified lab to make sure you have the correct bottle types, number of bottles, or appropriate field test kits to have your water analyzed for all required WQP analytes.

Note: Unlike lead and copper sampling, WQP sampling does not need to be within a home, does not require a stagnation period and does not need to be a first draw sample.

EGLE Laboratory test codes for WQP samples:

Test Description	Analytes	Fee	Unit Number	Test Code	Hold Time	Thermal Preservation
Automated Partial Chemistry	Chloride and Sulfate	$18	32,33	R	48 hours	Yes
Corrosion	Conductivity, Alkalinity, Orthophosphate, and Calcium	$51	33	CORR	48 hours	Yes
Field tests (at the time of sample collection)	pH, Temperature	N/A	N/A	N/A	N/A	N/A

WATER QUALTIY PARAMETER REPORTING:

Enter the water supply name, WSSN and corresponding related information from the water quality parameter monitoring carried out, if applicable. Indicate the street address of the sampling point (and the site code for entry point sampling points), date of sample collection and the results of chemical analyses. Dosages for corrosion control inhibitors (orthophosphate, silicates and alkalinity) must be reported on your Monthly Operational Report (MOR), due to your local district office on the 10th of the following month. Note: alkalinity and calcium analyses should be reported as mg/l as CaCO3; conductivity should be reported in umhos; temperature in degrees Celsius; and where applicable, phosphate as PO_4 and Silica a Si.

Michigan Lead and Copper Rules
Lead and Copper Sample Site Selection Criteria
(per June 2018 rule revisions)

Community water supplies must identify a pool of lead and copper sampling sites containing AT LEAST the number of sites necessary to conduct standard sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites unless**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used unless
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES – Single family residences with either:

- Lead service lines (LSL)*****
- Interior lead plumbing

Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.

TIER 2 SITES – Other buildings or multiple family residences with either:

- Lead service lines*****
- Interior lead plumbing

TIER 3 SITES – Single family residences with:

- Copper plumbing with lead solder installed before July 1988

OTHER SITES

- Sites representative of plumbing materials commonly found throughout the water supply

*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the same sampling sites. If an original sampling site is not available, collect a tap sample from another site meeting the same tier criteria as the original site and document the reason for the change.
- **DO NOT** sample from outside hose spigots or utility sinks. For residential sites, samples MUST BE collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples MUST BE collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as a water softener.

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 15, 2020

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The Benton Harbor community water supply's 90th percentile value exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from January 1, 2020, through June 30, 2020, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	23	9	0 - 440 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.0	0	0 – 0.2 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. A template has already been provided to you. Please contact EGLE if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit Michigan.gov/LCR.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system.

The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Reduce Corrosion Rates
Minimize lead in the drinking water by reducing corrosion of water pipes and household plumbing that contain lead. This is Benton Harbor's fourth AL exceedance. Benton Harbor has made corrective actions to the corrosion control treatment system per EGLE's direction in a letter dated February 13, 2020. EGLE anticipates this change having a positive impact on the distribution system's corrosion rates and will assess the effectiveness of the current corrosion control treatment based on sequential sampling at homes in the distribution system, corrosion control study results, and future rounds of compliance sampling.

Lead and Copper Monitoring
To show the ALs can be met, continue collecting lead and copper samples from 60 sites between July 1 and December 31, 2020, and again between January 1 and June 30, 2021.

If you need to select new sites, choose the highest Tier sites available within the distribution system, giving Tier 1 sites first priority. Document any changes on your Lead and Copper Sampling Site Plan and submit it to your local district office email address. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of results, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2021. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?

If you can show that both lead and copper ALs are met in two consecutive six-month periods then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks	Collect WQP samples.	Collect one set of WQP samples every two weeks from the entry point to the distribution system for pH, temperature, alkalinity, calcium, conductivity, orthophosphate, chloride, and sulfate.
August 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in the enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required whenever PE required.
Between July 1 and December 31, 2020	Collect samples 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples.	Collect WQP samples from ten locations in the distribution system quarterly.
September 30, 2020	For the January through June 2020 monitoring, send EGLE certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2021	Collect samples 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2021.**
Between January 1 and June 30, 2021	Collect WQP samples.	Collect WQP samples from ten locations in the distribution system quarterly.

Complete By	Requirement	Comments
March 31, 2021	For the July through December 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
July 1, 2021	Report the 2020 AL exceedance in the CCR.	Specific lead health effects language must be included.
September 28, 2021	For the January through June 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from each entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Distribution Checklist, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

From:	Bolt, Jennifer (EGLE)
To:	DARWIN WATSON
Cc:	Vincent, Courtney (EGLE); Mike O"Malley; Marcus Muhammed; Antonyia Wade; kthompson@cityofbentonharbormi.gov; dharlan@fv-operations.com; nbritten@bchdmi.org; Nick Margaritis; Crider, Steven (DHHS); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE); Klein, Jeremy (EGLE); Walstrom, Kimberly (EGLE)
Subject:	Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)
Date:	Wednesday, July 24, 2019 4:31:43 PM
Attachments:	0600_Benton Harbor_LCR_ALE letter 2019-1.pdf PE Certificate -DRAFT 5 8 2019 NON-FACILITY 2.docx Public Advisory Distribution Checklist.docx LCR_WQP_Report_ALE.docx Sample_Site_Selection_Criteria.pdf

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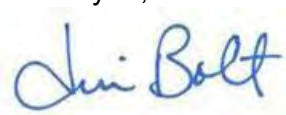
Mr. Watson,

Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures.

Please note that a lead Action Level exceedance requires a Public Notice to your community within 3 business days of this email. This advisory must be distributed by July 29, 2019.

A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact me at your convenience.

Thank you,



Jeni Bolt
Environmental Quality Specialist
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STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 24, 2019

VIA E-MAIL AND U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from January 1, 2019, through June 30, 2019, Benton Harbor community water supply's ninetieth percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	27 ppb	12	0 ppb – 59 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements, along with a sample copy of your consumer notice, 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format, visit Michigan.gov/LCR. Select the appropriate report form based on whether you are or are not collecting samples from sites with lead services lines.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and information about the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material, along with a PE distribution certification form, must be submitted to EGLE no later than ten days after the PE is due.

Conduct WQP Monitoring
As part of installing corrosion control treatment, you have been requested to collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your second AL exceedance. You recently installed corrosion control treatment using a phosphate product to reduce corrosion. As part of this installation, a coupon study was to be performed. Results from this study should be used to help identify the dosage necessary to sufficiently reduce corrosion rates in the distribution system. EGLE looks forward to receiving the study results and the recommendations based off those results.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between July 1 and December 31, 2019, and again between January 1 and June 30, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1, or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first liter and fifth liter sample from each sampling location.

Within 30 days of learning of results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks (Starting July 1st)	Collect WQP samples. (Entry Point)	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
August 29, 2019	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2019	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
September 28, 2019	For the January through June 2019 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2020	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
March 31, 2020	For the July through December 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
September 29, 2020	For the January through June 2020 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc: Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Ernie Sarkipato, Surface Water Specialist, EGLE
Mr. Jeremy Klein, District Analyst, EGLE
cc/enc: Mr. Mike O'Malley, City of Benton Harbor

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

Summary of Public Advisory (PA) Requirements and Distribution Checklist

For Community Water Supplies that Exceed the Lead Action Level

A Public Advisory (PA) must be issued within three business days after the Department of Environmental Quality (DEQ) notifies a water supply that an exceedance of the lead action level has occurred, per the Michigan Safe Drinking Water Act, 1976 PA 399, as amended.

To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation to the DEQ along with a sample copy of the PA that was issued.

Start Here (indicate one or more of the following activities)

1. Issue the PA using appropriate broadcast media, such as radio and television.
   Please list media outlets and date of broadcast: _____

2. Post the PA in conspicuous locations throughout the area served by the public water supply.
   Locations posted and date of posting: _____

3. Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage.
   Date delivered: _____

4. Use a communication method other than one listed, as approved in writing by the DEQ.
   Date delivered: _____

I affirm that the Public Advisory has been issued. I am enclosing a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

Send this checklist to the appropriate DEQ district office at http://michigan.gov/deq. Click Contacts, click on Environmental Contacts, click on District.

WATER QUALITY PARAMETER DATA (when applicable):

System Name:_____ WSSN:_____

	Sample Location	Date	pH	Alk. (mg/L)	Ca as $CaCO_3$ (mg/L)	Cond. (umhos)	Temp (ºC)	Inhibitor (mg/L) ☐ Orthophosphate (PO_4) ☐ Silica (Si)	Chloride (mg/L)	Sulfate (mg/L)
Entry Point to the Distribution System (Plant Tap)										
Distribution System										

INSTRUCTIONS:

WATER QUALITY PARAMETER SAMPLING LOCATIONS:

- Point-of-entry sampling locations: Each point-of-entry location is a required sampling point for WQPs. Exceptions can be made for wells that are offline or standby, or consecutive connections without additional treatment. Review your supply's monitoring schedule for specific requirements.
- Distribution sampling locations: Distribution sampling locations should be representative locations throughout the distribution system. Established bacteriological sampling locations can be used for WQP sampling.

WATER QUALITY PARAMETER SAMPLING:

Sampling procedure: WQP sampling requirements are a combination of analytes and test codes. Double check your monitoring schedule and check with your certified lab to make sure you have the correct bottle types, number of bottles, or appropriate field test kits to have your water analyzed for all required WQP analytes.

Note: Unlike lead and copper sampling, WQP sampling does not need to be within a home, does not require a stagnation period and does not need to be a first draw sample.

EGLE Laboratory test codes for WQP samples:

Test Description	Analytes	Fee	Unit Number	Test Code	Hold Time	Thermal Preservation
Automated Partial Chemistry	Chloride and Sulfate	$18	32,33	R	48 hours	Yes
Corrosion	Conductivity, Alkalinity, Orthophosphate, and Calcium	$51	33	CORR	48 hours	Yes
Field tests (at the time of sample collection)	pH, Temperature	N/A	N/A	N/A	N/A	N/A

WATER QUALTIY PARAMETER REPORTING:

Enter the water supply name, WSSN and corresponding related information from the water quality parameter monitoring carried out, if applicable. Indicate the street address of the sampling point (and the site code for entry point sampling points), date of sample collection and the results of chemical analyses. Dosages for corrosion control inhibitors (orthophosphate, silicates and alkalinity) must be reported on your Monthly Operational Report (MOR), due to your local district office on the 10th of the following month. Note: alkalinity and calcium analyses should be reported as mg/l as CaCO3; conductivity should be reported in umhos; temperature in degrees Celsius; and where applicable, phosphate as PO_4 and Silica a Si.

Michigan Lead and Copper Rules
Lead and Copper Sample Site Selection Criteria
(per June 2018 rule revisions)

Community water supplies must identify a pool of lead and copper sampling sites containing AT LEAST the number of sites necessary to conduct standard sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites unless**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used unless
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES – Single family residences with either:

- Lead service lines (LSL)*****
- Interior lead plumbing

Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.

TIER 2 SITES – Other buildings or multiple family residences with either:

- Lead service lines*****
- Interior lead plumbing

TIER 3 SITES – Single family residences with:

- Copper plumbing with lead solder installed before July 1988

OTHER SITES

- Sites representative of plumbing materials commonly found throughout the water supply

*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the same sampling sites. If an original sampling site is not available, collect a tap sample from another site meeting the same tier criteria as the original site and document the reason for the change.
- **DO NOT** sample from outside hose spigots or utility sinks. For residential sites, samples MUST BE collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples MUST BE collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as a water softener.

From:	Bolt, Jennifer (EGLE)
To:	DARWIN WATSON
Cc:	Vincent, Courtney (DEQ); Mike O"Malley; Marcus Muhammed; Antonyia Wade; kthompson@cityofbentonharbormi.gov; dharlan@fv-operations.com; nbritten@bchdmi.org; Nick Margaritis; Crider, Steven (DHHS); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE); Klein, Jeremy (EGLE); Walstrom, Kimberly (EGLE)
Subject:	Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)
Date:	Wednesday, July 24, 2019 4:31:15 PM
Attachments:	0600_Benton Harbor_LCR_ALE letter 2019-1.pdf PE Certificate -DRAFT 5 8 2019 NON-FACILITY 2.docx Public Advisory Distribution Checklist.docx LCR_WQP_Report_ALE.docx Sample_Site_Selection_Criteria.pdf

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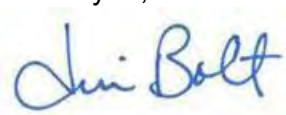
Mr. Watson,

Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures.

Please note that a lead Action Level exceedance requires a Public Notice to your community within 3 business days of this email. This advisory must be distributed by July 29, 2019.

A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact me at your convenience.

Thank you,



Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes,
and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

Follow Us | **Michigan.gov/EGLE**

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 24, 2019

VIA E-MAIL AND U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from January 1, 2019, through June 30, 2019, Benton Harbor community water supply's ninetieth percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	27 ppb	12	0 ppb – 59 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements, along with a sample copy of your consumer notice, 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format, visit Michigan.gov/LCR. Select the appropriate report form based on whether you are or are not collecting samples from sites with lead services lines.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and information about the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material, along with a PE distribution certification form, must be submitted to EGLE no later than ten days after the PE is due.

Conduct WQP Monitoring
As part of installing corrosion control treatment, you have been requested to collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your second AL exceedance. You recently installed corrosion control treatment using a phosphate product to reduce corrosion. As part of this installation, a coupon study was to be performed. Results from this study should be used to help identify the dosage necessary to sufficiently reduce corrosion rates in the distribution system. EGLE looks forward to receiving the study results and the recommendations based off those results.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between July 1 and December 31, 2019, and again between January 1 and June 30, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1, or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first liter and fifth liter sample from each sampling location.

Within 30 days of learning of results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Every two weeks (Starting July 1st)	Collect WQP samples. (Entry Point)	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
August 29, 2019	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
September 8, 2019	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2020.**
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September 28, 2019	For the January through June 2019 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Microsoft Word or PDF format from Michigan.gov/LCR.
Between January 1 and June 30, 2020	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
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July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
March 31, 2020	For the July through December 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
September 29, 2020	For the January through June 2020 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc: Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Ernie Sarkipato, Surface Water Specialist, EGLE
Mr. Jeremy Klein, District Analyst, EGLE
cc/enc: Mr. Mike O'Malley, City of Benton Harbor

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

Summary of Public Advisory (PA) Requirements and Distribution Checklist

For Community Water Supplies that Exceed the Lead Action Level

A Public Advisory (PA) must be issued within three business days after the Department of Environmental Quality (DEQ) notifies a water supply that an exceedance of the lead action level has occurred, per the Michigan Safe Drinking Water Act, 1976 PA 399, as amended.

To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation to the DEQ along with a sample copy of the PA that was issued.

Start Here (indicate one or more of the following activities)

1. Issue the PA using appropriate broadcast media, such as radio and television.
   Please list media outlets and date of broadcast: _____

2. Post the PA in conspicuous locations throughout the area served by the public water supply.
   Locations posted and date of posting: _____

3. Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage.
   Date delivered: _____

4. Use a communication method other than one listed, as approved in writing by the DEQ.
   Date delivered: _____

I affirm that the Public Advisory has been issued. I am enclosing a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

Send this checklist to the appropriate DEQ district office at http://michigan.gov/deq. Click Contacts, click on Environmental Contacts, click on District.

WATER QUALITY PARAMETER DATA (when applicable):

System Name:_____ WSSN:_____

	Sample Location	Date	pH	Alk. (mg/L)	Ca as $CaCO_3$ (mg/L)	Cond. (umhos)	Temp (ºC)	Inhibitor (mg/L) ☐ Orthophosphate (PO_4) ☐ Silica (Si)	Chloride (mg/L)	Sulfate (mg/L)
Entry Point to the Distribution System (Plant Tap)										
Distribution System										

INSTRUCTIONS:

WATER QUALITY PARAMETER SAMPLING LOCATIONS:

- Point-of-entry sampling locations: Each point-of-entry location is a required sampling point for WQPs. Exceptions can be made for wells that are offline or standby, or consecutive connections without additional treatment. Review your supply's monitoring schedule for specific requirements.
- Distribution sampling locations: Distribution sampling locations should be representative locations throughout the distribution system. Established bacteriological sampling locations can be used for WQP sampling.

WATER QUALITY PARAMETER SAMPLING:

Sampling procedure: WQP sampling requirements are a combination of analytes and test codes. Double check your monitoring schedule and check with your certified lab to make sure you have the correct bottle types, number of bottles, or appropriate field test kits to have your water analyzed for all required WQP analytes.

Note: Unlike lead and copper sampling, WQP sampling does not need to be within a home, does not require a stagnation period and does not need to be a first draw sample.

EGLE Laboratory test codes for WQP samples:

Test Description	Analytes	Fee	Unit Number	Test Code	Hold Time	Thermal Preservation
Automated Partial Chemistry	Chloride and Sulfate	$18	32,33	R	48 hours	Yes
Corrosion	Conductivity, Alkalinity, Orthophosphate, and Calcium	$51	33	CORR	48 hours	Yes
Field tests (at the time of sample collection)	pH, Temperature	N/A	N/A	N/A	N/A	N/A

WATER QUALTIY PARAMETER REPORTING:

Enter the water supply name, WSSN and corresponding related information from the water quality parameter monitoring carried out, if applicable. Indicate the street address of the sampling point (and the site code for entry point sampling points), date of sample collection and the results of chemical analyses. Dosages for corrosion control inhibitors (orthophosphate, silicates and alkalinity) must be reported on your Monthly Operational Report (MOR), due to your local district office on the 10th of the following month. Note: alkalinity and calcium analyses should be reported as mg/l as CaCO3; conductivity should be reported in umhos; temperature in degrees Celsius; and where applicable, phosphate as PO_4 and Silica a Si.

Michigan Lead and Copper Rules
Lead and Copper Sample Site Selection Criteria
(per June 2018 rule revisions)

Community water supplies must identify a pool of lead and copper sampling sites containing AT LEAST the number of sites necessary to conduct standard sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites unless**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used unless
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES – Single family residences with either:

- Lead service lines (LSL)*****
- Interior lead plumbing

Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.

TIER 2 SITES – Other buildings or multiple family residences with either:

- Lead service lines*****
- Interior lead plumbing

TIER 3 SITES – Single family residences with:

- Copper plumbing with lead solder installed before July 1988

OTHER SITES

- Sites representative of plumbing materials commonly found throughout the water supply

*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the same sampling sites. If an original sampling site is not available, collect a tap sample from another site meeting the same tier criteria as the original site and document the reason for the change.
- **DO NOT** sample from outside hose spigots or utility sinks. For residential sites, samples MUST BE collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples MUST BE collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as a water softener.

From:	Vincent, Courtney (EGLE)
To:	emitchell@cityofbentonharbormi.gov
Cc:	momalley@cityofbentonharbormi.gov; nbritten@bchdmi.org; Nick Margaritis; Crider, Steven (DHHS); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE); Klein, Jeremy (EGLE); Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Walstrom, Kimberly (EGLE)
Subject:	Lead and Copper Monitoring - Action Level Exceedance Letter for the city of Benton Harbor (WSSN: 00600)
Date:	Thursday, January 16, 2020 4:38:35 PM
Attachments:	0600_Benton Harbor_LCR_ALE letter 2019-2_FINALIZED.pdf EQP6791_Public Advisory Distribution Checklist_EGLE.pdf PE Certificate -DRAFT 5 8 2019 NON-FACILITY 2.docx LCR_WQP_Report_ALE.docx Lead and Copper Tap Sample Site Selection Criteria.pdf

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Dear Mr. Mitchell,
Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead and Copper Monitoring – Lead Action Level Exceedance letter for the city of Benton Harbor (WSSN: 00600) along with its corresponding enclosures. A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact Ms. Jeni Bolt, Environmental Quality Specialist, Lead and Copper Unit, Community Water Supply Section, Drinking Water and Environmental Health Division, by email at BoltJ@Michigan.gov or by phone at 517-331-5161.
Thank you,

Courtney Vincent
Unit Secretary
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-284-5424 | VincentC4@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

January 16, 2020

VIA E-MAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

During the most recent round of lead and copper monitoring of drinking water taps, from July 1, 2019, through December 31, 2019, Benton Harbor community water supply's 90th percentile value exceeded the AL for lead as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	32 ppb	10	0 ppb – 72 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0 ppm	0	0 ppm – 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days from the date of this letter to inform all persons served by the water system about the lead AL exceedance. It is the intent of the Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PE materials to distribute to your customers to fulfill both the PA and PE requirements simultaneously. A template has already been provided to you. If you plan to use broadcast media as your delivery method, please contact EGLE.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days from the date of this letter or sixty days after the end of the monitoring period that exceeded the AL, whichever is sooner, deliver PE materials to all consumers. As previously mentioned, it is your intent to develop and distribute the PE materials within three business days to fulfill both the PA and PE requirements simultaneously.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184, or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement timely. You completed this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. This is your third AL exceedance. A letter regarding changes to your current corrosion control treatment will be sent under separate cover from Mr. Ernie Sarkipato, Surface Water Engineer, Engineering Unit, Environmental Health Section, Drinking Water and Environmental Health

Division (DWEHD); and Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, DWEHD.

Lead and Copper Monitoring
You have already increased your lead and copper monitoring. Please continue to collect samples from 60 sites between January 1 and June 30, 2020, and again between July 1 and December 31, 2020.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of the results from the samples, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2020. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Every two weeks	Collect WQP samples. (Entry Point)	Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap). Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
February 29, 2020	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 10, 2020	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
Between January 1 and June 30, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due July 10, 2020.**
Between January 1 and June 30, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2020	Report the 2019 AL exceedance in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2020	Collect samples from 60 sites in the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice for Community Water Supply* (download form at Michigan.gov/LCR). **Report due January 10, 2021.**
Between July 1 and December 31, 2020	Collect WQP samples. (Distribution system)	Collect one set of WQP samples from ten locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 29, 2020	For the January through June 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download the *Lead and Copper Report and Consumer Notice for Community Water Supply* in Word or PDF format from Michigan.gov/LCR.
March 31, 2021	For the July through December 2020 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental
Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental
Health Division
616-307-6736

Enclosures (PA Checklist, PE Checklist, WQP Report Form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Jeremy Klein, EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

SUMMARY OF PUBLIC ADVISORY REQUIREMENTS AND DISTRIBUTION CHECKLIST FOR COMMUNITY WATER SUPPLIES THAT EXCEED THE LEAD ACTION LEVEL

Issued under the authority of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the Administrative Rules. Act 399, MCL 325.1019 et seq. requires that, if a water supply is found not to be compliant with the state drinking water standards, they shall be required to notify users of the extent and nature of the noncompliance. Complete and submit this form to EGLE

Act 399 requires that a Public Advisory (PA) must be issued within three business days after the Department of Environment, Great Lakes, and Energy (EGLE) notifies a water supply that an exceedance of the lead action level has occurred. To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation, to EGLE along with a sample copy of the issued PA.

START HERE (indicate one or more of the following activities)

☐ Issue the PA using appropriate broadcast media, such as radio and television.
Please list media outlets and date of broadcast: _____
_____

☐ Post the PA in conspicuous locations throughout the area served by the public water supply.
Locations posted and date of posting: _____
_____

☐ Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage. Date delivered: _____

☐ Use a communication method other than one listed, as approved in writing by EGLE.
Date delivered: _____

I affirm that the Public Advisory has been issued. I have enclosed a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	Date

Send this checklist to the appropriate EGLE district office. Contact information for the district offices can be found online at Michigan.gov/CommunityWater. Under Information, click on "District Offices Map and Contact Information."

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

WATER QUALITY PARAMETER DATA (when applicable):

System Name:_____ WSSN:_____

	Sample Location	Date	pH	Alk. (mg/L)	Ca as $CaCO_3$ (mg/L)	Cond. (umhos)	Temp (ºC)	Inhibitor (mg/L) ☐ Orthophosphate (PO_4) ☐ Silica (Si)	Chloride (mg/L)	Sulfate (mg/L)
Entry Point to the Distribution System (Plant Tap)										
Distribution System										

INSTRUCTIONS:

WATER QUALITY PARAMETER SAMPLING LOCATIONS:

- Point-of-entry sampling locations: Each point-of-entry location is a required sampling point for WQPs. Exceptions can be made for wells that are offline or standby, or consecutive connections without additional treatment. Review your supply's monitoring schedule for specific requirements.
- Distribution sampling locations: Distribution sampling locations should be representative locations throughout the distribution system. Established bacteriological sampling locations can be used for WQP sampling.

WATER QUALITY PARAMETER SAMPLING:

Sampling procedure: WQP sampling requirements are a combination of analytes and test codes. Double check your monitoring schedule and check with your certified lab to make sure you have the correct bottle types, number of bottles, or appropriate field test kits to have your water analyzed for all required WQP analytes.

Note: Unlike lead and copper sampling, WQP sampling does not need to be within a home, does not require a stagnation period and does not need to be a first draw sample.

EGLE Laboratory test codes for WQP samples:

Test Description	Analytes	Fee	Unit Number	Test Code	Hold Time	Thermal Preservation
Automated Partial Chemistry	Chloride and Sulfate	$18	32,33	R	48 hours	Yes
Corrosion	Conductivity, Alkalinity, Orthophosphate, and Calcium	$51	33	CORR	48 hours	Yes
Field tests (at the time of sample collection)	pH, Temperature	N/A	N/A	N/A	N/A	N/A

WATER QUALTIY PARAMETER REPORTING:

Enter the water supply name, WSSN and corresponding related information from the water quality parameter monitoring carried out, if applicable. Indicate the street address of the sampling point (and the site code for entry point sampling points), date of sample collection and the results of chemical analyses. Dosages for corrosion control inhibitors (orthophosphate, silicates and alkalinity) must be reported on your Monthly Operational Report (MOR), due to your local district office on the 10th of the following month. Note: alkalinity and calcium analyses should be reported as mg/l as CaCO3; conductivity should be reported in umhos; temperature in degrees Celsius; and where applicable, phosphate as PO_4 and Silica a Si.

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

MICHIGAN LEAD AND COPPER RULE
LEAD AND COPPER TAP SAMPLE SITE SELECTION CRITERIA

Community water supplies must identify a pool of lead and copper sampling sites containing **AT LEAST** the number of sites necessary to conduct **STANDARD** monitoring (see instructions for number of required sites). It is highly recommended that the sampling pool contain more sites than required incase routine sites are unavailable at time of sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites, unless …**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used, unless …
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES - Single family residences with either: o Lead service lines (LSL)***** o Interior lead plumbing Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.
TIER 2 SITES – Other buildings or multiple family residences with either: o Lead service lines***** o Interior lead plumbing
TIER 3 SITES - Single family residences with: o Copper plumbing with lead solder installed before July 1988
OTHER SITES o Sites representative of plumbing materials commonly found throughout the water supply.
*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the **SAME** sampling sites unless …
  - a site no longer meets tiering criteria (for example, a site is no longer Tier 1 after having the lead service line replaced); or
  - a site is unavailable (for example, a site has no water service, resident refuses to participate, etc.)
- **DO NOT** sample from outside hose spigots or utility sinks.
  - For residential sites, samples **MUST BE** collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples **MUST BE** collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as an iron removal filter, reverse osmosis system, or water softener.

From:	Bolt, Jennifer (EGLE)
To:	Sarkipato, Ernest (EGLE)
Subject:	Lead and Copper Monitoring - Lead Action Level Exceedance Letter for Benton Harbor (WSSN: 00600)
Date:	Thursday, February 4, 2021 3:28:00 PM
Attachments:	00600_BentonHarbor_LCR_ALELetter_2020-2_FINAL.pdf EQP6791_Public Advisory Distribution Checklist_EGLE.pdf Lead and Copper Tap Sample Site Selection Criteria.pdf image003.png PE Certificate -NON-FACILITY.docx

---

To: emitchell@bhcity.us; gregan@fv-operations.com; rjones@fv-operations.com
CC: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Vincent, Courtney (EGLE) <VincentC4@michigan.gov>; EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>; nbritten@bchdmi.org; nmargaritis@bchdmi.org; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>; Pavone, Anthony (DHHS) <PavoneA1@michigan.gov>; Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>

Dear Mr. Ellis Mitchell,

Please see attached for the standard letter from the Michigan Department of Environment, Great Lakes, and Energy regarding a Lead and Copper Monitoring – Lead Action Level Exceedance letter for the city of Benton Harbor (WSSN: 00600), along with its corresponding enclosures. A hard copy of this letter will be sent to you via U.S. Mail.

Templates for the Public Advisory and Public Education documents have already been provided to you under separate cover.

If you have any questions regarding this correspondence, please contact me.

Thank you,

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes,
and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

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LET'S STAY SAFE TOGETHER

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

February 4, 2021

VIA EMAIL AND U.S. MAIL

Mr. Ellis Mitchell
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 00600
County: Berrien
Supply: Benton Harbor

Dear Mr. Mitchell:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The Benton Harbor community water supply's 90th percentile value exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from July 1 to December 31, 2020, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Sites Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	24 ppb	11	0 - 240 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.0	0	0 – 0.2 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadlines for each of the following requirements.

Issue a Public Advisory (PA)
An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a PA within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. A template has already been provided to you. Please contact EGLE if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Thank you for completing this requirement timely.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL deliver PE materials to all consumers.

This material is intended to educate consumers about lead health effects, sources of lead, and steps to minimize exposure. Note that the PE material must include information about the following: the exceedance in your water supply, what you are doing to reduce lead levels, lead service lines in your distribution system, and the history of lead levels in your water supply. A template has already been provided to you.

A sample copy of the final PE material along with a PE distribution certification form must be submitted to EGLE no later than ten days after the PE is due. Repeat each year until the lead AL is no longer exceeded.

Conduct WQP Monitoring
Continue collecting one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap), and quarterly from ten locations in the distribution system.

The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use EGLE's laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from Michigan.gov/EGLELab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
Thank you for completing this requirement on March 16, 2019. You must repeat this sampling every third year until both lead and copper ALs are met during the entire three-year period.

Minimize Corrosion
Minimize lead in the drinking water by reducing corrosion of water pipes and household plumbing that contain lead. This is Benton Harbor's fifth AL exceedance. Benton Harbor has made corrective actions to the corrosion control treatment system per EGLE's

direction in a letter dated February 13, 2020. EGLE anticipates this change having a positive impact on the distribution system's corrosion rates and will assess the effectiveness of the current corrosion control treatment based on sequential sampling at homes in the distribution system and future rounds of compliance monitoring.

Lead and Copper Monitoring
To show the ALs can be met, collect a lead and copper sample from 60 sites between January 1 and June 30, 2021, and again between July 1 and December 31, 2021. These sites should be selected from your Lead and Copper Sampling Plan.

If you need to select new sites, choose the highest Tier criteria available within your distribution system, giving Tier 1 sites first priority. Document any changes on your Lead and Copper Sample Site Plan and submit it to your local district office email address. If you have Tier 1 or Tier 2 sites, i.e. sites with a lead service line, compliance sampling will require that you collect a first-liter and fifth-liter sample from each sampling location.

Within 30 days of learning of results, provide individual lead and copper tap results to people who receive water from sites that were sampled. Even if lead or copper was not detected, all monitoring, reporting, consumer notification, and EGLE certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2021. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a PA.	Distribute a PA to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Continue	Collect WQP samples (entry point to the distribution system).	Collect one set of WQP samples every two weeks from the entry point to the distribution system, TP001 (Treatment Plant Tap).
March 1, 2021	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
March 11, 2021	Send EGLE certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required whenever PE required.
Between January 1 and June 30, 2021	Collect samples from 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2021.**
Between January 1 and June 30, 2021	Collect WQP samples (Distribution system).	Collect one set of WQP samples from 10 locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
July 1, 2021	Report the 2020 AL exceedances in the CCR.	Specific lead health effects language must be included.
Between July 1 and December 31, 2021	Collect samples from 60 sites from the distribution system and have them analyzed for lead and copper.	Report the results to EGLE and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2022.**
Between July 1 and December 31, 2021	Collect WQP samples (Distribution system).	Collect one set of WQP samples from 10 locations in the distribution system quarterly. Analyze the samples for pH, alkalinity, calcium, conductivity, orthophosphate, chloride, sulfate, and temperature.
September 30, 2021	For the January through June 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	For the July through December 2021 monitoring, send EGLE certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from Michigan.gov/LCR.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system, TP001 (Treatment Plant Tap).	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at BoltJ@Michigan.gov; OnanB@Michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt, Environmental Quality Specialist
Lead and Copper Unit
Drinking Water and Environmental Health Division
517-331-5161

Brandon Onan, Supervisor
Lead and Copper Unit
Drinking Water and Environmental Health Division
616-307-6736

Enclosures (PA Checklist, PE Distribution Check, WQP report form, Tier Criteria)
cc/enc: Mr. George Regan, F&V Operations
Ms. Nicki Britten, Berrien County Health Department
Mr. Nick Margaritis, Berrien County Health Department
Mr. Steve Crider, Michigan Department of Health and Human Services
Mr. Mike Bolf, EGLE
Mr. Ernie Sarkipato, EGLE
Mr. Matt Sylvester, EGLE
Mr. Jeremy Klein, EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

SUMMARY OF PUBLIC ADVISORY REQUIREMENTS AND DISTRIBUTION CHECKLIST FOR COMMUNITY WATER SUPPLIES THAT EXCEED THE LEAD ACTION LEVEL

Issued under the authority of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the Administrative Rules. Act 399, MCL 325.1019 et seq. requires that, if a water supply is found not to be compliant with the state drinking water standards, they shall be required to notify users of the extent and nature of the noncompliance. Complete and submit this form to EGLE

Act 399 requires that a Public Advisory (PA) must be issued within three business days after the Department of Environment, Great Lakes, and Energy (EGLE) notifies a water supply that an exceedance of the lead action level has occurred. To meet this requirement, water supplies may use this checklist to document the PA issuance activities.

Distribution must be reasonably calculated to reach all persons served by the water supply. Send this checklist, or similar documentation, to EGLE along with a sample copy of the issued PA.

START HERE (indicate one or more of the following activities)

☐ Issue the PA using appropriate broadcast media, such as radio and television.
Please list media outlets and date of broadcast: _____
_____

☐ Post the PA in conspicuous locations throughout the area served by the public water supply.
Locations posted and date of posting: _____
_____

☐ Hand deliver the PA to each person served by the water supply. The water supply may use electronic transmission instead of, or combined with, printed materials as long as it achieves at least the same coverage. Date delivered: _____

☐ Use a communication method other than one listed, as approved in writing by EGLE.
Date delivered: _____

I affirm that the Public Advisory has been issued. I have enclosed a copy of the Public Advisory.

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	Date

Send this checklist to the appropriate EGLE district office. Contact information for the district offices can be found online at Michigan.gov/CommunityWater. Under Information, click on "District Offices Map and Contact Information."

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

MICHIGAN LEAD AND COPPER RULE
LEAD AND COPPER TAP SAMPLE SITE SELECTION CRITERIA

Community water supplies must identify a pool of lead and copper sampling sites containing **AT LEAST** the number of sites necessary to conduct **STANDARD** monitoring (see instructions for number of required sites). It is highly recommended that the sampling pool contain more sites than required incase routine sites are unavailable at time of sampling. The sampling pool must target high risk sites using the criteria below.

- **Samples must be collected from Tier 1 sites, unless …**
- insufficient Tier 1 sampling sites are available, then **Tier 2** sites must be used, unless …
- insufficient Tier 1 and Tier 2 sampling sites are available, then **Tier 3** sites must be used.
- If no Tier 1, 2, or 3 sites are available, sampling sites must be representative of plumbing materials typically found throughout the water system.

TIER 1 SITES - Single family residences with either: o Lead service lines (LSL)***** o Interior lead plumbing Multiple family residences (MFR) with LSLs or interior lead plumbing may be used as Tier 1 sites when MFR comprise at least 20 percent of the total service connections.
TIER 2 SITES – Other buildings or multiple family residences with either: o Lead service lines***** o Interior lead plumbing
TIER 3 SITES - Single family residences with: o Copper plumbing with lead solder installed before July 1988
OTHER SITES o Sites representative of plumbing materials commonly found throughout the water supply.
*** Priority should be placed on sites with full LSLs, followed by partial LSLs, followed by lead goosenecks or pigtails.**

Also Note:

- Each round of sampling should be conducted at the **SAME** sampling sites unless …
  - a site no longer meets tiering criteria (for example, a site is no longer Tier 1 after having the lead service line replaced); or
  - a site is unavailable (for example, a site has no water service, resident refuses to participate, etc.)
- **DO NOT** sample from outside hose spigots or utility sinks.
  - For residential sites, samples **MUST BE** collected from kitchen or bathroom taps typically used for consumption. For non-residential sites, samples **MUST BE** collected from taps typically used for consumption.
- Samples **MAY NOT** be taken from taps that have point of use or point of entry treatment devices designed to remove inorganic contaminants, such as an iron removal filter, reverse osmosis system, or water softener.

Summary of Public Education (PE) Requirements and Certificate of Distribution

For Community Water Supplies That Exceed the Lead Action Level

Within 10 days after PE distribution deadline (e.g., within 70 days of notification of a lead action level exceedance, or within 70 days after the end of the monitoring period whichever is sooner), send this certificate of distribution document to EGLE showing you have completed **all** applicable requirements below.

Complete each PE distribution requirement below.

Completed	Requirement	Date Completed
☐	Deliver PE printed materials (pamphlets, brochures, posters) to all bill paying customers.	
☐	Do more than 10% of your customers speak a language other than English? _____ What additional languages did you include in your PE materials? _____	
☐	Provide the following message on or in each water bill (no less frequently than quarterly). "[Water Supply Name] exceeded the action level for lead in drinking water. Lead can cause serious health problems. For more information please call [Water Supply Name] or visit [insert Web site if available]."	
☐	Deliver PE materials to the local public health agency along with an informational notice instructing them to distribute to potentially affected consumers.	
☐	Contact the local public health agency in person or by phone. Name of person contacted: _____ ☐ If the agency provides a list of organizations that serve target populations, customers who are most at risk, deliver materials to those organizations even if not served by the water supply. A water supply serving 3,300 or fewer people may limit the distribution to organizations it serves. List of organizations provided by local public health agency: _____	
☐	Deliver PE materials to the following facilities and organizations that are served by the water supply along with an informational notice that instructs the organization to distribute the PE to its potentially affected customers. Check all that apply, list the names of facilities and organizations: ☐ Public and private schools or school boards: _____ ☐ Women Infants and Children (WIC) and Head Start programs: _____ ☐ Public and private hospitals and medical clinics: _____ ☐ Pediatricians: _____ ☐ Family planning clinics: _____ ☐ Local welfare agencies: _____ ☐ Community Centers: _____ ☐ Adult foster care facilities: _____	
☐	Make a good faith effort to locate the following organizations within the service area and deliver PE materials, along with an informational notice that instructs the organizations to distribute the PE to all potentially affected customers or users. The good faith effort to contact at-risk customers may include requesting a specific contact list of the organizations from the local public health agencies, even if the agencies are not located within the water system service area. Check all organizations that apply, list the names of the organizations: ☐ Licensed childcare centers: _____ ☐ Public and private preschools: _____ ☐ Obstetricians-Gynecologists and Midwives: _____	

DRAFT

☐	Submit press release to newspaper, television, and radio stations. Water supplies serving 3,300 or fewer people may skip this requirement provided the water supply delivers PE materials to every household served by the water supply. List the newspapers, television, and radio stations: ☐ Newspapers: _____ ☐ Television: _____ ☐ Television: _____	
☐	Conduct activities from the following general categories. The content and selection of these activities shall be determined in consultation with the department. ● For water supplies serving 3,300 or fewer people, conduct one activity from one of the general categories listed below. ● For water supplies serving more than 3,300 people, conduct three activities from the general categories listed below. For your three activities, you may do multiples of the same activity. For example, you may do three PSAs or two public meetings and one paid advertisement if the DEQ allows. ☐ Public service announcements: _____ ☐ Paid advertisements: _____ ☐ Display information in public areas: _____ ☐ Email to customers: _____ ☐ Text messages to customers: _____ ☐ Robocalls to customers: _____ ☐ Public meetings: _____ ☐ Delivery to every household: _____ ☐ Targeted individual customer contact: _____ ☐ Provide materials directly to multi-family homes: _____ ☐ Other methods approved by the DEQ: _____	
☐	Post and retain material on the primary water supply's and municipality's websites and provide a link to the material on social media platforms commonly used by the supply. (required for supplies serving more than 1,000 people). Provide the date the information was posted. ☐ Website address(es): _____ ☐ Other media platform(s): _____	

Certify.

I affirm that public education material content and delivery requirements have been completed.

I have enclosed a sample each of the following public education materials we delivered:

- ☐ Public Education printed materials
- ☐ Water Bill (quarterly)
- ☐ Informational notice instructing organizations to distribute PE
- ☐ Press Release (If applicable)

Signature	Water Supply Name
Printed Name	Water Supply Serial Number (WSSN)
Title	

DRAFT

DRAFT

From:	Mike O"Malley
To:	EGLE-DWEH-Grand-Rapids; Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE)
Cc:	Mike OMalley; emitchell
Subject:	MI 0600 Benton Harbor ACO Corrosion Control Treatment Study submittal
Date:	Friday, May 29, 2020 4:38:24 PM
Attachments:	MI 0600 Benton Harbor ACO Corrosion Control Study Submittal.pdf

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Gentlemen,

Please see attached: *MI 0600 Benton Harbor ACO Corrosion Control Study Submittal.pdf*

Thank you,

Mike O'Malley
Benton Harbor Water Operator IN Charge

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Benton Harbor Water Plant and Utility Services Departments

Date: May 19, 2020

To: Ernie Sarikipato, Michael Bolf, Brandon Onan, Eric Oswald, and Brian Thurston

From: Mike O'Malley, Water Superintendent

CC: Ellis Mitchell, City Manager

RE: MI 0600 Benton Harbor ACO Corrosion Control Treatment Response

DWEHD Order No. AACO-399-07-2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 31, 2019.

This project was completed by March 21, 2019 when corrosion protection treatment began.

City of Benton Harbor First Amended Administrative Consent Order AACO-399-07-2019

2.18 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

I have done a great deal of investigation regarding Lead in the Benton Harbor Water System. I have also sought out firms that may be able to provide a Corrosion Control Study.

During my investigation, I did a thorough comparison to lead and copper test results dating back to 2018 and into all of 2019. That comparison yielded a much better picture of Orthopolyphosphate treatment with Carus 8600 treatment that has been applied to the Benton Harbor Community water supply since March 26, 2019.

The comparison showed:

- The June 2019 1st draw results showed a reduction of Lead results compared to the massive 2018 pool of 13 out of 16 locations where the lead level dropped; an 81% reduction.
- The June 2019 5th draw results compared to the 2018 pool even better; 14 out of 16 locations dropped; an 87.5% reduction.
- The December 2019 1st draw & 5th draw were reduced 85% & 100% respectively.
- The overall table showed an 83% decrease in lead values.

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

The results of this comparison are far more impressive that the former comparison offered by EGLE in its February 2020 order to change treatment chemical and increase the dose. There was not enough time available from December 2019 monitoring period and the letter sent in February 2020 to analyze all the available data. That decision was made by EGLE by only comparing the June & December data, which had significantly less available data points to compare.

A copy of the comparison is attached in a separate form as part of this scan.

This revised comparison paints a bit more of the apparent effectiveness of Carus 8600 Orthopolyphosphate in reducing lead results in homes in Benton Harbor. The Corrosion Specialist during this entire time was Elhorn Engineering, led by Todd Lucks, Vice President of Elhorn. The former representative Mike Enlow has since retired and Elhorn Engineering went through a bit of an organizational change.

When the change from EGLE letter in February 2020 where the City was demanded to alter its treatment to a more aggressive Orthopolyphosphate and a doubling of the dose for treatment, Todd Lucks came nearly immediately to the water plant to assist us in the change out. At that time he also changed out the coupon rack with new and sent the coupons for analysis.

EGLE agreed to a phone conference with a different Corrosion Control Specialist Dr. David Cronwell, because I was very worried about this change in treatment with little supporting documentation. Dr. Cronwell eased My fears by saying there is no health effects to worry about with the new corrosion treatment.

After all of my efforts, I believe that we the skill and integrity to provide the City of Benton Harbor with a good corrosion protection plan going forward. And sought and received a quotation for a corrosion treatment study. I also believe that the Carus Corporation's corrosion protection products have performed well in Benton Harbor and understand that the Carus distribution system is solely to Elhorn Engineering. And further more Carus provides outstanding support to Elhorn Engineering and the City of Benton Harbor.

I am certain that the ACO regarding a Corrosion Study be accepted by the City and given to the State EGLE as the City's response. It will take nearly a month to iron out all the details. So the target date should be June 30 2020.

City Manager, Ellis Mitchell has already approved the Purchase Order for Elhorn Engineering.

Sincerely

Mike O'Malley _____ Date: 5/29/20

Benton Harbor Water Operator IN Charge

BENTON·HARBOR
PORT·OF·OPPORTUNITIES

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

2.18 **Not later than September 30, 2020,** the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

The City of Benton Harbor intends to hire Elhorn Engineering to initiate another corrosion control study. The proposal is attached and needs to go through the typical Accounts Payable system here in Benton Harbor. We expect the project will start well before the September 30, 2020

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

City of Benton Harbor Water Treatment Plant
200 East Wall Street
Benton Harbor, MI 49022
Mr. Mike O'Malley

RE: Corrosion Study

Mr. O'Malley,

This letter is concerning the cost to implement a critical corrosion control study for the City of Benton Harbor Water Treatment Plant. A complete detailed outline will be presented in the near future; however, the scope of the project will be focused on long term corrosion control treatment. We have harvested lead & galvanized service line materials from the City of Benton Harbor Water distribution system to be used to create testing loops. These loops will be installed at the City of Benton Harbor Water Treatment Plant for the purpose of determining optimum corrosion control in accordance with EPA optimum corrosion control guidance manual.

The cost to make the test loops, install the test loops, startup, instruction on operation & development of sample frequency will be exactly $1600.00 to the City of Benton Harbor. In a effort to keep cost at a minimum for the City of Benton Harbor this study will be jointly accomplished by Elhorn Company and Carus Corporation to provide all products to be tested, complete water analysis & lab services, the City of Benton Harbor to provide the source water, daily supervision, daily testing and sample collection according to the developed schedule.

Elhorn Company looks forward to being of service to the City of Benton Harbor and continue to provide over 40 years of experience in the municipal water treatment business!

Thank You,

Todd E. Luks
President

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

Lab Code	Lead 1st Draw	June 2019 lead 1st draw	Diff 18 to 0619	June 2019 lead 5th draw	Diff 18 to 0619	Dec 2019 Lead Result 1st Draw	dif 18 1219	dif 0619 to 1219	Dec 2019 Lead Result 5th Draw	dif 18 1219	dif 0619 to 1219
BHFree 67	34.0	14.00	20.00	12.00	22.00	9.2	24.8	4.80	6.3	27.7	5.70
BHFEA 45	56.0	35.00	21.00	22.00	34.00	25	31.0	10.00	18	38.0	4.00
BHEAM 138	62	22.00	40.00	24.00	38.00	23	39.0	-1.00	9.4	52.6	14.60
BHM1	5.8	3.00	2.80	2.00	3.80	4.4	1.4	-1.40	3.9	1.9	-1.90
BHFree 33	18.0	4.00	14.00	2.00	16.00						
BHFEA 52	21.0	14.00	7.00	18.00	3.00	0	21.0	14.00	0	21.0	18.00
BHFEA 12	30.0					33	-3.0		21	9.0	-21.00
BHFree 93	5.0	29.00	-24.00	59.00	-54.00						
BHFEA 23	12.0					4	8.0		3	9.0	-3.00
BHFEA 18	16.0	21.00	-5.00	13.00	3.00	10	6.0	11.00	12	4.0	1.00
BHFree 20	41.0	15.00	26.00	6.00	35.00						
BH33	4.4	1.00	3.40	1.00	3.40						
BH8	4.4	13.00	-8.60	5.00	-0.60						
BHFEA 7	27.0	23.00	4.00	8.00	19.00	19	39.0		40	18.0	
BHFEA 20	55.0	0.00	55.00	0.00	55.00	10	17.0	13.00	7.8	19.2	0.20
BHFree 22	17.0	12.00	5.00	12.00	5.00						
BHFree 86	5.0										
BH48	33	12.00	21.00	17.00	16.00	9.3	-4.3		1.8	3.2	
aBH14	5.5	2.00	3.50	3.00	2.50	8.6	24.4	3.40	5.3	27.7	11.70
						2	3.5	0.00	5	0.5	-2.00

Counts	2018 samples	June 19 samples 1st Draw	June 19 5th draw	Dec 19 1st Draw	Dec 19 5th Draw
	20	16	16	13	9 13 11

	June 2019 1st draw	June 2019 5th draw	December 2019 1st draw	December 2019 5th Draw
Reduction in 1st drawlead compared to 2018	13	14	11	13
Increase in 1st draw Lead compared to 2018	3	2	2	0
Percentage samples decrease	81.25%	87.50%		
Percentage samples increase	18.75%	12.50%		
difference 0619 to 1219 reduction			7	7
difference 0619 to 1219 increase			2	4
Percentage samples decrease				63.64%
Percentage samples increase				36.36%
Percentage Decrease to all periods	83.33%			
Percentage increase to all periods	16.67%			

From:	Mike O"Malley
To:	EGLE-DWEH-Grand-Rapids; Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE)
Cc:	Mike OMalley; emitchell
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Gentlemen,

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Thank you,

Mike O'Malley
Benton Harbor Water Operator IN Charge

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Benton Harbor Water Plant and Utility Services Departments

Date: May 19, 2020

To: Ernie Sarikipato, Michael Bolf, Brandon Onan, Eric Oswald, and Brian Thurston

From: Mike O'Malley, Water Superintendent

CC: Ellis Mitchell, City Manager

RE: MI 0600 Benton Harbor ACO Corrosion Control Treatment Response

DWEHD Order No. AACO-399-07-2019

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City of Benton Harbor First Amended Administrative Consent Order AACO-399-07-2019

2.18 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

I have done a great deal of investigation regarding Lead in the Benton Harbor Water System. I have also sought out firms that may be able to provide a Corrosion Control Study.

During my investigation, I did a thorough comparison to lead and copper test results dating back to 2018 and into all of 2019. That comparison yielded a much better picture of Orthopolyphosphate treatment with Carus 8600 treatment that has been applied to the Benton Harbor Community water supply since March 26, 2019.

The comparison showed:

- The June 2019 1st draw results showed a reduction of Lead results compared to the massive 2018 pool of 13 out of 16 locations where the lead level dropped; an 81% reduction.
- The June 2019 5th draw results compared to the 2018 pool even better; 14 out of 16 locations dropped; an 87.5% reduction.
- The December 2019 1st draw & 5th draw were reduced 85% & 100% respectively.
- The overall table showed an 83% decrease in lead values.

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

The results of this comparison are far more impressive that the former comparison offered by EGLE in its February 2020 order to change treatment chemical and increase the dose. There was not enough time available from December 2019 monitoring period and the letter sent in February 2020 to analyze all the available data. That decision was made by EGLE by only comparing the June & December data, which had significantly less available data points to compare.

A copy of the comparison is attached in a separate form as part of this scan.

This revised comparison paints a bit more of the apparent effectiveness of Carus 8600 Orthopolyphosphate in reducing lead results in homes in Benton Harbor. The Corrosion Specialist during this entire time was Elhorn Engineering, led by Todd Lucks, Vice President of Elhorn. The former representative Mike Enlow has since retired and Elhorn Engineering went through a bit of an organizational change.

When the change from EGLE letter in February 2020 where the City was demanded to alter its treatment to a more aggressive Orthopolyphosphate and a doubling of the dose for treatment, Todd Lucks came nearly immediately to the water plant to assist us in the change out. At that time he also changed out the coupon rack with new and sent the coupons for analysis.

EGLE agreed to a phone conference with a different Corrosion Control Specialist Dr. David Cronwell, because I was very worried about this change in treatment with little supporting documentation. Dr. Cronwell eased My fears by saying there is no health effects to worry about with the new corrosion treatment.

After all of my efforts, I believe that we the skill and integrity to provide the City of Benton Harbor with a good corrosion protection plan going forward. And sought and received a quotation for a corrosion treatment study. I also believe that the Carus Corporation's corrosion protection products have performed well in Benton Harbor and understand that the Carus distribution system is solely to Elhorn Engineering. And further more Carus provides outstanding support to Elhorn Engineering and the City of Benton Harbor.

I am certain that the ACO regarding a Corrosion Study be accepted by the City and given to the State EGLE as the City's response. It will take nearly a month to iron out all the details. So the target date should be June 30 2020.

City Manager, Ellis Mitchell has already approved the Purchase Order for Elhorn Engineering.

Sincerely

Mike O'Malley _____ Date: 5/29/20

Benton Harbor Water Operator IN Charge

BENTON·HARBOR
PORT·OF·OPPORTUNITIES

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

2.18 **Not later than September 30, 2020,** the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

The City of Benton Harbor intends to hire Elhorn Engineering to initiate another corrosion control study. The proposal is attached and needs to go through the typical Accounts Payable system here in Benton Harbor. We expect the project will start well before the September 30, 2020

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

City of Benton Harbor Water Treatment Plant
200 East Wall Street
Benton Harbor, MI 49022
Mr. Mike O'Malley

RE: Corrosion Study

Mr. O'Malley,

This letter is concerning the cost to implement a critical corrosion control study for the City of Benton Harbor Water Treatment Plant. A complete detailed outline will be presented in the near future; however, the scope of the project will be focused on long term corrosion control treatment. We have harvested lead & galvanized service line materials from the City of Benton Harbor Water distribution system to be used to create testing loops. These loops will be installed at the City of Benton Harbor Water Treatment Plant for the purpose of determining optimum corrosion control in accordance with EPA optimum corrosion control guidance manual.

The cost to make the test loops, install the test loops, startup, instruction on operation & development of sample frequency will be exactly $1600.00 to the City of Benton Harbor. In a effort to keep cost at a minimum for the City of Benton Harbor this study will be jointly accomplished by Elhorn Company and Carus Corporation to provide all products to be tested, complete water analysis & lab services, the City of Benton Harbor to provide the source water, daily supervision, daily testing and sample collection according to the developed schedule.

Elhorn Company looks forward to being of service to the City of Benton Harbor and continue to provide over 40 years of experience in the municipal water treatment business!

Thank You,

Todd E. Luks
President

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

Lab Code	Lead 1st Draw	June 2019 lead 1st draw	Diff 18 to 0619	June 2019 lead 5th draw	Diff 18 to 0619	Dec 2019 Lead Result 1st Draw	dif 18 1219	dif 0619 to 1219	Dec 2019 Lead Result 5th Draw	dif 18 1219	dif 0619 to 1219
BHFree 67	34.0	14.00	20.00	12.00	22.00	9.2	24.8	4.80	6.3	27.7	5.70
BHFEA 45	56.0	35.00	21.00	22.00	34.00	25	31.0	10.00	18	38.0	4.00
BHEAM 138	62	22.00	40.00	24.00	38.00	23	39.0	-1.00	9.4	52.6	14.60
BHM1	5.8	3.00	2.80	2.00	3.80	4.4	1.4	-1.40	3.9	1.9	-1.90
BHFree 33	18.0	4.00	14.00	2.00	16.00						
BHFEA 52	21.0	14.00	7.00	18.00	3.00	0	21.0	14.00	0	21.0	18.00
BHFEA 12	30.0					33	-3.0		21	9.0	-21.00
BHFree 93	5.0	29.00	-24.00	59.00	-54.00						
BHFEA 23	12.0					4	8.0		3	9.0	-3.00
BHFEA 18	16.0	21.00	-5.00	13.00	3.00	10	6.0	11.00	12	4.0	1.00
BHFree 20	41.0	15.00	26.00	6.00	35.00						
BH33	4.4	1.00	3.40	1.00	3.40						
BH8	4.4	13.00	-8.60	5.00	-0.60						
BHFEA 7	27.0	23.00	4.00	8.00	19.00	19	39.0		40	18.0	
BHFEA 20	55.0	0.00	55.00	0.00	55.00	10	17.0	13.00	7.8	19.2	0.20
BHFree 22	17.0	12.00	5.00	12.00	5.00						
BHFree 86	5.0										
BH48	33	12.00	21.00	17.00	16.00	9.3	-4.3		1.8	3.2	
aBH14	5.5	2.00	3.50	3.00	2.50	8.6	24.4	3.40	5.3	27.7	11.70
						2	3.5	0.00	5	0.5	-2.00

Counts	2018 samples	June 19 samples 1st Draw	June 19 5th draw	Dec 19 1st Draw	Dec 19 5th Draw
	20	16	16	13	9 13 11

	June 2019 1st draw	June 2019 5th draw	December 2019 1st draw	December 2019 5th Draw
Reduction in 1st drawlead compared to 2018	13	14	11	13
Increase in 1st draw Lead compared to 2018	3	2	2	0
Percentage samples decrease	81.25%	87.50%		
Percentage samples increase	18.75%	12.50%		
difference 0619 to 1219 reduction			7	7
difference 0619 to 1219 increase			2	4
Percentage samples decrease				63.64%
Percentage samples increase				36.36%
Percentage Decrease to all periods	83.33%			
Percentage increase to all periods	16.67%			

From:	Mike O"Malley
To:	EGLE-DWEH-Grand-Rapids; Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE); Bolf, Michael (EGLE)
Cc:	Jim and Todd Luks Elhorn Engineerint; emitchell; Mike OMalley; Darold Harlan
Subject:	MI 0600 Benton Harbor ACO Required Corrosion Study Packet
Date:	Tuesday, July 28, 2020 11:37:21 AM
Attachments:	MI 0600 Benton Harbor Water Corrosion Plan for ACO.pdf

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

See attached for your information:

Attached: *MI 0600 Benton Harbor Water Corrosion Plan for ACO.pdf*

Mike O'Malley
Benton Harbor Community Water Operator IN Charge

MI 0600 Benton Harbor ACO 8/14 Corrosion Study (1)

7/28/20

CITY OF BENTON HARBOR-CORROSION STUDY PLAN

Purpose:

The purpose of this study is to determine optimum corrosion control treatment for the City of Benton Harbor water treatment plant. This study will utilize harvested Lead & Galvanized service line material from the cities distribution system and new copper in order to replicate lead service line replacement activities. The study will focus on "not only Lead" but all aspects of optimum corrosion control treatment. The study will be ran for a minimum of 6 months for initial result data to be compiled and a treatment technic plan be developed. A additional 6 month period will follow.

Pipe Loops:

Example of pipe loops attached. Five Test Loops will utilized. Each pipe loop will consist of 36" sections of Lead, Galvanized & Copper pipe. A 3/4" flow meter, 24 hour timer, solenoid switch, phosphate feed pump w/injection, tubing, valves and sample taps.

Pipe Loop Operation:

Each pipe loop will be run from a 24 hour timer to be used for 6 hour on/ 6 hours off operation. Flow will be maintained using valving set to less than 0.5 gpm when solenoid valve is opened.

Source Water Feed:

The water used will be from the finished water clear well prior to any phosphate feed on (4)four of the test loops. The fifth test loop will test finished water with current phosphate feed.

Products to be Tested:

The products to be tested and there particular blends are as follows:

1-TEST LOOP-SK-7661 Blended 10% Polyphosphate/ 90% Orthophosphate Current feed rate.
1-TEST LOOP-SK-7661 " " " @1.0-1.5ppm PO4
1-TEST LOOP-Carus 8600 Blend 30% Polyphosphate/ 70% Orthophosphate@1.0-1.5ppm PO4
1-TEST LOOP-Carus 8600 " " " @2.5-3.0ppm PO4
1-TEST LOOP-Carus 4105 36% Phosphoric Acid @2.5-3.0ppm PO4

Operation:

Daily oversight will be provided by the City of Benton Harbor staff. Oversight should consist of checking test loops daily for proper operating conditions; leaks, pipe failure, pump failure, electrical problems etc. Any failures of operation should be reported directly to Elhorn Company @517-676-3786. Minor issue's can be discussed for correct repair instructions.
Weekly visits from Elhorn Staff will commence upon study system startup.

Sample/Testing Schedule:

Benton Harbor staff to provide daily PO4 residual testing on all test loops! Reagents will be provided by Elhorn Company for additional testing. Elhorn Company will collect weekly WQP samples & First Draw L/C samples from each test loop. Samples will be delivered to Carus Corporation for analysis. Each sample will be tested for: Hardness, Orhtophosphate, Iron, Manganese, pH, Langelier, Temperature, Alkalinity, Calcium, Chloride, Conductivity, TDS, Sulfate, Polyphosphate & Total phosphate, Lead, Copper.

Section Pieces:

The section pieces will be individually weighed prior to installation on the pipe loop. The pieces will consist of 2 sections each of lead, galvanized & copper pipe. Rubber fernco style fittings will hold pieces in place during operation. After a minimum of 90 days 1 section of each type of material will be carefully removed from the loop system. A unknown drying time will be determined for each piece and then re-weighed upon dried weight. Section pieces will then be sent to Carus Lab for analysis of film development.

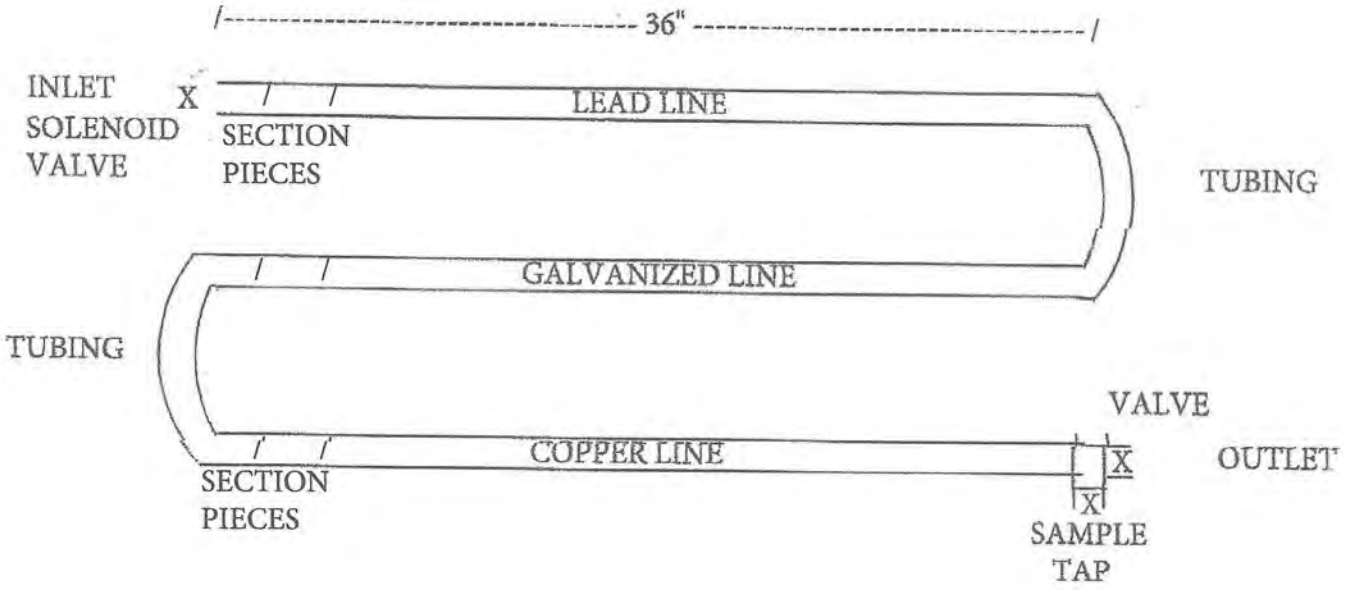
This same procedure will take place with the 2nd section piece of each material after a minimum of 180 days.

Completion of Results:

All results will be compiled into several spread sheets and graphs to determine a optimal corrosion treatment plan. The plan will depict the best overall treatment product and dosage rates concerning the City of Benton Harbor Water Treatment Plant.

Acc Reply Corrosion study (3)

PIPE LOOP LAYOUT



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Mike O'Malley
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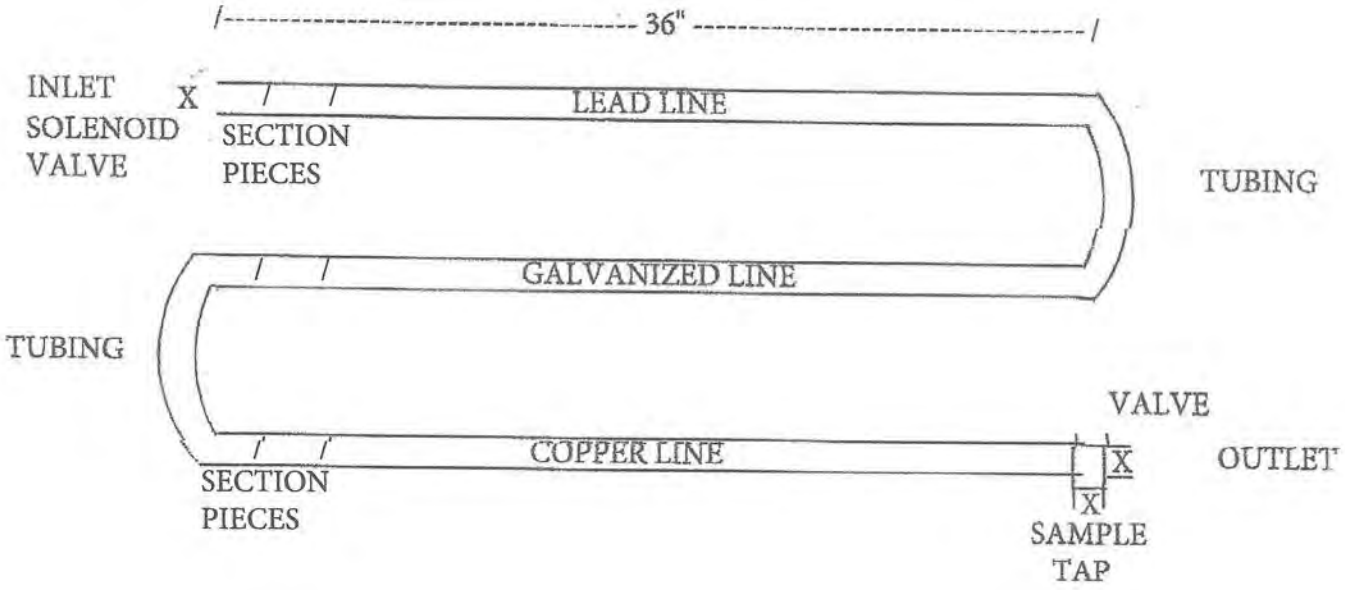

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I cannot send it via email it is larger than my system is allowed to send.
This attachment is the best I can do for awhile.

Attached: *MI 0600 CCCP Short version 07 28 2020.pdf*

FYI I will be out of the office for the rest of this week, starting now

My father died Sunday and I have to help my family.

Mike O'Malley
Benton Harbor Community Water Supply Operator IN Charge

City of Benton Harbor

Cross Connection Control Plan

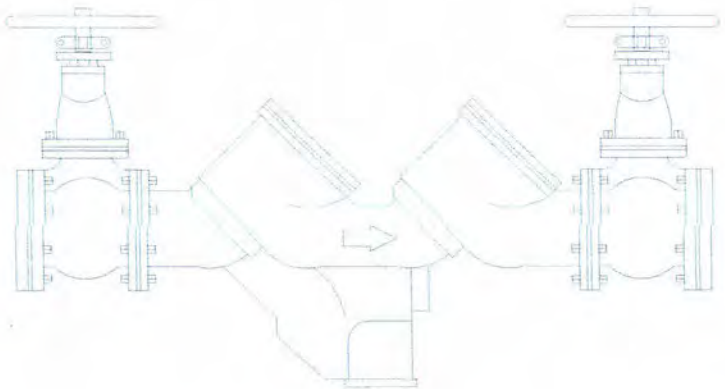

TABLE OF CONTENTS

1.0 INTRODUCTION
- 1.1 Purpose 1
- 1.2 Legality 1

2.0 ORDINANCE

3.0 LOCALITY OF Benton Harbor
- 3.1 City of Benton Harbor 5
- 3.2 Inspector/Designated Agent 5
- 3.3 Other Applicable Laws 6

4.0 INSPECTIONS
- 4.1 Rights of Inspection 6
- 4.2 Responsibility of Owner 6
- 4.3 Initial Inspections 6
- 4.4 Inspection Notification 6
- 4.5 Inspection Notice 7
- 4.6 Inspection Forms 7
- 4.7 Inspection Field Form 8
- 4.8 Existing Device Field Form 9
- 4.9 Requirement Field Form 10
- 4.10 Inspection Procedures 11
- 4.11 Exit Interview 11
- 4.12 Initial Inspection Non-Compliance Notification 11
- 4.13 Non-Compliance Notice #1 12
- 4.14 Request of Pertinent Piping Information 13
- 4.15 Request for Internal Cross Connection Control Information 13
- 4.16 Request for Pertinent Piping Information Notice 14
- 4.17 Submission of Pertinent Piping Data 15
- 4.18 Containment Notification 15
- 4.19 Containment Notice 16
- 4.20 Compliance Notification 17
- 4.21 Compliance Notice 18

5.0 PERIODIC FOLLOW-UP
- 5.1 Continuing - Inspections Frequency 19
- 5.2 Continuing - Inspections Frequency Determination 19
- 5.3 Follow-up - Inspection Procedure 19
- 5.4 Non-Compliance Notification #2 19
- 5.5 Non-Compliance Notice #2 20
- 5.6 Follow-up Inspection 21
- 5.7 Non-Compliance Notification #3 21
- 5.8 Non-Compliance Notice #3 22
- 5.9 Water Shut-Off Notification 23
- 5.10 Inspection Shut-Off Notice 23
- 5.11 Water Shut-Off Notice 24

6.0 BACKFLOW PREVENTION DEVICES
- 6.1 Responsibility 25

6.2 Device Abbreviation List 26
6.3 A.S.S.E. Approved Device List 27

TABLE OF CONTENTS

6.4 Tester Application 28
6.5 Device Testing Notification 29
6.6 Test Form 30
6.7 Test Notice #1 (annual testing of isolation devices/containment devices) 31
6.8 Testing Notification #2 32
6.9 Test Notice #2 33
6.10 Testing Shut-Off Notice 34
6.11 Test Shut-Off Notice 35

7.0 New Service Inspections

7.1 Procedures 36
7.2 Inspections 36
7.3 Records 36
7.4 Non-Compliance 36
7.5 Compliance 36

8.0 PIPING IDENTIFICATION

8.1 Requirements 37

9.0 REPORTS

9.1 Annual Report 38
9.2 City of Benton Harbor Annual Report 39
9.3 Monthly Reports 40
9.4 On-Site Inspections Competed by Date 41
9.5 On-Site Inspections Not Completed by Date 42
9.6 Inspection Notices Sent by Date 43
9.7 Test Notices Sent by Date 44
9.8 On-Site Inspection Schedule 45
9.9 Inspection Notices Schedule by Date 46
9.10 Testing Notices Schedule by Date 47

10.0 REGULATIONS

10.1 State of Michigan Department of Environmental Quality Drinking Water and Radiological protection Division Cross Connection Control Rules Manal 48
10.2 State of Michigan Department of Environmental Quality Safe Drinking Water Act PA 399 49
10.3 State of Michigan Department of Environmental Quality Drinking Water and Radiological Protection Division Policy and Procedures DWRP-03-002 50
10.4 Environmental Protection Agency Cross Connection Control Manual 51
10.5 Michigan Plumbing Code 2003 52
10.6 Michigan Residential Code 2003 53
10.7 MIOSHA Safety & health Administration Standard 54
10.8 State of Michigan Department of Environmental Quality Environmental Health Food Standards 55
10.9 ANSI Specifications 56

11.0 INSTALLATION SCHEMATICS

11.1 Fixture Vacuum Breaker 58
11.2 Typical 1/2" RPBP Installation 59
11.3 Typical VDCV Installation 60

TABLE OF CONTENTS

11.4 Typical 3/4" - 2" RPBP Installation 61
11.5 Typical SVB Installation 62
11.6 Typical AVB Installation 63
11.7 Typical 3/8" VMBP Installation 64
11.8 Typical PVB Installation 65
11.9 Typical 2 1/2" - 10" RPBP Installation 66

12.0 CHARTS

12.1 Degree of Hazard and Recommended Prevention Chart I 67
12.2 Degree of Hazard and Recommended Prevention Chart II 68
12.3 Time Intervals for Periodic Follow-Up Chart III 69
12.4 Summary of Facility Types Chart IV 70

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to outline City of Benton Harbor cross connection control policies for all commercial, institutional, industrial and miscellaneous facilities, which can be summarized as follows:

- Protect the public water supply from contaminants and pollutants which could back flow through the customer service connection
- Promote the elimination of actual and/or potential cross connections between the public potable water supply from non-potable water systems, plumbing fixtures and sources or systems containing substances of unknown or questionable quality
- Provide for the maintenance of a continuing program

1.2 Legality

In accordance with the Michigan Department of Environmental Quality, Water Bureau (MDEQWB), the City of Benton Harbor proclaims this program as a continuing effort to maintain pure, clean, safe potable water. By reference to the State of Michigan Public Act 399, 1976 Rule #325.11401 through Rule #325.11407 of the Administrative Code, we hereby establish "City of Benton Harbor Cross Connection Control Program." This program was adopted by the hereby above described governing body on **Insert Date** and made effective upon approval of the MDEQWB on **Insert Date.**

Sec. 44-38. Cross connections.

(a) *Definitions.* For the purpose of this section, the following definitions shall apply:

(1) *Backflow* shall mean water of questionable quality, wastes or other contaminants entering water supply system due to a reversal of flow.

(2) *Cross-connection* shall mean a connection or arrangement of piping or appurtenances through which a backflow could occur.

(3) *Safe air gap* shall mean the minimum distance of water inlet or opening above the maximum high water level or overflow rim in a fixture, device or container to which water is furnished which shall be at least two (2) times the inside diameter of the water inlet pipe; but shall not be less than one (1) inch and need not be more than twelve (12) inches.

(4) *Secondary water supply* shall mean a water supply system maintained in addition to a public water supply, including but not limited to water systems from ground or surface sources not meeting the requirements of Act No. 98 of the Public Acts of 1913, as amended [MCL § 325.201 et seq., MSA § 14.411 et seq.], or water from a public water supply which in any way has been treated, processed or exposed to any possible contaminant or stored in other than an approved storage facility.

(5) *Submerged inlet* shall mean a water pipe or extension thereto from a public water supply terminating in a tank, vessel, fixture or appliance which may contain water of questionable quality, waste or other contaminant and which is unprotected against backflow.

(6) *Water utility* shall mean the city division of water.

(b) *Adoption of state rules.* The city adopts by reference the Water Supply Cross-Connection Rules of the Michigan Department of Public Health, being R 325.431 to R 325.440 of the Michigan Administrative Code.

(c) *Inspections.* It shall be the duty of the city manager or his designate to cause inspections to be made of all properties served by the public water supply where cross-connections with the public water supply is deemed possible. The frequency of inspections and reinspections based on potential health hazards involved shall be as established by the cross-connection control program, and as approved by the state department of public health.

(d) *Right of entry to premises.* The representatives of the city manager s hall have the right to enter at any reasonable time any property served by a connection to the public water supply system of the city for the purpose of inspecting the piping system or systems thereof for cross-connections. On request, the owner,

lessees or occupants of any property so served shall furnish to the inspection agency any pertinent information regarding the piping system or systems on such property. The refusal of such information or refusal of access, when requested, shall be deemed evidence of the presence of cross-connections.

(e) *Discontinuance of water service.* The division of water is hereby authorized and directed to discontinue water service after reasonable notice to any property wherein any connection in violation of this section exists, and to take such other precautionary measures deemed necessary to eliminate any danger of contamination to the public water supply system. Water service to such property shall not be restored until the cross-connection has been eliminated in compliance with the provisions of this section.

(f) *Protection from contamination.* The potable water supply made available on the properties served by the public water supply shall be protected from possible contamination as specified by this section and by the state plumbing code. Any water outlet which could be used for potable or domestic purposes and which is not supplied by the potable system must be labeled in a conspicuous manner as: "WATER UNSAFE FOR DRINKING!"

(g) *Compliance with existing laws.* A connection with a public water supply system shall comply with the existing laws and rules including Act No. 266 of the Public Acts of 1929, as amended [MCL § 338.901 et seq., MSA § 14.451 et seq.], and the provisions of this Code. This does not supersede the state plumbing code and city plumbing ordinance, but is supplementary to them.

(h) *Cross*-connection prohibited. Cross-connection of the public water supply system and any other water supply system or source including but not limited to the following are prohibited:

(1) Between a public water supply system and a secondary water supply;

(2) By submerged inlet;

(3) Between a lawn sprinkling system and the public water supply system;

(4) Between a public water supply and piping which may contain sanitary waste or a chemical contaminant; (5) Between a public water supply system and piping immersed in a tank or vessel which may contain a contaminant.

(i) *Local cross-connection control program.* The city shall develop a control program for the elimination and prevention of all cross-connections. The plan for the program shall be submitted to the state department of public health for review and approval. After the plan has been approved by the state department of health, the city shall implement the

program for removal of all existing cross-connections and prevention of all future cross-connections.

(j) *Corrections and protective devices.* Any user of city water shall obtain written approval from the city manager or his designee of any proposed corrective action or protective device before using or installing it. The total time allowed for completion of the necessary corrections shall be contingent upon the degree of hazard involved and include the time required to obtain and install equipment. If the cross-connection has not been removed within the time as hereinafter specified, the city shall physically separate the city water supply from the on-site piping system in such a manner that the two (2) systems cannot again be connected by any unauthorized person.

(k) *Piping identification.* When a secondary water source is used in addition to the city water supply, exposed city water and secondary water piping shall be identified by distinguishing colors or tags and so maintained
that each pipe may be traced readily in its entirety, it will be necessary to protect the city water supply at the service connection in a manner acceptable to the division of water.

(l) *Private water storage tanks.* A private water storage tank supplied from the city water supply system shall be deemed a secondary water supply unless it is designed and approved for potable water usage.

(m) *Penalty for violations.* Any person or customer found guilty of violating any of the provisions of this section, or any written order of the building official, his designate or the division of water in pursuance thereof, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not less than one hundred fifty dollars ($150.00), nor more than three hundred dollars ($300.00), or imprisonment of ninety (90) days, or both such fines for each violation. Each day upon which a violation of the provisions of this section shall occur shall be deemed a separate and additional violation for the purpose of this section. (Gen. Code 1946, Ch. 7, § 501.1; Code 1972, § 2.63; Ord. of 4-16-73; Ord. of 5-
31-77)

3.0 LOCAL CITY OF BENTON HARBOR

3.1 City of Benton Harbor

The City of Benton Harbor shall be the Authority and Administrator of the cross connection control program. This shall include, but not be limited to:

- Inspections
- Requirements/Recommendations
- Data Management
- Reporting to State
- Public Relations
- Notifications
- Re-inspections

3.2 Inspector/Designated Agent

The City of Benton Harbor or Designated Agent (Authority/Agent) conducting inspections on behalf of the City of Benton Harbor must be designated/approved by the City of Benton Harbor. The individuals/firm **must** meet one or more of the following qualifications:

(a) Be employed by a Utility, Water Purveyor, Building Department or body of jurisdiction and must meet the qualifications and training requirements as dictated by the Authority conducting inspections/surveys on behalf of the City of Benton Harbor
(b) Have held a similar position (CCC Inspector) with a previous municipality
(c) Meet American Society of Sanitary Engineer Standards (ASSE) 5020 and completed their Cross Connection Inspector Course (40 hours)
(d) Possess a certificate of completion from one of the following:
    - USC Cross Connection Control Specialist Course (40 hours)
    - TREEO Cross Connection Control Program Manager Course (40 hour)
(e) Other approved cross connection courses for surveying, approved by the Authority for conducting inspections/surveys on behalf of the City of Benton Harbor. Submission requirements for approvals include course outline, date of attendance, and outline of test questions, categories and grading criteria, and certificate of satisfactory completion. Course contact must be a minimum of 40 hours.

3.3 Other Applicable Laws

The Authority shall conduct this Cross Connection Control Program in accordance with the 2003 Michigan Plumbing Code, Michigan Department of Environmental Quality - Water Division, *Cross Connection Control Rules Manual*, Third Edition, MIOSHA Safety and Health Administration Sanitation Standard 4201, Michigan Food Service Sanitation Regulations, Local District/County Health Department Standards relating to cross connection control and any other applicable laws that affect public health protection through cross connection control.

4.0 INSPECTIONS

4.1 Rights of Inspection

Authorized employees/contractors, having proper identification, shall be permitted to enter the building/premises at reasonable times for the purpose of inspection for the presence or absence of cross connections, testing, repair and maintenance of any part of the plumbing system or any cross connection control device connected to the water system. The Authority shall deny or discontinue, after reasonable notice to the occupants, water service to any building/premises for refusal or failure to arrange for a cross connection inspection. The Authority shall deny or discontinue water service if there is reason to believe the building/premises pose a potential for danger to the public and/or occupants.

4.2 Responsibility of Owner

The Owner of the property shall be responsible for the protection of the public water supply from contamination due to backflow through the Owner's water service connection. The Authority may require Owners at their own expense to install, alter, replace, or repair any plumbing connected to the public water system that may pose a threat to public health. Failure, refusal or the inability on the part of the Owner to correct any deficiency or violation immediately shall be unlawful and the Authority may deny or discontinue water service to the building/premises.

4.3 Initial Inspections

Every facility connected to the public water system shall have the building/premises inspected by a Cross Connection Control Inspector for the water use practices at the building/premises to determine whether there are actual or potential cross connections to the plumbing system through which contaminants or pollutants could backflow into the plumbing system or the public water supply. This type of inspection must be done once every one (1) to five (5) years depending on the degree of hazard and recorded with the Authority.

4.4 Inspection Notification

A notification of an inspection will be made. The Inspection Notice will contain the following information; reason for inspection, inspection date and name and

telephone number of the cross connection control inspector. The Inspection Notice will be mailed to the facility to be inspected approximately 10 to 30 days before the scheduled inspection.

The building/premises or Authority/Agent can request a change in inspection date. However, the Authority/Agent still reserves the right to enter any building/premises unannounced for the sole purpose of surveying for cross connections. Refusal of entry by the building/premises constitutes a violation of this program and the Authority can enforce code actions or deny or discontinue water service as applicable.

4.5 Inspection Notice

4.6 Inspection Forms

An Inspection Form, Existing Devices Form and Requirements Form shall be used in every inspection, as required, and will be filed in a location as identified by the Authority/Agent along with other pertinent information accumulated.

4.7 Inspection Field Form

INSPECTION FORM

Facility

Address

City ST Zip

Main Contact *Phone*

Facility Type Inspection Date

Inspection Frequency yrs Completed? In Compliance?

Containment

	No. of Inlets	Protection Required	Properly Installed
Potable Supply			
Fire Supply			
Secondary Sources	Exist		

Isolation Hazards

	Exist	Qty	Prply Protd		Exist	Qty	Prply Protd
1. Lawn Sprinkler(s)				7.			
2. Boiler(s)				8.			
3. Cooling Tower(s)				9.			
4. Heat Exchanger(s)				10.			
5. Water Cooled A/C				11.			
6. Temporary Machines				12.			

Remarks

Inspector's Name

Inspector's Signature

Contact's Signature

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Cc:	Henderson, Shannon (EGLE)
Subject:	MI 0600 Benton Harbor MOR for March 2020
Date:	Monday, April 13, 2020 12:47:05 PM
Attachments:	MI 0600 Benton Harbor MOR for March 2020.pdf

This is the first full month of the new phosphate treatment for BH. On Page 6, it looks like the dosed amount around 3.2-3.3 mg/L is resulting in an average of around 2.5 mg/Lin distribution. (orthophosphate as PO4).

My thought is to open a discussion with O'Malley about how the treatment is going, in particular what the feed rate of the pump is at?

-Ernie

MI0600 Benton Harbor MOR for March 2020

MONTHLY OPERATION REPORT OF THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1

Signature of Operator-in-Charge

Month/Year **March-20** F1-S2

Water Plant Classification

Berrien County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1375	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	180.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.99	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.94	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.82%	Percent of Treated Water

Chemical Data

Chlorine on hand:	53530	lb.	Est. supply:	356	days
Primary Coagulant (Alum (Al3+)) on hand:	77444	lb.	Est. supply:	174	days
Cost of All Chemicals per Million Gallons:	$63.61	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **If yes,** attach specific filter(s) information and indicate required follow-up status.	NO
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **If yes,** indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	NO
Did POE disinfectant residual fall below 0.2 ppm during the month? **If yes,** indicate date(s) and duration on a separate sheet.	NO
Was minimum C*T credit achieved for the entire month? **If no,** indicate on a separate sheet the date(s) not achieved.	YES
Was continuous POE chlorine residual monitoring equipment off-line during the month? **If yes,** indicate date(s) and duration on a separate sheet.	NO

Distribution	Total	37.3951	Avg	1.2459774	Max	1.4139	Min	0.997

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **March-20**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.37	0.27	0.76		0	0.00	184	2.97	16	0.26	200	2.43	0.63	1.64	1.80
2	0.52	0.33	0.83		0	0.00	231	3.14	20	0.27	251	2.72	1.02	1.56	1.70
3	0.40	0.34	0.82		0	0.00	238	3.84	17	0.27	255	2.81	1.01	1.63	1.80
4	0.50	0.29	0.77	0.80	0	0.00	227	3.11	21	0.29	248	2.71	0.68	1.83	2.03
5	0.51	0.40	0.87		0	0.00	198	3.09	13	0.20	211	2.91	1.10	1.63	1.81
6	0.55	0.36	0.83		0	0.00	206	3.06	98	1.46	304	3.71	1.48	2.06	2.23
7	0.72	0.22	0.76		0	0.00	213	3.08	27	0.39	240	2.91	0.87	1.76	2.04
8	0.50	0.19	0.87		0	0.00	214	3.07	24	0.34	238	2.73	0.77	1.76	1.96
9	0.55	0.33	0.90		0	0.00	201	3.20	19	0.30	220	2.42	0.64	1.61	1.78
10	0.52	0.33	0.90		0	0.00	218	3.08	18	0.25	236	2.65	0.98	1.50	1.67
11	0.53	0.37	0.85	0.78	0	0.00	206	2.91	22	0.31	228	2.68	1.00	1.52	1.68
12	0.58	0.35	0.83		0	0.00	188	3.03	20	0.32	208	2.31	0.47	1.68	1.84
13	0.47	0.44	0.89		0	0.00	207	2.91	21	0.30	228	2.42	0.69	1.56	1.73
14	0.51	0.41	0.85		0	0.00	181	2.84	20	0.31	201	2.39	0.66	1.57	1.73
15	0.51	0.28	0.76		0	0.00	201	2.78	23	0.32	224	2.37	0.62	1.59	1.75
16	0.52	0.37	0.71		0	0.00	214	3.00	39	0.55	253	2.93	0.95	1.83	1.98
17	0.54	0.41	0.88		0	0.00	211	3.01	31	0.44	242	2.81	1.03	1.64	1.78
18	0.48	0.52	0.90		0	0.00	192	3.08	28	0.45	220	2.57	0.68	1.73	1.89
19	0.61	0.34	0.87	0.83	0	0.00	166	2.72	22	0.36	188	2.07	0.12	1.75	1.95
20	0.49	0.39	0.85		0	0.00	182	2.70	21	0.31	203	2.41	0.37	1.67	2.04
21	0.47	0.30	0.91		0	0.00	204	2.75	27	0.36	231	3.03	1.04	1.79	1.99
22	0.55	0.38	0.94		0	0.00	214	2.81	35	0.46	249	2.94	0.96	1.79	1.98
23	0.48	0.26	0.97		0	0.00	161	2.84	28	0.49	189	2.38	0.42	1.78	1.96
24	0.50	0.36	0.87		0	0.00	206	2.78	33	0.44	239	2.71	0.90	1.61	1.81
25	0.55	0.31	0.98		0	0.00	177	2.82	27	0.43	204	2.70	0.63	1.91	2.07
26	0.52	0.32	0.75		0	0.00	173	2.80	24	0.39	197	2.58	0.70	1.64	1.88
27	0.47	0.27	0.81		0	0.00	179	2.80	25	0.39	204	2.67	0.81	1.64	1.86
28	0.51	0.43	0.92		0	0.00	189	2.99	29	0.46	218	3.01	1.47	1.41	1.54
29	0.61	0.35	0.91		0	0.00	156	2.96	21	0.40	177	2.65	1.04	1.45	1.61
30	0.51	0.32	0.85		0	0.00	189	3.08	26	0.42	215	3.09	1.49	1.45	1.60
31	0.48	0.24	0.85		0	0.00	195	3.22	29	0.48	224	2.81	1.07	1.58	1.74
Tot.							5,937		808		6,945				
Avg.	0.52	0.34	0.85	0.80	0.00	0.00	197.53	2.97	26.50	0.40	224.03	2.69	0.84	1.67	1.85
Max	0.72	0.52	0.98	0.83	0.00	0.00	238.00	3.84	98.00	1.46	304.00	3.71	1.49	2.06	2.23
Min.	0.37	0.19	0.71	0.78	0.00	0.00	156.00	2.70	13.00	0.20	177.00	2.07	0.12	1.41	1.54

WSSN 0600 City of Benton Harbor Month/Year March-20

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.9250	284.00	1.62	16.30	25.40	3.10	3	0.10	0.11	3	0.08	0.09	6	0	0
2	1.0975	336.00	1.61	11.40	20.10	2.80	3	0.10	0.11	3	0.08	0.09	6	0	0
3	0.9250	301.00	1.71	10.00	18.00	2.40	3	0.10	0.12	3	0.07	0.08	6	0	0
4	1.0900	363.00	1.75	6.80	10.70	1.50	3	0.08	0.09	3	0.06	0.06	6	0	0
5	0.9575	325.00	1.79	5.00	5.70	1.90	3	0.10	0.12	3	0.09	0.09	6	0	0
6	1.0050	312.00	1.70	10.00	11.70	1.70	3	0.09	0.10	3	0.07	0.07	6	0	0
7	1.0325	325.00	1.66	21.20	24.50	3.30	3	0.10	0.11	3	0.09	0.10	6	0	0
8	1.0400	339.00	1.71	14.20	18.20	3.20	3	0.08	0.09	3	0.08	0.09	6	0	0
9	0.9375	287.00	1.61	16.80	21.30	3.10	3	0.12	0.13	3	0.08	0.09	6	0	0
10	1.0550	346.00	1.73	17.10	20.60	2.50	3	0.08	0.11	3	0.08	0.09	6	0	0
11	1.0550	330.00	1.65	16.20	22.70	2.10	3	0.07	0.08	3	0.08	0.10	6	0	0
12	0.9275	291.00	1.65	14.20	26.20	1.90	3	0.08	0.09	3	0.07	0.08	6	0	0
13	1.0625	318.00	1.57	11.60	15.50	1.70	3	0.11	0.15	3	0.08	0.10	6	0	0
14	0.9500	303.00	1.68	10.00	16.60	1.60	3	0.06	0.07	3	0.09	0.09	6	0	0
15	1.0775	343.00	1.67	10.10	14.50	1.60	3	0.07	0.08	3	0.07	0.08	6	0	0
16	1.0650	338.00	1.67	8.90	11.30	1.50	3	0.07	0.08	3	0.10	0.11	6	0	0
17	1.0475	358.00	1.80	6.80	10.00	1.40	3	0.08	0.09	3	0.08	0.08	6	0	0
18	0.9300	293.00	1.66	7.90	13.30	1.60	3	0.09	0.10	3	0.12	0.13	6	0	0
19	0.9125	280.00	1.61	10.50	21.90	1.60	3	0.08	0.10	3	0.12	0.16	6	0	0
20	1.0075	301.00	1.57	6.70	8.50	1.50	3	0.08	0.08	3	0.08	0.09	6	0	0
21	1.1075	331.00	1.57	12.00	12.80	1.80	3	0.07	0.08	3	0.12	0.18	6	0	0
22	1.1375	352.00	1.63	10.90	12.20	2.10	3	0.07	0.08	3	0.16	0.18	6	0	0
23	0.8475	262.00	1.63	10.00	13.90	1.80	3	0.07	0.09	3	0.13	0.15	6	0	0
24	1.1075	341.00	1.62	6.70	7.30	1.40	3	0.08	0.09	3	0.18	0.19	6	0	0
25	0.9375	288.00	1.62	6.80	9.20	1.40	3	0.08	0.09	3	0.16	0.17	6	0	0
26	0.9225	280.00	1.62	4.90	5.90	1.40	3	0.08	0.08	3	0.15	0.16	6	0	0
27	0.9550	285.00	1.57	5.50	6.70	1.30	3	0.08	0.10	3	0.15	0.16	6	0	0
28	0.9450	275.00	1.53	6.50	11.10	1.40	3	0.10	0.13	3	0.13	0.16	6	0	0
29	0.7875	228.00	1.52	11.50	17.40	1.40	3	0.12	0.14	3	0.12	0.15	6	0	0
30	0.9175	269.00	1.54	13.50	19.20	1.70	3	0.10	0.12	3	0.14	0.17	6	0	0
31	0.9050	279.00	1.62	10.10	17.20	1.40	3	0.08	0.09	3	0.13	0.16	6	0	0
Total	30.6700	9563.00					93			93			186	0	0
Avg.	0.9894	308.48	1.64	10.65	15.15	1.91		0.09	0.10		0.10		Total	Total	Total
Max	1.1375	363.00	1.80	21.20	26.20	3.30		0.12	0.15		0.18	0.19	6	0	0
Min.	0.7875	228.00	1.52	4.90	5.70	1.30		0.06	0.07		0.06				

WSSN 0600 MONTH/YEAR March-20 PAGE 4

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness		Total Alkalinity		Non-Carb. Hardness							
D	pH		as CaCO3		as CaCO3		as CaCO3		Calcium as Ca++		Magnesium as Mg++		Chloride as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	7.9	206	162	142	116	64	46	54	42	17	14		
2	8.1	8.0	198	184	153	120	45	64	44	46	21	17		
3	8.0	7.9	194	180	141	130	53	50	46	43	19	17	22.0	26.5
4	8.1	8.0	158	168	130	121	28	47	45	45	11	14		
5	8.0	8.0	188	180	139	126	49	54	46	51	18	13		
6	8.1	8.0	180	176	134	122	46	54	44	46	17	15		
7	8.1	8.1	152	158	123	125	29	33	43	46	11	10		
8	8.3	7.9	176	166	143	121	33	45	55	49	9	11		
9	8.1	8.2	192	184	138	121	54	63	51	46	16	17		
10	8.0	8.0	184	196	119	128	65	68	46	51	17	17	19.5	23.5
11	7.9	8.0	196	170	156	122	40	48	41	45	23	14		
12	8.1	8.1	194	176	137	117	57	59	46	46	19	15		
13	8.1	8.1	180	172	126	117	54	55	45	46	17	14		
14	8.1	8.1	180	170	129	120	51	50	48	46	15	14		
15	8.0	8.0	182	172	124	117	58	55	46	45	16	15		
16	8.2	7.9	146	154	116	121	30	33	43	47	9	9	21.0	22.5
17	8.2	8.1	164	158	133	117	31	41	49	51	10	7		
18	8.0	8.0	190	172	130	113	60	59	48	45	17	15		
19	8.0	8.1	178	170	127	118	51	52	46	42	16	16		
20	8.3	8.3	178	166	138	121	40	45	52	46	12	12		
21	8.1	8.3	146	156	119	121	27	35	46	53	7	6		
22	8.1	8.0	178	166	141	123	37	43	58	57	8	6		
23	8.1	8.1	168	162	130	121	38	41	46	45	13	12	22.0	23.0
24	8.2	8.2	148	170	115	119	33	51	44	55	9	8		
25	8.1	8.1	148	150	109	123	39	27	42	46	11	9		
26	8.3	8.2	180	156	147	114	33	42	58	51	9	7		
27	8.2	8.2	176	154	147	122	29	32	52	46	11	9		
28	8.1	8.1	182	172	134	124	48	48	44	42	17	16		
29	8.1	8.0	196	188	132	124	64	64	49	46	18	17		
30	8.1	8.0	196	184	132	123	64	61	49	46	18	17	21.5	24.5
31	8.0	8.1	196	180	144	125	52	55	48	46	18	16		
Avg.	8.1	8.1	177.8	169.7	132.8	120.9	45.0	48.8	47.5	47.0	14.4	12.8	21.2	24.0
Max	8.3	8.3	206.0	196.0	156.0	130.0	65.0	68.0	58.0	57.0	23.0	17.0	22.0	26.5
Min.	7.9	7.9	146.0	150.0	109.0	113.0	27.0	27.0	41.0	42.0	7.0	6.0	19.5	22.5

WSSN 0600 MONTH/YEAR March-20 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1		0	1	A	108	0	2	2.5	0.9436	83	3.46	2.74
2		0	1	A	77	0	2	2.5	1.0651	87	3.25	2.95
3		0	1	A	98	0	3	2.5	1.0201	46	1.78	2.47
4	2.06	City Hall	1	A	46	1	3	4.0	1.0256	96	3.70	3.06
4	1.29	Wolfs	1	A	29	0	3	3.0	0.9190	90	3.89	2.99
4	1.58	Bait Shed	1	A	49	1	3	3.5	0.9945	84	3.35	3.01
4	2.72	Sunny Spot	1	A	93	0	3	5.0	0.9846	67	2.70	3.08
4	2.46	B & Z	1	A	91	0	4	5.0	0.9499	84	3.49	3.09
9		0	1	A	82	0	5	3.5	1.0003	82	3.24	2.99
10		0	1	A	87	0	4	5.0	1.0048	82	3.23	3.05
11	2.90	City Hall	1	A	127	0	4	5.5	0.9446	100	4.21	3.00
11	2.89	Wolfs	1	A	78	0	4	4.5	1.0273	92	3.54	2.82
11	2.82	Bait Shed	1	A	91	0	4	5.0	1.0761	86	3.17	3.23
11	2.85	Sunny Spot	1	A	88	0	4	5.1	0.9306	97	4.14	3.19
11	2.43	B & Z	1	A	78	0	4	4.5	1.0662	64	2.36	0.59
16		0	1	A	16	0	4	6.0	0.9614	71	2.92	3.02
17		0	1	A	31	0	5	5.0	1.0010	92	3.62	2.94
18		0	1	A	32	0	5	4.5	0.9713	83	3.37	2.83
19	2.72	City Hall	1	A	46	0	4	4.5	1.0271	85	3.27	2.81
19	2.81	Wolfs	1	A	58	0	5	7.0	0.9800	89	3.59	2.89
19	2.54	Bait Shed	1	A	27	0	4	6.0	0.8992	63	2.76	3.03
19	2.60	Sunny Spot	1	A	32	0	5	6.0	0.9842	62	2.48	2.85
19	2.25	B & Z	1	A	47	0	5	6.0	0.8789	83	3.74	2.98
24		0	1	A	16	0	5	6.0	1.0177	80	3.09	3.18
25		0	1	A	38	0	5	6.0	0.8329	91	4.33	3.23
26		0	1	A	58	1	6	6.0	0.8512	99	4.60	3.12
27		0	1	A	15	1	6.0	7.0	0.9134	81	3.51	3.08
28		0	1	A	123	0	9.0	12.0	0.8263	57	2.72	3.08
29		0	1	A	44	0	8.7	8.5	0.7592	82	4.29	2.94
30		0	1	A	149	1	8.5	9.5	0.8649	74	3.40	3.08
31		0	1	A	84	0	6.3	6.5	0.9270	71	3.01	3.17
Totals									29.6479	2501.2		
AVG.	2.46		1	A	64	0	5	6	0.9564	80.7	3.36	2.93
Max	2.90				149	1	9	12	1.0761	100.4	4.60	3.23
Min	1.29				15	0	2	3	0.7592	45.8	1.78	0.59

MI 0600 Distribution Monitoring Report MI 0600 DMR

DISTRIBUTION SYSTEM MONITORING WSSN 0600 March-20

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4	1.44		1.40	1.19	1.30		1.14			
5										
6										
7										
8										
9										
10										
11	1.21		1.20	1.36	1.59		1.36			
12										
13										
14										
15										
16										
17										
18										
19	0.79		1.01	1.49	1.49		1.01			
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.27	1.59	0.79
Total number of check samples	0600			
Total number of positive check samples	0600			

From:	Mike O"Malley
To:	EGLE-DWEH-Grand-Rapids; EGLE-DWEH-Kalamazoo
Cc:	Mike OMalley; Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject:	MI 0600 Benton Harbor SDS for new Corrosion Treatment
Date:	Tuesday, March 3, 2020 1:29:32 PM
Attachments:	MI 0600 Benton Harbor SDS new Corrosion Treatment Chemical.pdf

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Please see attached: *MI 0600 Benton Harbor SDS new Corrosion Treatment Chemical.pdf*

Thank you,

Mike O'Malley
Benton Harbor Water Operator IN Charge

SAFETY DATA SHEET

BH 1 from Carus Corporation

MI 0600 Benton Harbor new corrosion treatment

Sold to BH by Elhorn Engineering

Started change Friday 2/21/20

1. Identification

Product identifier	**Aquadene® SK-7661**
Other means of identification	
SDS number	-
Recommended use	Aquadene® SK-7661 s an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems.
Recommended restrictions	None known.

Note: SG Product 1.35

Strength @ 32%

Manufacturer / Importer / Supplier / Distributor information

Company name	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixtures	
Composition comments	The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling	Avoid inhalation and contact with skin and eyes. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate.
Individual protection measures, such as personal protective equipment	
Eye/face protection	If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.
Form	Liquid.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	1% solution = 5.4±0.5
Melting point/freezing point	Not available.

Initial boiling point and boiling range	213.8 °F (101 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1.35±0.03 at 25°C
Solubility(ies)	
Solubility (water)	Completely soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

BH3

1.35 × 8.34 = 11.259 #/gal

32% Strength = 3.603 #/gal OPP

OR

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization will not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure	
Ingestion	May cause discomfort if swallowed.
Inhalation	In high concentrations, vapors may be irritating to the respiratory system.
Skin contact	Prolonged or repeated skin contact may cause irritation.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
Information on toxicological effects	
Acute toxicity	May cause discomfort if swallowed.
Skin corrosion/irritation	Prolonged contact may cause dryness of the skin.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	No data available.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Reproductive toxicity	No data available.
Specific target organ toxicity - single exposure	No data available.

BH 4

Specific target organ toxicity - repeated exposure	No data available.
Aspiration hazard	Not classified.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	The product is not expected to be readily biodegradable.
Bioaccumulative potential	No data available for this product.
Mobility in soil	Not available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

15. Regulatory information

US federal regulations

This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.

BH 5

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-March-2014

Revision date -

Version # 01

NFPA Ratings

References HSDB® - Hazardous Substances Data Bank

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Aquadene® is a registered trademark of Carus Corporation.

From:	Mike O"Malley
To:	EGLE-DWEH-Grand-Rapids; EGLE-DWEH-Kalamazoo; Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Cc:	Mike OMalley
Subject:	MI 0600 Benton Harbor Water Quality Parameters June 2019
Date:	Friday, July 5, 2019 4:34:39 PM
Attachments:	MI 0600 Benton Harbor WQP Results June 2019.xlsx

---

Attached please find: *MI 0600 Benton Harbor WQP Results June 2019.xlsx*

Ernie and Brandon,

I left this in excel for you to play with.

I compared Feb's to June's WQP and I have noticed a difference in the Langlier's Index. After all: Feb was before OPP installation March 26. Obviously it has made some impact in June.

Mike O'Malley
Benton Harbor Water Supt.

If you want, I can show you some comparisons.

Benton Harbor Water System
Water Quality Parameter Testing

MI 0600 Benton Harbor WQP

Date	6/27/2019
Field Analyst	Denny Edwards
Laboratory Analyst	Denny and Doug

WSSN #0600 Benton Harbor Water Department

Site	Field Date and Time	Field Temp C	Calc Temp F	Field pH	Laboratory Chloride	Laboratory Sulfate	Field Conductivity	Field TDS	Laboratory Calcium	Calc CSMR	Laboratory TA	Calc LSI MO	Calc LSI AWWA
Raw	7.3.19 - 1:55 pm	16.6	61.9	7.7	19	18	372	264	37	1.056	108		-0.68
Tap	7.13.19- 1:59 pm	16.7	62.1	7.1	23	19	388	275	36	1.211	102		-1.32
Abonmarche	7.13.19- 11:05 am	20.7	69.3	8.1	21	31	428	281	51	0.677	101		-0.09
Cornerstone	7.13.19-10:30 am	23.9	75.0	8.2	21.5	26	393	280	49	0.827	102		0.06
BP Station Main and Fair	7.13.19- 11:35	24.4	75.9	8.4	22	24	393	276	45	0.917	103		0.23
May Street Service	7.13.19- 12:16	21.2	70.2	8	21.5	25	387	278	42	0.860	102		-0.26
City Hall	7.13.19-10:15 am	23.2	73.8	8.3	22	26	380	280	38	0.846	101		0.03
Villa Environmental	7.13.19- 11:26 am	23.8	74.8	8.1	22.5	27	391	279	41	0.833	102		-0.12
Babes Lounge	7.13.19- 11:15 am	21.9	71.4	8.1	22	28	391	280	38	0.786	101		-0.20
Sunny Spot	7.13.19- 11:56 am	21	69.8	8	21.5	26	399	284	39	0.827	102		-0.30
Blue Water Thermal	7.13.19- 11:50	28.1	82.6	8	21.5	26	401	281	41	0.827	101		0.03
B&Z Construction	7.13.19- 12:05	22.1	71.8	8.1	21	24	392	276	39	0.875	102		-0.18

From: Sarkipato, Ernest (EGLE)
To: David A. Cornwell; Onan, Brandon (EGLE)
Cc: Thurston, Brian (EGLE); Bolf, Michael (EGLE)
Subject: Meeting to discuss corrosion treatment
Attachments: image001.jpg
image002.jpg
image003.jpg
image002.jpg

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Join Skype Meeting <https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmeet.lync.com%2Fstateofmichigan-michigan%2Fsarkipatoe%2FRQGLW84S&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961596244&sdata=XGkgXtZ7EaQ%2BH%2BckPZudIIIwmA%2Bi1hAfN0uif1Q0Eyo%3D&reserved=0>

Trouble Joining? Try Skype Web App <https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmeet.lync.com%2Fstateofmichigan-michigan%2Fsarkipatoe%2FRQGLW84S%3Fsl%3D1&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961606198&sdata=%2FeV6kSjDLxseWMsU4C5KTeEfwQMwgBqg12lb9jGhRBg%3D&reserved=0>

Join by phone

Toll number: +1 (248) 509-0316,,191240683# (Dial-in Number) English (United States)

Find a local number <https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdialin.lync.com%2F95e14c4b-c14d-430f-a556-75831bdf5dbf%3Fsl%3D191240683&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961606198&sdata=uCXMi%2F15XHKKIbUUPgmzjGqSsqmS0l%2Bk9309v6KRfOQ%3D&reserved=0>

Conference ID: 191240683

Forgot your dial-in PIN? <https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmysettings.lync.com%2Fpstnconferencing&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961616179&sdata=lX%2ByKiOQSrBysck3Sle%2BzwqS5tVHuUvL27bK45wOv6w%3D&reserved=0> |Help <https://gcc01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fgo.microsoft.com%2Ffwlink%2F%3FLinkId%3D389737&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961616179&sdata=6fc%2BynuzUCpjAPu9uK0le1R3ovfeKkt0Q1WybehiXjI%3D&reserved=0>

[!OC([1033)!]

.....

Sorry, the conference line is taken!!!!!!!!!

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater <https://gcc01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961616179&sdata=P4lN6zvVZtVIKpTnyrfs9rNg3nFk5RszPklu%2BDFN9KM%3D&reserved=0>

_____

From: David A. Cornwell <DCornwell@cornwellinc.com <mailto:DCornwell@cornwellinc.com> >
Sent: Friday, February 28, 2020 3:18 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >; Onan, Brandon (EGLE) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Subject: RE: Meeting to discuss corrosion treatment

Just making sure Eric is ok with me getting involved. It was he and I and Brandon that first discussed switching Benton Harbor. Its important to keep in mind I haven't seen any of their water chemistry.

I could do 9 am the 5th or later but not 10 am.

I can do 2:30 the 6th

Dave

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >
Sent: Friday, February 28, 2020 3:05 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >; David A. Cornwell <DCornwell@cornwellinc.com <mailto:DCornwell@cornwellinc.com> >
Subject: RE: Meeting to discuss corrosion treatment

Good afternoon Mr. Cornwell,

I wanted to reach out to you to inquire about scheduling a phone conversation with you and the City of Benton Harbor officials regarding their corrosion control treatment. They have been struggling to reduce lead numbers using a 70/30 poly/ortho blend, and we recently designated a chemical composition and treatment target for them. They would like some more discussion regarding that decision, and your name was brought up as an expert in the field. I know you have talked with Brandon Onan in the past, so he will reach out to you to fill you in.

Would you be available either of the following for a phone call with the city officials?

3/5/2020-10:00AM

3/6/2020-02:30PM

Thank you in advance,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

From: Onan, Brandon (EGLE) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Sent: Friday, February 28, 2020 2:20 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >
Subject: RE: Meeting to discuss corrosion treatment

Hey,

Just call me Monday. Not sure if this is an action item for me or the city…If you are speaking of Cornwell as the "national expert" I have to know ASAP so that I can get his availability.

Brandon Onan, P.E.

Lead and Copper Unit Supervisor

Drinking Water & Environmental Health Division

Michigan Department of Environment, Great Lakes, and Energy

(p) 616.307.6736

onanb@michigan.gov <mailto:onanb@michigan.gov>

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >
Sent: Friday, February 28, 2020 1:56 PM
To: rrice@cityofbentonharbormi.gov <mailto:rrice@cityofbentonharbormi.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >; momalley@cityofbentonharbormi.gov <mailto:momalley@cityofbentonharbormi.gov> ; Ellis Mitchell <emitchell@cityofbentonharbormi.gov <mailto:emitchell@cityofbentonharbormi.gov> >; Bolf, Michael (EGLE) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >
Subject: Meeting to discuss corrosion treatment

Good afternoon Ms. Rice,

Please consider the following appointments for a phone conversation with City Manager Mitchell regarding the new corrosion treatment in Benton Harbor. We will be looking to invite a national expert in corrosion control treatment, so please indicate which options are available and we will try to coordinate schedules.

3/3/2020 11:00AM

1:30PM

3:00PM

3/5/2020 10:00AM

1:30PM

3:00PM

3/6/2020 2:30PM

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater <https://gcc01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CTHURSTONB%40michigan.gov%7C453b804688bd491cae3308d7c0774f02%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637189490961626130&sdata=JpJROZDEkp0THp2JPvJP2oDZbjiN2usdLYEx6TARkAM%3D&reserved=0>

From: Oswald, Eric (EGLE)
To: McDonald, Paul (EGLE)
Cc: Ruch, Suzann (EGLE); Krisztian, George (EGLE)
Subject: Meeting
Date: Monday, February 3, 2020 3:54:13 PM

Paul, George and I would like to sit down with you and talk in very general terms about how we can use some of the $120 million supplemental.
We have some issues in Benton Harbor and would like to fast track money to them for a technical, managerial and financial study and a corrosion control study.
Eric

From: Sarkipato, Ernest (DEQ)
To: Bolf, Michael (EGLE)
Subject: My schedule
Date: Wednesday, February 20, 2019 8:52:14 AM

Hi Mike, the next two days I'm heading down to Berrien County for field work. I am justifying an overnight due to the number of meetings and travel time, and my current AL situation. Let me know if you think that will be an issue.

Thursday
8:30AM - South Haven discussion on Capacity Plan for new authority
10AM - Benton Harbor WTP meeting with contractors for phosphate project
1:30PM - Routine visit with Lake Township

Friday
8:00AM - New Buffalo meeting to discuss interconnect with neighboring water supply
10:30AM - Bridgman, need to push getting floc drives fixed (haven't worked in years)
1:30PM - Michiana meeting to discuss chloramine conversion project

Ernie Sarkipato, P.E.
Drinking Water and Municipal Assistance Division
Michigan Dept. of Environmental Quality
616-307-0261 (cell)

From: Jackson, Heather (EGLE)
To: Sarkipato, Ernest (EGLE)
Subject: Original Benton Harbor CCT plan
Date: Friday, March 12, 2021 2:46:40 PM
Attachments: image001.png

Hey Ernie,

Do you by chance have the original email from Elhorn for the Benton Harbor chemical/corrosion control plan? I want to make sure that date gets into SDWIS. If you could forward it to me, that would be great!

Thanks,

Heather Jackson, MPH
Environmental Quality Analyst – Lead and Copper Unit
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-3997 | JacksonH@Michigan.gov

From:	Thurston, Brian (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Sarkipato, Ernest (EGLE); London, Bob (EGLE); Bolf, Michael (EGLE)
Subject:	PRT Review for Benton Harbor Phosphate Treatment
Date:	Wednesday, December 4, 2019 2:00:06 PM
Attachments:	RE Benton Harbor Phosphate Addition.msg

Brandon,

During our phone call earlier today, I was looking for the PRT file folder on this review and was unable to find a folder. I did find the attached e-mail string in my inbox. I am sure you may have more information. Could you create a folder under PRT and place in relevant notes and supporting materials. Also based on the continued Pb ALE we may want to re-open this review with recent LCR data and WQP data since the treatment was started.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,

Brian E. Thurston, P.E.
Field Operations Section Manager
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
231-590-3430 | thurstonb@michigan.gov

Follow Us | **Michigan.gov/EGLE**

From: Bolf, Michael (EGLE) []
To: London, Bob (EGLE) [LONDONR@michigan.gov]; Onan, Brandon (EGLE) [OnanB@michigan.gov]
CC: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]
Subject: RE: Benton Harbor Phosphate Addition
Sent: Friday, February 22, 2019 10:59:23

Yes, check calanders.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

-----Original Message-----
From: London, Bob (DEQ) <LONDONR@michigan.gov>
Sent: Friday, February 22, 2019 9:52 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition

I'm available between noon and 2:15 today

Sent from my iPhone

> On Feb 22, 2019, at 8:30 AM, Onan, Brandon (DEQ) <OnanB@michigan.gov> wrote:
>
> I think we need to get on the phone and discuss this. We should only need about 10 minutes. Is there a time we can make this happen?
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov
>
> -----Original Message-----
> From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> Sent: Thursday, February 21, 2019 5:13 PM
> To: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
> Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ)
> <BOLFM@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
> Subject: Re: Benton Harbor Phosphate Addition
>
> I appreciate the PRT input and will continue to wait for consensus. FYI, the recommendation from Elhorn was for 1.5 mg/L as total PO4, which was discussed with them in a meeting. I recall their concerns being the poly portion of the blend may be too high and counterproductive above this amount. I wonder if Mike Enlow would provide supporting science for this!?
>
> Have other recent proposals been for 100% ortho, as opposed to a blended product? This could explain

the different approach.
>
> One more comment, I believe the coupon test to follow would then quantify lead release at different dosages, resulting in the optimal designation by DEQ.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> DEQ-Drinking Water and Municipal Assistance Division
> 616-307-0261
>
> On Feb 21, 2019, at 4:47 PM, Thurston, Brian (DEQ) <THURSTONB@michigan.gov> wrote:
>
> As far as I can tell the proposal is for approximately 1.05 ppm PO4 as Orthophosphate to address a city with Pb service lines and known Pb ALE. We have seen through recent sequential service line sampling that the city has a significant Pb issue. In my opinion this proposed treatment is not in line with other recent OCCT proposals of 3.1 ppm as Orthophosphate for a community with known Pb service lines and Pb ALE.
>
> The issue discussed below shows the proposed chemical feed cannot feed the proposed dose at all plant flow conditions. It appears the pump is undersized. This needs to be addressed in the permit. What about a two pump system?
>
> The attached permit submittal does not show how the consultant is planning to reach OCCT. In my opinion, a higher initial dose of Orthophosphate is need to quickly establish a protective film in the Pb service lines. I do not support the proposal as submitted. Maybe additional documentation has been submitted and not included in this permit package that addresses my concerns.
>
> If you should have any questions with this e-mail please contact me to discuss.
>
> Sincerely,
> Brian E. Thurston, P.E., Community Water Supply Section Manager
> (Acting) Drinking Water & Municipal Assistance Division Michigan
> Department of Environmental Quality
> E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
> Direct: (231) 590-3430
> Fax (231) 775-4050
>
> Cadillac District Office
> 120 W. Chapin Street
> Cadillac, Michigan 49601
> [DEQ]
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> deq&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314cf2ca9008d6
> 98d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C6368644389626216
> 74&sdata=%2FKjoF%2FOQM%2FAcT0wVC3IZ2D%2Fxdzh8TMoWZlzgwd9ozHU%3D&am
> p;reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3
> A%2F%2Fwww.michigan.gov%2Fdeq&data=02%7C01%7CBOLFM%40michigan.gov%
> 7Cc5482ec4b0314cf2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%
> 7C0%7C0%7C636864438962621674&sdata=3F%2FKOtdZLITv3WhvGawt%2F0ombiS
> SDm1VmuokMyd%2BD54%3D&reserved=0>
>
> From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
> Sent: Thursday, February 21, 2019 3:14 PM
> To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov>
> Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> Subject: RE: Benton Harbor Phosphate Addition
>

> Brandon,
>
> I agree with your explanation and have no further concerns. As long as the permit or the AL exceedance communication spells out the WQP monitoring requirements, I think this permit can be issued. I suspect OCCT ranges will be set subsequently once we have monitoring data available after the phosphate has been in use for a while.
>
> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
>
> From: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Sent: Thursday, February 14, 2019 2:20 PM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> Do either of you have any further comments or discussion points on this permit review? I would like to get back with Ernie on this as he is trying to move the project forward.
>
> Thanks,
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Onan, Brandon (DEQ)
> Sent: Thursday, February 7, 2019 11:38 AM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.
>
> I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.
>
> I'm calculating it in the following manor: [(ppm PO4
> total)*(MGD*8.34)]/[0.33*11.4] = gpd of product
>
> The following table is setup the same as the one on page 12 utilizing
> the equation above
>
>
> MGD
>
> ppm PO4 total
>

> 2
>
> 3
>
> 5
>
> 8
>
> 1
>
> 4.4
>
> 6.7
>
> 11.1
>
> 17.7
>
> 2
>
> 8.9
>
> 13.3
>
> 22.2
>
> 35.5
>
> 3
>
> 13.3
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> 20.0
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> 33.3
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> 53.2
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>

> Based off this I think the pump selection still holds for up to 5 MGD
> but will be inadequate for 8 MGD
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Sent: Thursday, February 7, 2019 10:00 AM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> Brandon,
>
> I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.
>
> Can you shine some light on this?
>
> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
>
> From: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Sent: Tuesday, February 05, 2019 8:34 AM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: FW: Benton Harbor Phosphate Addition
> Importance: High
>
> Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.
>
> Thanks,
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Sarkipato, Ernest (DEQ)
> <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
> Sent: Monday, February 4, 2019 1:53 PM

> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Cc: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division Department of
> Environmental Quality
> 616-307-0261 mobile
>
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
> f2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864
> 438962621674&sdata=y0mwuE0jbu7rGsDCinTN36cCo0Ka%2BPkOcMbusTrrSlo%3
> D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=ht
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> a892ef47225d1%7C0%7C0%7C636864438962631682&sdata=Km17xBxS5WOzGa36r
> aoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> From: Sarkipato, Ernest (DEQ)
> Sent: Friday, January 25, 2019 3:22 PM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Cc: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Subject: PRT: Benton Harbor Phosphate Addition
>
> Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.
>
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division Department of
> Environmental Quality
> 616-307-0261 mobile
>
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
> f2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864
> 438962631682&sdata=pLOJu2T%2Bx7SSl%2BXdJW6glwy85wg62W3zmD%2BLCdG30
> ZQ%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?ur
> l=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CBOL
> FM%40michigan.gov%7Cc5482ec4b0314cf2ca9008d698d53dec%7Cd5fb7087377742a
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> a36raoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> <bh phosphate application 1_24_19.pdf> <image003.png>

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Thurston, Brian (EGLE); London, Bob (EGLE); Bolf, Michael (EGLE)
Subject:	PRT review for BH phosphate
Date:	Wednesday, December 4, 2019 2:12:23 PM
Attachments:	RE Benton Harbor Phosphate Addition.msg Benton Harbor Permit for CCT.msg RE Benton Harbor Phosphate Addition.msg Corrosion Inhibitor Permit.msg Corrosion Plan update and miscellaneous.msg

---

Attached are emails pertaining to the PRT review, then subsequent discussions about the corrosion study.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Onan, Brandon (EGLE) []
To: Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]
CC:
Subject: RE: Benton Harbor Phosphate Addition
Sent: Thursday, February 07, 2019 12:38:24

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

MGD

ppm PO4 total

2

3

5

8

1

4.4

6.7

11.1

17.7

2

8.9

13.3

22.2

35.5

3

13.3

20.0

33.3

53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

(p) 616.307.6736

<mailto:onanb@michigan.gov> onanb@michigan.gov

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>

Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.

Can you shine some light on this?

Michael Bolf, P.E.

Engineering Unit Supervisor

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Sent: Tuesday, February 05, 2019 8:34 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >; Thurston, Brian (DEQ) <THURSTONB@michigan.gov <mailto:THURSTONB@michigan.gov> >
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

(p) 616.307.6736

<mailto:onanb@michigan.gov> onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7COnanB%40michigan.gov%7C638fdccdaab84eb68e4f08d68d0cfbb0%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636851484227380656&sdata=tBgaPt3Euv3p5Lm%2FZjNF5SdMV3Dwfk8oTIzt3CdBoWA%3D&reserved=0>
www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7COnanB%40michigan.gov%7C638fdccdaab84eb68e4f08d68d0cfbb0%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636851484227390664&sdata=3tUYjd4mf65T%2FumhiMFohOR7%2F%2BfjGezWBUNJAu8g80U%3D&reserved=0>
www.michigan.gov/drinkingwater

From: Onan, Brandon (EGLE) []
To: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]
CC: Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; London, Bob (EGLE) [LONDONR@michigan.gov]
Subject: Benton Harbor Permit for CCT
Sent: Friday, February 22, 2019 13:44:52
Attachment 1: image001.png

As per our conference call, the overall consensus from the PRT is for the current permit to construct to be issued with a special condition to the permit that addresses the lack of a corrosion control study plan post installation. Through our conversations with the City and Elhorn Engineering, we know a coupon study to identify optimum dose for the proposed product is to be conducted. The PRT would like the plan for said coupon study to be proposed to the department for evaluation and comment. This way we can try and make sure that the data received after the study will allow the department to make a determination on optimized dose.

If you have any questions please feel free to ask, and PRT if I have missed any pertinent comments from our call please feel free to interject them now.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From: Onan, Brandon (EGLE) []
To: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; Bolf, Michael (EGLE) [BOLFM@michigan.gov]; London, Bob (EGLE) [LONDONR@michigan.gov]
CC:
Subject: RE: Benton Harbor Phosphate Addition
Sent: Friday, February 22, 2019 09:30:54

I think we need to get on the phone and discuss this. We should only need about 10 minutes. Is there a time we can make this happen?

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

-----Original Message-----
From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 21, 2019 5:13 PM
To: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition

I appreciate the PRT input and will continue to wait for consensus. FYI, the recommendation from Elhorn was for 1.5 mg/L as total PO4, which was discussed with them in a meeting. I recall their concerns being the poly portion of the blend may be too high and counterproductive above this amount. I wonder if Mike Enlow would provide supporting science for this!?

Have other recent proposals been for 100% ortho, as opposed to a blended product? This could explain the different approach.

One more comment, I believe the coupon test to follow would then quantify lead release at different dosages, resulting in the optimal designation by DEQ.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 21, 2019, at 4:47 PM, Thurston, Brian (DEQ) <THURSTONB@michigan.gov> wrote:

As far as I can tell the proposal is for approximately 1.05 ppm PO4 as Orthophosphate to address a city with Pb service lines and known Pb ALE. We have seen through recent sequential service line sampling that the city has a significant Pb issue. In my opinion this proposed treatment is not in line with other recent OCCT proposals of 3.1 ppm as Orthophosphate for a community with known Pb service lines and Pb ALE.

The issue discussed below shows the proposed chemical feed cannot feed the proposed dose at all plant flow conditions. It appears the pump is undersized. This needs to be addressed in the permit. What about a two pump system?

The attached permit submittal does not show how the consultant is planning to reach OCCT. In my opinion, a higher initial dose of Orthophosphate is need to quickly establish a protective film in the Pb service lines. I do not support the proposal as submitted. Maybe additional documentation has been submitted and not included in this permit package that addresses my concerns.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E., Community Water Supply Section Manager (Acting) Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
Direct: (231) 590-3430
Fax (231) 775-4050

Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601
[DEQ] https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2Fdeq&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556397851&sdata=Jt3yFUwAwSM7GAfpYflpIBfYT1LUE45vwJ4OT4IbkV8%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdeq&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556397851&sdata=JRhp7vHcmtBy%2FYez5nvc58KhXs1%2Fyfn6%2BcRkkS7%2F0uM%3D&reserved=0>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Sent: Thursday, February 21, 2019 3:14 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I agree with your explanation and have no further concerns. As long as the permit or the AL exceedance communication spells out the WQP monitoring requirements, I think this permit can be issued. I suspect OCCT ranges will be set subsequently once we have monitoring data available after the phosphate has been in use for a while.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Thursday, February 14, 2019 2:20 PM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

Do either of you have any further comments or discussion points on this permit review? I would like to get back with Ernie on this as he is trying to move the project forward.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Onan, Brandon (DEQ)
Sent: Thursday, February 7, 2019 11:38 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

MGD

ppm PO4 total

2

3

5

8

1

4.4

6.7

11.1

17.7

2

8.9

13.3

22.2

35.5

3

13.3

20.0

33.3

53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.

Can you shine some light on this?

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Tuesday, February 05, 2019 8:34 AM

To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division Department of Environmental Quality
616-307-0261 mobile

https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=rH6ev1CaOPBoOGIUcpcFgfw3hEfL5I%2FzqwBt7cSOnwM%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=6iIJ9GorGmxLUQk698FB8bV2xuS%2F%2FDzwC9JLFXlZqfU%3D&reserved=0>

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division Department of Environmental Quality
616-307-0261 mobile

https://na01.safelinks.protection.outlook.com/?

url=www.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=rH6ev1CaOPBoOGIUcpcFgfw3hEfL5I%2FzqwBt7cSOnwM%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=6iIJ9GorGmxLUQk698FB8bV2xuS%2F%2FDzwC9JLFXlZqfU%3D&reserved=0>

<bh phosphate application 1_24_19.pdf>
<image003.png>

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

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Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

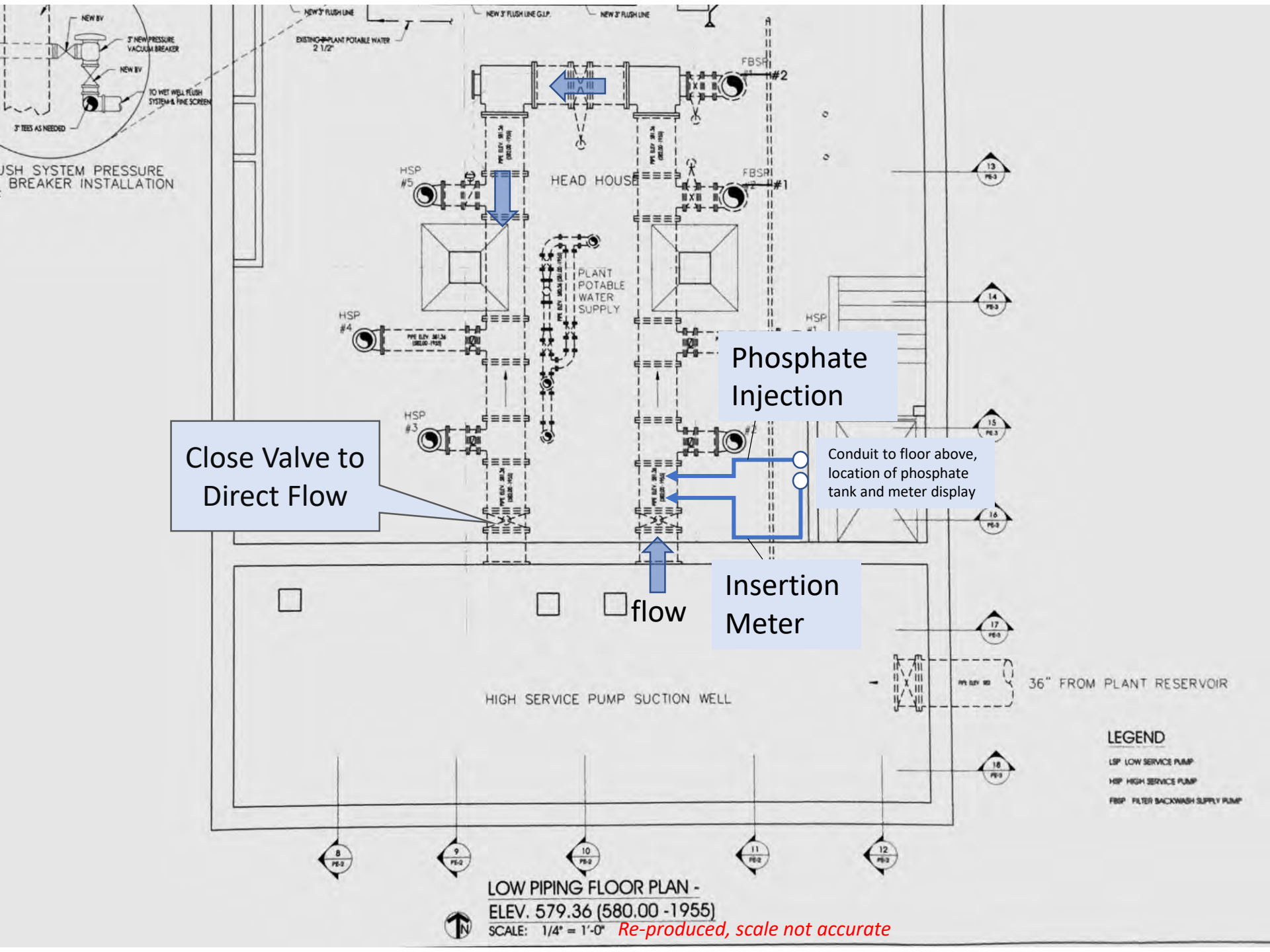
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

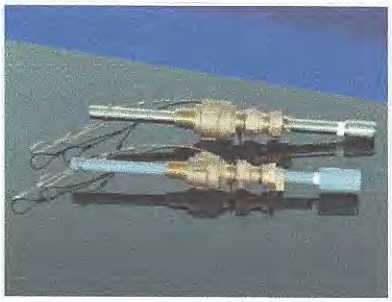
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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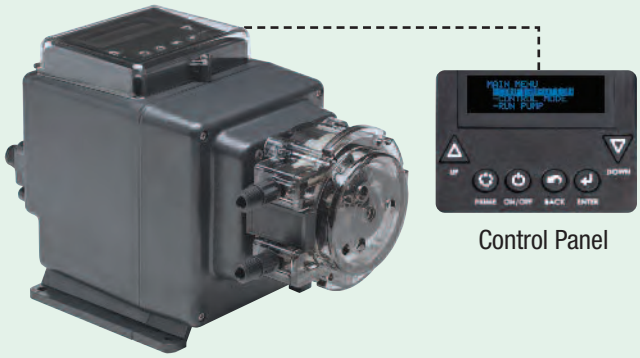
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

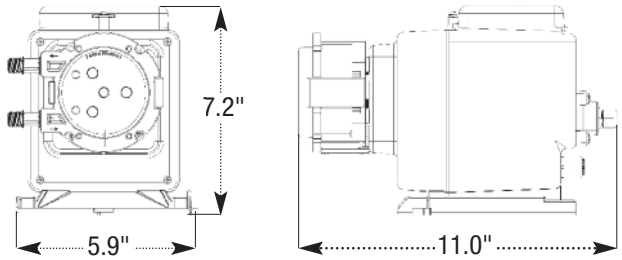
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

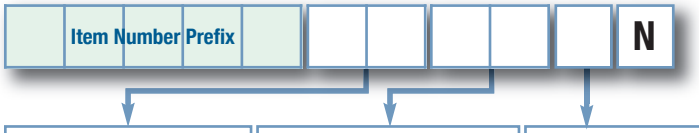
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

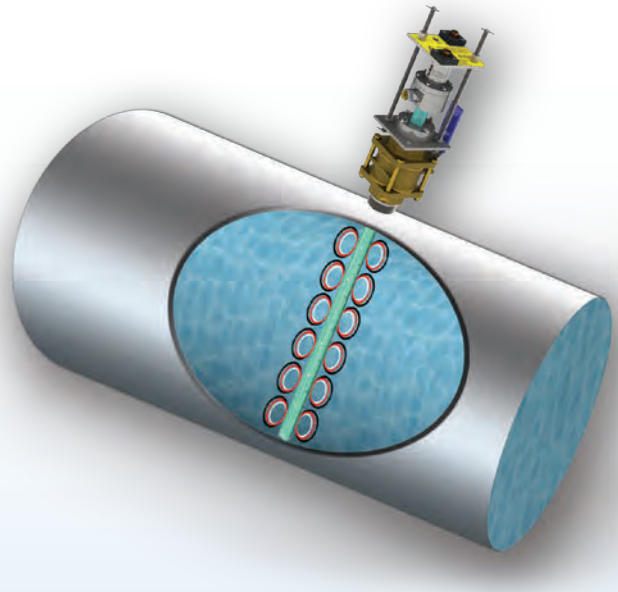
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

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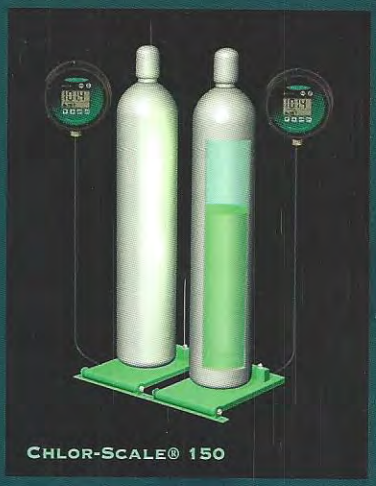
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

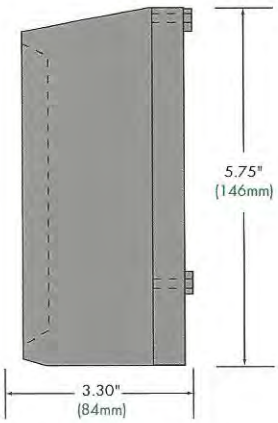
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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From: Sarkipato, Ernest (EGLE) []
To: momalley@cityofbentonharbormi.gov [momalley@cityofbentonharbormi.gov]; dwatson@cityofbentonharbormi.gov [dwatson@cityofbentonharbormi.gov]; 'Marcus Muhammad' [mmuhammad@cityofbentonharbormi.gov]
CC: Onan, Brandon (EGLE) [OnanB@michigan.gov]; Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; Crider, Steven (DHHS) [CriderS1@michigan.gov]; 'Nicki Britten' [nbritten@bchdmi.org]; Lachance, Amy (EGLE) [LACHANCEA1@michigan.gov]; Bolt, Jennifer (EGLE) [BOLTJ@michigan.gov]; mike@michonline.net [mike@michonline.net]; 'Todd Luks' [elhorneng@aol.com]; 'tim@oudbierinst.com' [tim@oudbierinst.com]; Oswald, Eric (EGLE) [OswaldE1@michigan.gov]
Subject: Corrosion Inhibitor Permit
Sent: Monday, February 25, 2019 16:41:25
Attachment 1: bh phosphate permit 199015.pdf
Attachment 2: 2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf

---

Attached please find a DEQ permit to construct a corrosion inhibitor feed system at the water plant. This is a result of lots of effort from all parties involved. We believe the interim installation of the phosphate feed system is close at hand (see special conditions page 6), with the permanent installation occurring within the next couple months. My words of encouragement for the city are, keep juggling those balls but remember this one is the heaviest! The sooner this feed system is installed, the sooner public health protection is improved.

For your reference, the initial Action Level Exceedance (ALE) letter is attached as well. Please note, the timeline is mapped out for the City with some due dates coming up. A corrosion control treatment study is due to the DEQ by March 31, 2019, which will help optimize this installation to best prevent release of lead. In addition, please be prepared to conduct Lead and Copper tap sampling by June 30, 2019, and water quality parameters as noted in the letter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE) []
To: momalley@cityofbentonharbormi.gov [momalley@cityofbentonharbormi.gov]; elhorneng@aol.com [elhorneng@aol.com]; Onan, Brandon (EGLE) [OnanB@michigan.gov]
CC: Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; dwatson@cityofbentonharbormi.gov [dwatson@cityofbentonharbormi.gov]; Bolf, Michael (EGLE) [BOLFM@michigan.gov]; mike@michonline.net [mike@michonline.net]; Bolt, Jennifer (EGLE) [BOLTJ@michigan.gov]
Subject: Corrosion Plan update, and miscellaneous
Sent: Tuesday, April 30, 2019 07:46:28
Attachment 1: deq-dwmad-cws-tsu-NonLSL_Sampling_Infographic_649018_7.pdf
Attachment 2: deq-dwmad-cws-tsu-LSL_Sampling_Infographic_649015_7.pdf
Attachment 3: MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

---

Thank you for the quick phone call yesterday to discuss Elhorn's proposed corrosion control treatment plan for Benton Harbor (attached). Here's a summary of that, and the rest of our chat:

Corrosion Plan: Todd mentioned the attached corrosion treatment plan is a generic version he uses. We talked through the proposed series of events. Soon, sampling for water quality and lead and copper will begin at the racks. The next step is, the coupons will be pulled and tested after 90 days. Treatment adjustments will be made in-situ based on these initial results (assuming a good enough baseline is established), and this process should repeat for continued optimization. Currently, coupon racks are installed at the water plant and at city hall, both of which are treated tap water. We identified the benefit of having a treated water, pre-phosphate addition baseline rack installed at the water plant. Todd will look at options on Friday of this week when he is at the water plant. There was agreement on the phone this plan is acceptable.

Test Kit: Mike had inadvertently ordered a color wheel phosphate test kit, which is far too subjective. Todd mentioned he ordered an extra and will bring that Friday to the plant. We very much agree the city should not be using test equipment based on color comparators. SIDE NOTE: If you guys could confirm what the ortho reading is at the plant tap (with high service running), as well as at city hall on Friday, that would be a really good data point.

Meter Install: there are more delays in the McCrometer insertion meter, which is intended to measure HS flow and also pace the phosphate pump. We will keep pursuing that project to help with optimization of corrosion treatment.

Compliance Testing: We will not be reducing the city's required lead and copper sampling from 60 to 40 as requested by Mike O'Malley, based on population. This may occur in future years, particularly with another census around the corner. For this year, the additional sampling is needed to be most protective of public health and make well informed decisions regarding the treatment optimization. We recommend using the attached infographics to help residents sample the 5th liter correctly.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment Great Lakes and Energy

616-307-0261 mobile

<http://www.michigan.gov/drinkingwater> www.michigan.gov/drinkingwater

1ST AND 5TH LITER LEAD/COPPER SAMPLING INSTRUCTIONS

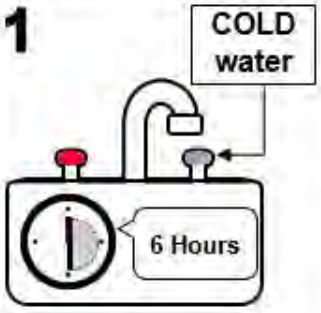
For Compliance Sampling at Sites with Lead Service Lines

READ ALL INSTRUCTIONS BEFORE OPENING YOUR SAMPLE BOTTLES.

Please note: These sampling instructions are generic; the procedure and included materials may vary depending on which certified laboratory your water supply is using.

- The sample kit that you will receive from your water supply may include various materials. Do not throw anything away unless otherwise instructed.
- Do not use any water in your house for at least six hours before you collect samples. The best time to sample may be first thing in the morning or after you return home from work.
- Only use a cold-water faucet in the kitchen or bathroom that is routinely used for drinking.
- If the faucet has a faucet mounted filter, the device must be bypassed or removed before sampling.
- If your home has a water softener, iron removal filter, reverse osmosis system or other treatment device, contact your water supplier before sampling.

1

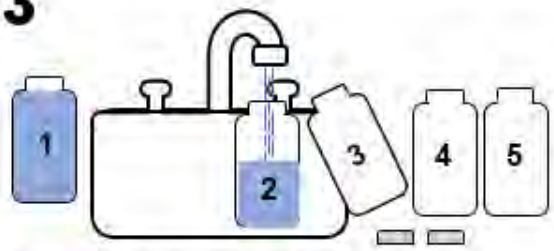


- Do not use any water in your house for at least six hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Set the bottles in order next to the kitchen or bathroom sink.
- Open the bottles and do not touch the inside of the bottle or cap.

3

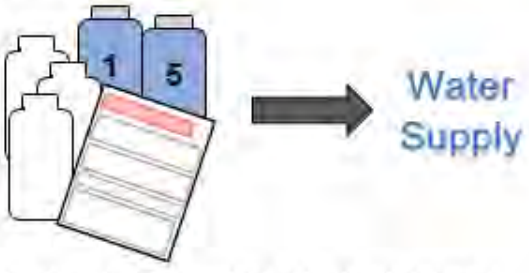


- Place Bottle 1 under the faucet.
- Turn on the **COLD water**.
- While Bottle 1 is filling, hold Bottle 2 next to Bottle 1.
- When Bottle 1 is **filled to the neck**, immediately move Bottle 2 under the stream of water.
- Repeat until all bottles are full. **Do not turn off water while filling the bottles**.

4

- Tightly cap Bottles 1 and 5 and pour out the remaining bottles.
- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork, please contact your water supply.

5



- Attach the form(s) to the bottle(s) and arrange pick-up according to instructions provided by your water department.

NOTE: Under the Michigan Safe Drinking Water Act, 1st and 5th liter samples are required for water supply compliance sampling at sites served by a lead service line.

1ST DRAW LEAD/COPPER SAMPLING INSTRUCTIONS

For Compliance Sampling at Sites Without Lead Service Lines

READ ALL INSTRUCTIONS BEFORE OPENING YOUR SAMPLE BOTTLE.

Please note: These sampling instructions are generic; the procedure and included materials may vary depending on which certified laboratory your water supply is using.

- The sample kit you will receive from your water supply may include various materials. Do not throw anything away unless otherwise instructed.
- Do not use any water in your house for at least six hours before you collect samples. The best time to sample may be first thing in the morning or after you return home from work.
- Only use a **cold-water** faucet in the **kitchen** or **bathroom** that is routinely used for drinking.
- If the faucet has a faucet-mounted filter, the device **must** be bypassed or removed before sampling.
- If your home has a water softener, iron removal filter, reverse osmosis system or other treatment device, contact your water supplier before sampling.

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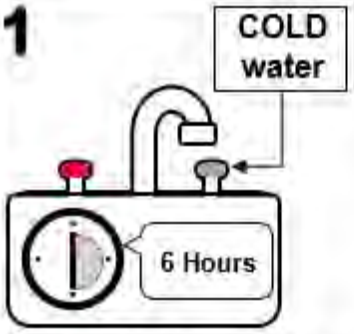
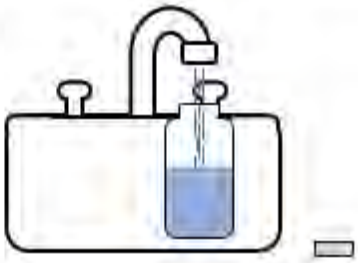


- Do not use any water in your house for at least 6 hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Open the bottle and do not touch the inside of the bottle or cap.

3



- Place bottle under the faucet.
- Turn on the **COLD water**.
- Fill the bottle to the neck, turn off the water, and tightly place the cap back on the bottle.

4

- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork please contact your water supply.

5

- Attach the form(s) to the bottle and arrange pick-up according to instructions provided by your water department.

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Thurston, Brian (EGLE); London, Bob (EGLE); Bolf, Michael (EGLE)
Subject:	PRT review for BH phosphate
Date:	Wednesday, December 4, 2019 2:12:23 PM
Attachments:	RE Benton Harbor Phosphate Addition.msg Benton Harbor Permit for CCT.msg RE Benton Harbor Phosphate Addition.msg Corrosion Inhibitor Permit.msg Corrosion Plan update and miscellaneous.msg

---

Attached are emails pertaining to the PRT review, then subsequent discussions about the corrosion study.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Onan, Brandon (EGLE) []
To: Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]
CC:
Subject: RE: Benton Harbor Phosphate Addition
Sent: Thursday, February 07, 2019 12:38:24

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

MGD

ppm PO4 total

2

3

5

8

1

4.4

6.7

11.1

17.7

2

8.9

13.3

22.2

35.5

3

13.3

20.0

33.3

53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

(p) 616.307.6736

<mailto:onanb@michigan.gov> onanb@michigan.gov

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>

Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.

Can you shine some light on this?

Michael Bolf, P.E.

Engineering Unit Supervisor

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Sent: Tuesday, February 05, 2019 8:34 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >; Thurston, Brian (DEQ) <THURSTONB@michigan.gov <mailto:THURSTONB@michigan.gov> >
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

(p) 616.307.6736

<mailto:onanb@michigan.gov> onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> >
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7COnanB%40michigan.gov%7C638fdccdaab84eb68e4f08d68d0cfbb0%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636851484227380656&sdata=tBgaPt3Euv3p5Lm%2FZjNF5SdMV3Dwfk8oTIzt3CdBoWA%3D&reserved=0>
www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> >
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov <mailto:BOLFM@michigan.gov> >
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7COnanB%40michigan.gov%7C638fdccdaab84eb68e4f08d68d0cfbb0%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636851484227390664&sdata=3tUYjd4mf65T%2FumhiMFohOR7%2F%2BfjGezWBUNJAu8g80U%3D&reserved=0>
www.michigan.gov/drinkingwater

From: Onan, Brandon (EGLE) []
To: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]
CC: Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; London, Bob (EGLE) [LONDONR@michigan.gov]
Subject: Benton Harbor Permit for CCT
Sent: Friday, February 22, 2019 13:44:52
Attachment 1: image001.png

As per our conference call, the overall consensus from the PRT is for the current permit to construct to be issued with a special condition to the permit that addresses the lack of a corrosion control study plan post installation. Through our conversations with the City and Elhorn Engineering, we know a coupon study to identify optimum dose for the proposed product is to be conducted. The PRT would like the plan for said coupon study to be proposed to the department for evaluation and comment. This way we can try and make sure that the data received after the study will allow the department to make a determination on optimized dose.

If you have any questions please feel free to ask, and PRT if I have missed any pertinent comments from our call please feel free to interject them now.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From: Onan, Brandon (EGLE) []
To: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; Bolf, Michael (EGLE) [BOLFM@michigan.gov]; London, Bob (EGLE) [LONDONR@michigan.gov]
CC:
Subject: RE: Benton Harbor Phosphate Addition
Sent: Friday, February 22, 2019 09:30:54

I think we need to get on the phone and discuss this. We should only need about 10 minutes. Is there a time we can make this happen?

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

-----Original Message-----
From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 21, 2019 5:13 PM
To: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition

I appreciate the PRT input and will continue to wait for consensus. FYI, the recommendation from Elhorn was for 1.5 mg/L as total PO4, which was discussed with them in a meeting. I recall their concerns being the poly portion of the blend may be too high and counterproductive above this amount. I wonder if Mike Enlow would provide supporting science for this!?

Have other recent proposals been for 100% ortho, as opposed to a blended product? This could explain the different approach.

One more comment, I believe the coupon test to follow would then quantify lead release at different dosages, resulting in the optimal designation by DEQ.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 21, 2019, at 4:47 PM, Thurston, Brian (DEQ) <THURSTONB@michigan.gov> wrote:

As far as I can tell the proposal is for approximately 1.05 ppm PO4 as Orthophosphate to address a city with Pb service lines and known Pb ALE. We have seen through recent sequential service line sampling that the city has a significant Pb issue. In my opinion this proposed treatment is not in line with other recent OCCT proposals of 3.1 ppm as Orthophosphate for a community with known Pb service lines and Pb ALE.

The issue discussed below shows the proposed chemical feed cannot feed the proposed dose at all plant flow conditions. It appears the pump is undersized. This needs to be addressed in the permit. What about a two pump system?

The attached permit submittal does not show how the consultant is planning to reach OCCT. In my opinion, a higher initial dose of Orthophosphate is need to quickly establish a protective film in the Pb service lines. I do not support the proposal as submitted. Maybe additional documentation has been submitted and not included in this permit package that addresses my concerns.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E., Community Water Supply Section Manager (Acting) Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
Direct: (231) 590-3430
Fax (231) 775-4050

Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601
[DEQ] https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2Fdeq&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556397851&sdata=Jt3yFUwAwSM7GAfpYflpIBfYT1LUE45vwJ4OT4IbkV8%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdeq&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556397851&sdata=JRhp7vHcmtBy%2FYez5nvc58KhXs1%2Fyfn6%2BcRkkS7%2F0uM%3D&reserved=0>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Sent: Thursday, February 21, 2019 3:14 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I agree with your explanation and have no further concerns. As long as the permit or the AL exceedance communication spells out the WQP monitoring requirements, I think this permit can be issued. I suspect OCCT ranges will be set subsequently once we have monitoring data available after the phosphate has been in use for a while.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Thursday, February 14, 2019 2:20 PM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

Do either of you have any further comments or discussion points on this permit review? I would like to get back with Ernie on this as he is trying to move the project forward.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Onan, Brandon (DEQ)
Sent: Thursday, February 7, 2019 11:38 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

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ppm PO4 total

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Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

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Can you shine some light on this?

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Tuesday, February 05, 2019 8:34 AM

To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division Department of Environmental Quality
616-307-0261 mobile

https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=rH6ev1CaOPBoOGIUcpcFgfw3hEfL5I%2FzqwBt7cSOnwM%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=6iIJ9GorGmxLUQk698FB8bV2xuS%2F%2FDzwC9JLFXlZqfU%3D&reserved=0>

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division Department of Environmental Quality
616-307-0261 mobile

https://na01.safelinks.protection.outlook.com/?

url=www.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=rH6ev1CaOPBoOGIUcpcFgfw3hEfL5I%2FzqwBt7cSOnwM%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C435f8a19091047d1757208d698c9f85c%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864390556407859&sdata=6iIJ9GorGmxLUQk698FB8bV2xuS%2F%2FDzwC9JLFXlZqfU%3D&reserved=0>

<bh phosphate application 1_24_19.pdf>
<image003.png>

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

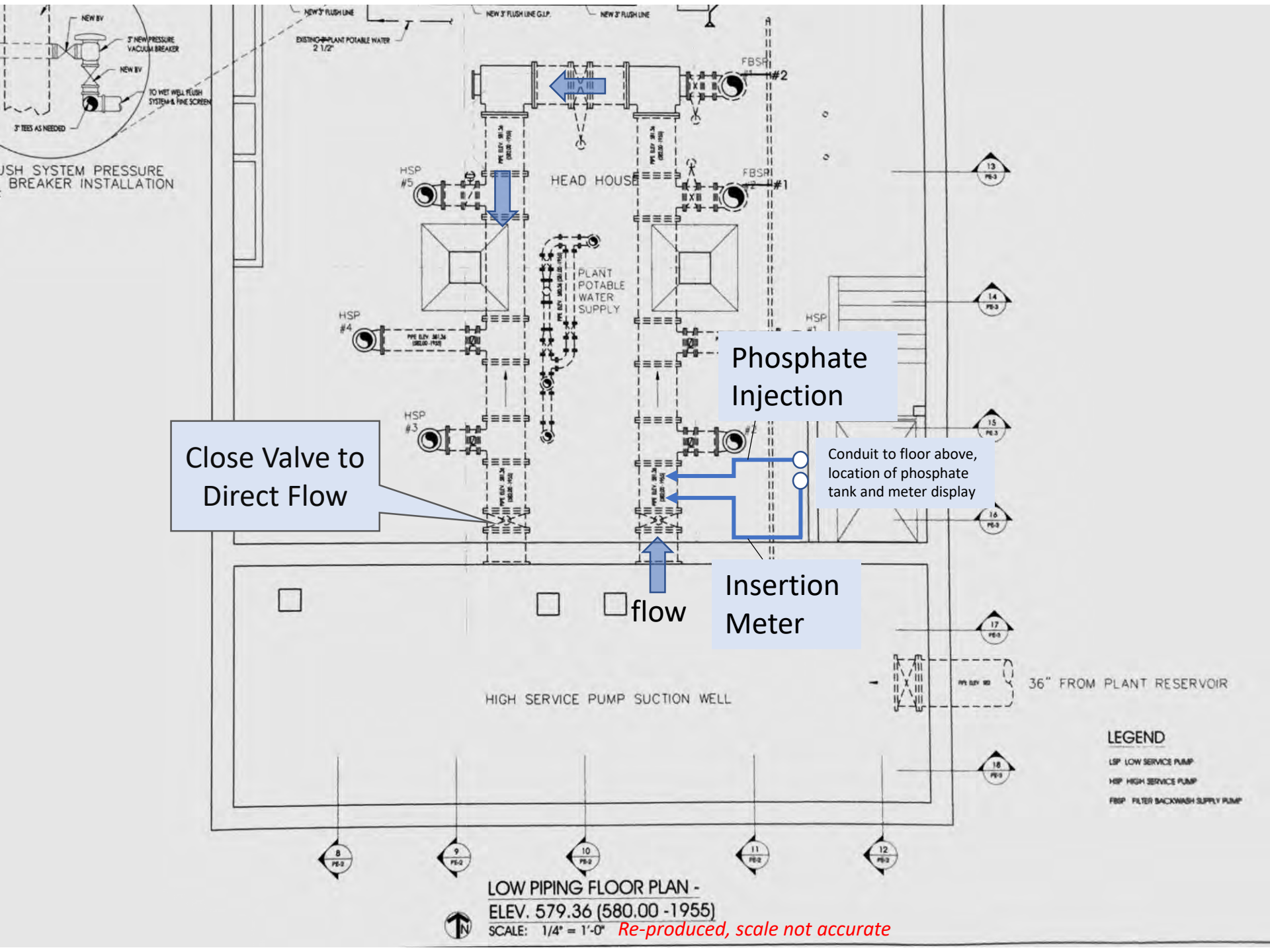
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

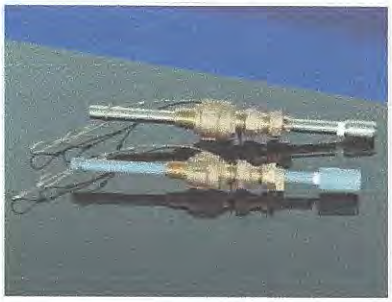
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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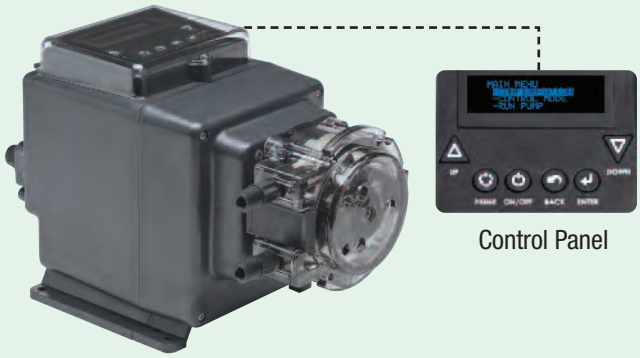
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

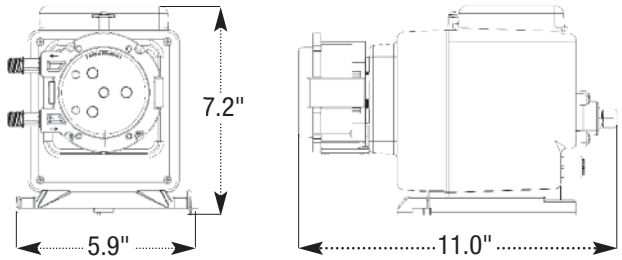
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

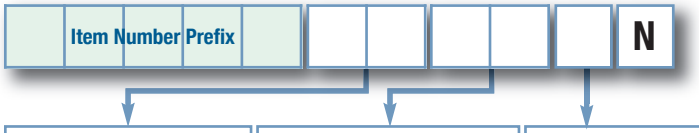
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

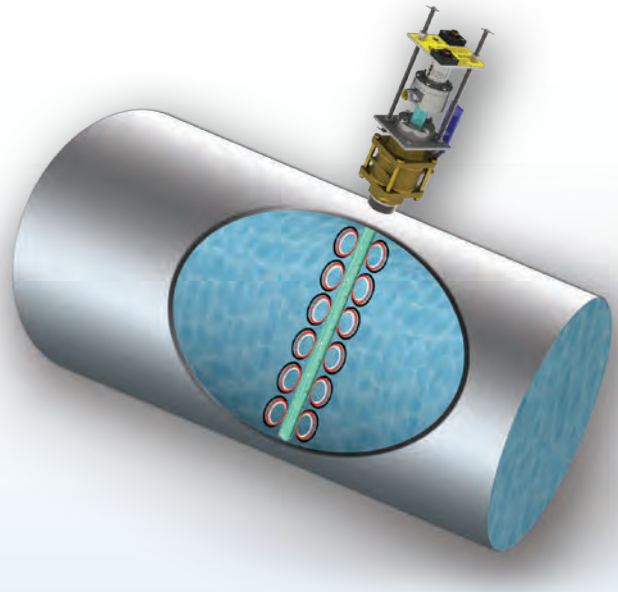
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

Printed in USA

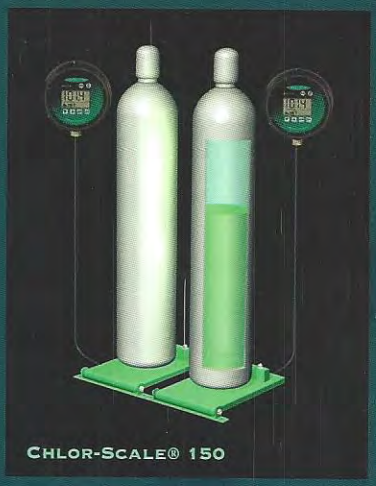
Lit Number 30120-45 Rev 1.3 / 05-13

Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

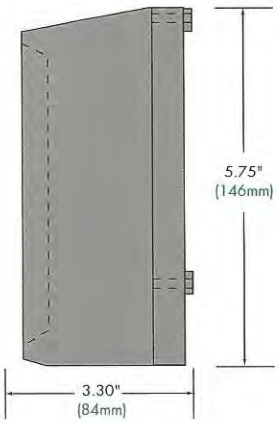
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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From: Sarkipato, Ernest (EGLE) []
To: momalley@cityofbentonharbormi.gov [momalley@cityofbentonharbormi.gov]; dwatson@cityofbentonharbormi.gov [dwatson@cityofbentonharbormi.gov]; 'Marcus Muhammad' [mmuhammad@cityofbentonharbormi.gov]
CC: Onan, Brandon (EGLE) [OnanB@michigan.gov]; Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; Crider, Steven (DHHS) [CriderS1@michigan.gov]; 'Nicki Britten' [nbritten@bchdmi.org]; Lachance, Amy (EGLE) [LACHANCEA1@michigan.gov]; Bolt, Jennifer (EGLE) [BOLTJ@michigan.gov]; mike@michonline.net [mike@michonline.net]; 'Todd Luks' [elhorneng@aol.com]; 'tim@oudbierinst.com' [tim@oudbierinst.com]; Oswald, Eric (EGLE) [OswaldE1@michigan.gov]
Subject: Corrosion Inhibitor Permit
Sent: Monday, February 25, 2019 16:41:25
Attachment 1: bh phosphate permit 199015.pdf
Attachment 2: 2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf

---

Attached please find a DEQ permit to construct a corrosion inhibitor feed system at the water plant. This is a result of lots of effort from all parties involved. We believe the interim installation of the phosphate feed system is close at hand (see special conditions page 6), with the permanent installation occurring within the next couple months. My words of encouragement for the city are, keep juggling those balls but remember this one is the heaviest! The sooner this feed system is installed, the sooner public health protection is improved.

For your reference, the initial Action Level Exceedance (ALE) letter is attached as well. Please note, the timeline is mapped out for the City with some due dates coming up. A corrosion control treatment study is due to the DEQ by March 31, 2019, which will help optimize this installation to best prevent release of lead. In addition, please be prepared to conduct Lead and Copper tap sampling by June 30, 2019, and water quality parameters as noted in the letter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE) []
To: momalley@cityofbentonharbormi.gov [momalley@cityofbentonharbormi.gov]; elhorneng@aol.com [elhorneng@aol.com]; Onan, Brandon (EGLE) [OnanB@michigan.gov]
CC: Thurston, Brian (EGLE) [THURSTONB@michigan.gov]; dwatson@cityofbentonharbormi.gov [dwatson@cityofbentonharbormi.gov]; Bolf, Michael (EGLE) [BOLFM@michigan.gov]; mike@michonline.net [mike@michonline.net]; Bolt, Jennifer (EGLE) [BOLTJ@michigan.gov]
Subject: Corrosion Plan update, and miscellaneous
Sent: Tuesday, April 30, 2019 07:46:28
Attachment 1: deq-dwmad-cws-tsu-NonLSL_Sampling_Infographic_649018_7.pdf
Attachment 2: deq-dwmad-cws-tsu-LSL_Sampling_Infographic_649015_7.pdf
Attachment 3: MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

---

Thank you for the quick phone call yesterday to discuss Elhorn's proposed corrosion control treatment plan for Benton Harbor (attached). Here's a summary of that, and the rest of our chat:

Corrosion Plan: Todd mentioned the attached corrosion treatment plan is a generic version he uses. We talked through the proposed series of events. Soon, sampling for water quality and lead and copper will begin at the racks. The next step is, the coupons will be pulled and tested after 90 days. Treatment adjustments will be made in-situ based on these initial results (assuming a good enough baseline is established), and this process should repeat for continued optimization. Currently, coupon racks are installed at the water plant and at city hall, both of which are treated tap water. We identified the benefit of having a treated water, pre-phosphate addition baseline rack installed at the water plant. Todd will look at options on Friday of this week when he is at the water plant. There was agreement on the phone this plan is acceptable.

Test Kit: Mike had inadvertently ordered a color wheel phosphate test kit, which is far too subjective. Todd mentioned he ordered an extra and will bring that Friday to the plant. We very much agree the city should not be using test equipment based on color comparators. SIDE NOTE: If you guys could confirm what the ortho reading is at the plant tap (with high service running), as well as at city hall on Friday, that would be a really good data point.

Meter Install: there are more delays in the McCrometer insertion meter, which is intended to measure HS flow and also pace the phosphate pump. We will keep pursuing that project to help with optimization of corrosion treatment.

Compliance Testing: We will not be reducing the city's required lead and copper sampling from 60 to 40 as requested by Mike O'Malley, based on population. This may occur in future years, particularly with another census around the corner. For this year, the additional sampling is needed to be most protective of public health and make well informed decisions regarding the treatment optimization. We recommend using the attached infographics to help residents sample the 5th liter correctly.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment Great Lakes and Energy

616-307-0261 mobile

<http://www.michigan.gov/drinkingwater> www.michigan.gov/drinkingwater

1ST AND 5TH LITER LEAD/COPPER SAMPLING INSTRUCTIONS

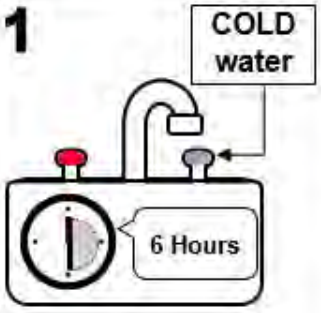
For Compliance Sampling at Sites with Lead Service Lines

READ ALL INSTRUCTIONS BEFORE OPENING YOUR SAMPLE BOTTLES.

Please note: These sampling instructions are generic; the procedure and included materials may vary depending on which certified laboratory your water supply is using.

- The sample kit that you will receive from your water supply may include various materials. Do not throw anything away unless otherwise instructed.
- Do not use any water in your house for at least six hours before you collect samples. The best time to sample may be first thing in the morning or after you return home from work.
- Only use a cold-water faucet in the kitchen or bathroom that is routinely used for drinking.
- If the faucet has a faucet mounted filter, the device must be bypassed or removed before sampling.
- If your home has a water softener, iron removal filter, reverse osmosis system or other treatment device, contact your water supplier before sampling.

1

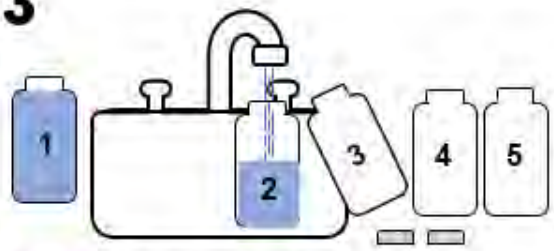


- Do not use any water in your house for at least six hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Set the bottles in order next to the kitchen or bathroom sink.
- Open the bottles and do not touch the inside of the bottle or cap.

3

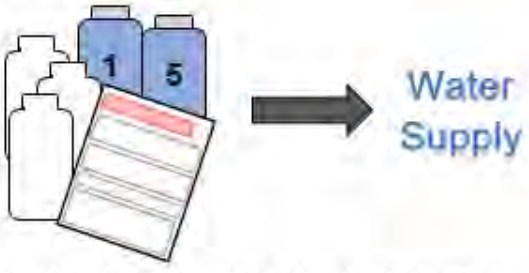


- Place Bottle 1 under the faucet.
- Turn on the **COLD water**.
- While Bottle 1 is filling, hold Bottle 2 next to Bottle 1.
- When Bottle 1 is **filled to the neck**, immediately move Bottle 2 under the stream of water.
- Repeat until all bottles are full. **Do not turn off water while filling the bottles**.

4

- Tightly cap Bottles 1 and 5 and pour out the remaining bottles.
- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork, please contact your water supply.

5



- Attach the form(s) to the bottle(s) and arrange pick-up according to instructions provided by your water department.

NOTE: Under the Michigan Safe Drinking Water Act, 1st and 5th liter samples are required for water supply compliance sampling at sites served by a lead service line.

1ST DRAW LEAD/COPPER SAMPLING INSTRUCTIONS

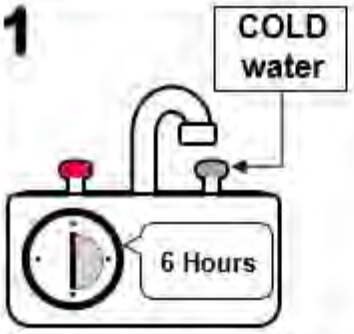
For Compliance Sampling at Sites Without Lead Service Lines

READ ALL INSTRUCTIONS BEFORE OPENING YOUR SAMPLE BOTTLE.

Please note: These sampling instructions are generic; the procedure and included materials may vary depending on which certified laboratory your water supply is using.

- The sample kit you will receive from your water supply may include various materials. Do not throw anything away unless otherwise instructed.
- Do not use any water in your house for at least six hours before you collect samples. The best time to sample may be first thing in the morning or after you return home from work.
- Only use a **cold-water** faucet in the **kitchen** or **bathroom** that is routinely used for drinking.
- If the faucet has a faucet-mounted filter, the device **must** be bypassed or removed before sampling.
- If your home has a water softener, iron removal filter, reverse osmosis system or other treatment device, contact your water supplier before sampling.

1

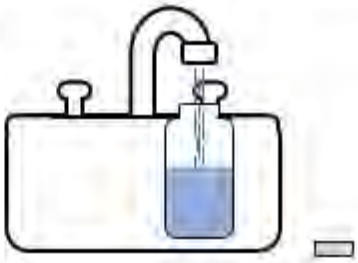


- Do not use any water in your house for at least 6 hours.
- Use the **COLD water only** at a **kitchen or bathroom** faucet for sample collection.

2

- Open the bottle and do not touch the inside of the bottle or cap.

3



- Place bottle under the faucet.
- Turn on the **COLD water**.
- Fill the bottle to the neck, turn off the water, and tightly place the cap back on the bottle.

4

- Fill out all corresponding forms completely and accurately.
- If you have any questions about paperwork please contact your water supply.

5

- Attach the form(s) to the bottle and arrange pick-up according to instructions provided by your water department.

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (DEQ)
To:	Onan, Brandon (DEQ)
Cc:	Bolf, Michael (DEQ)
Subject:	PRT: Benton Harbor Phosphate Addition
Date:	Friday, January 25, 2019 3:20:49 PM
Attachments:	bh phosphate application 1_24_19.pdf

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: Darwin Watson, City Manager 200 East Wall Street Benton Harbor, MI 49022 **WSSN**: 600	Permit Stamp Area (DEQ use only)	
2. **Owner's Contact Person** (provide name for questions): Contact: Mike O'Malley Title: Water Plant Superintendent Phone: 269-927-8470		
3. **Project Name** (Provide phase number if project is segmented): Phosphate Corrosion Inhibitor Installation	4. **Project Location** (City, Village, Township): City of Benton Harbor	5. **County** (location of project): Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc:

Issued by: _____

Reviewed by: _____

☐ **If this box is marked see attached special conditions.**

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
- -No day tank needed per estimated chemical use
- -Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
- -Insertion meter to interface with chemical dosing pump
- -isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
- -chemical scale with digital readout (Forceflow XT-600)
- -LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:

Chemical Supplier:
Mike Enlow, Elhorn Engineering Co.
517-204-2845
mike@michonline.net

8. Indicate who will provide project construction inspection:
☒Organization listed in Box 1.
☐Engineering firm listed in Box 7.
☐Other - name, address, and phone number listed below.

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ Date 1/24/19 Phone (269) 363-0575

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

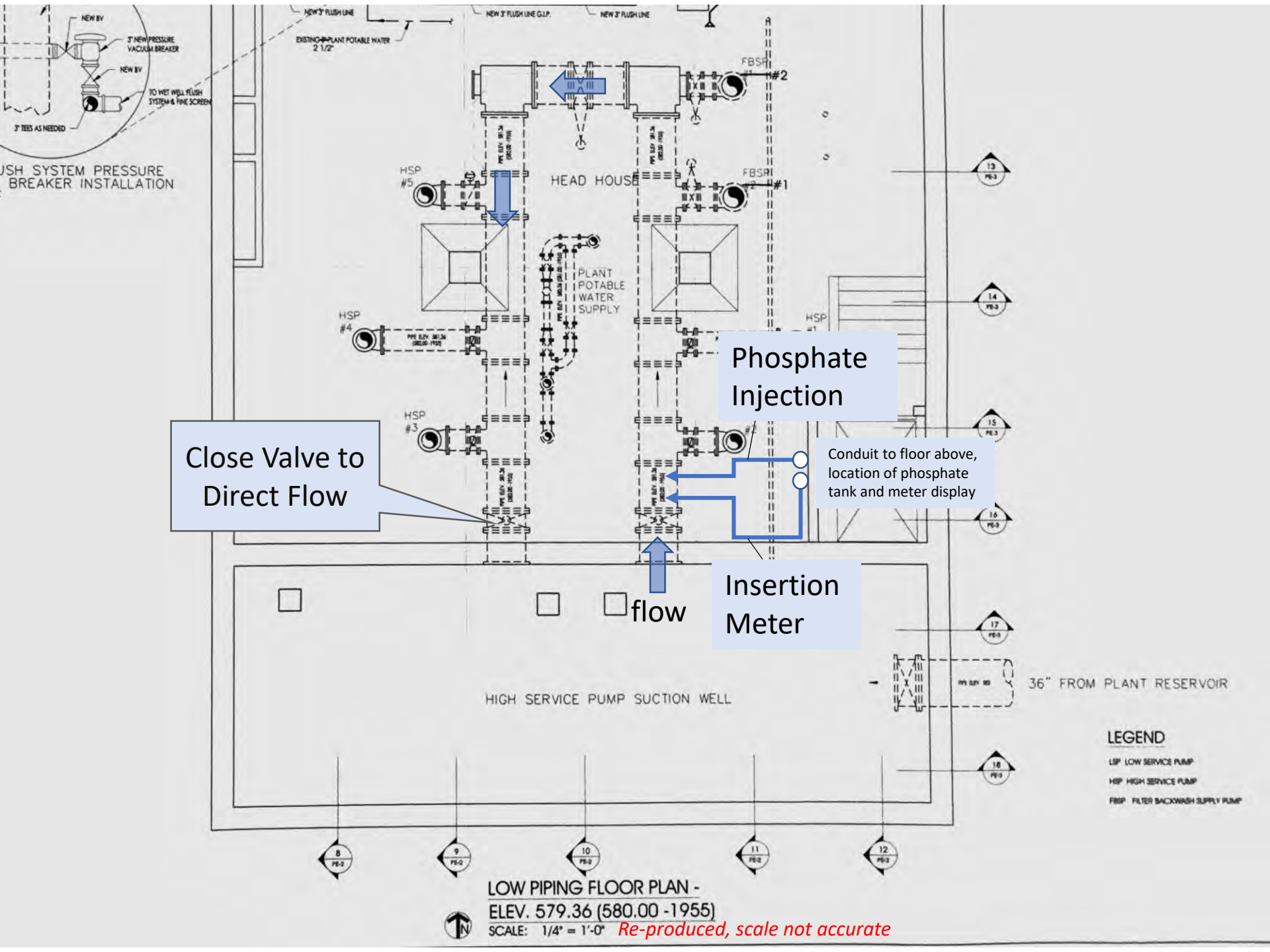
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4 lbs/gal
Strength	33%	total P			

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	6.33	9.50	15.84	25.34
	2 mg/L as PO4	12.67	19.00	31.67	50.67
	3 mg/L as PO4	19.00	28.50	47.51	76.01

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

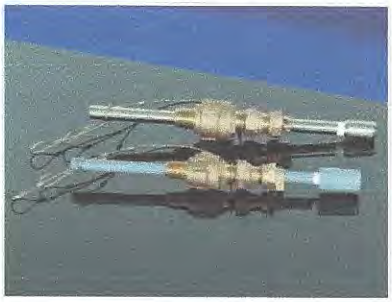
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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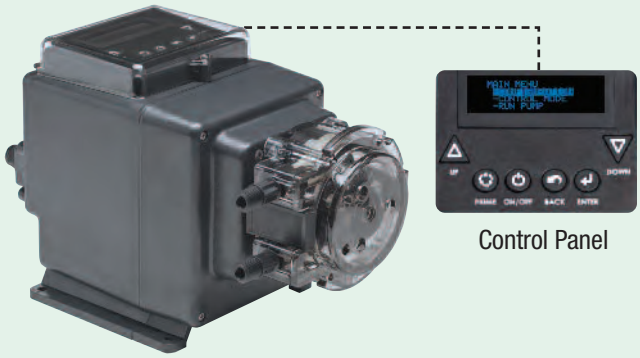
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

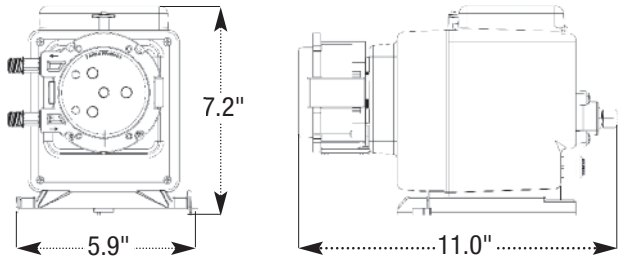
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

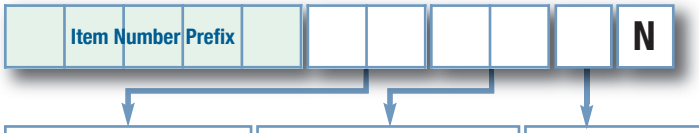
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

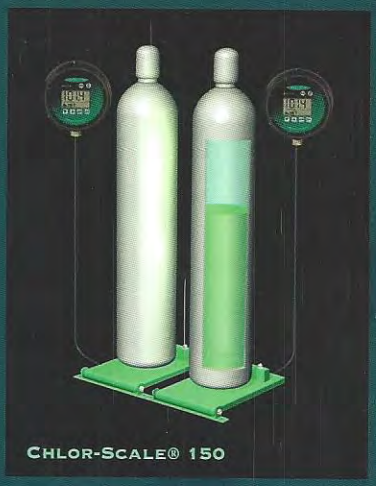
How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

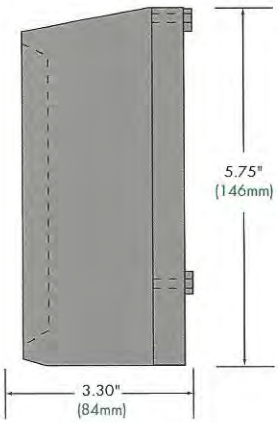
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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PROPOSAL

FOR: DEQ
onanb@mich.gov

ATTN: Brandon Onan - 616-307-6736
REF:

Please make Purchase Orders out to the below, thank you.
MMI, INC.

QUOTE NO: 1118DEQEQ250
REGION: B.R. - .6X
DATE: 12/3/2018
TERMS: 100% Net 30 Days
F.O.B.: Factory
VALIDITY: 90 Days
DELIVERY: 5 Weeks ARO
2592.838/2058

ITEM	MODEL	DESCRIPTION	QTY	UNIT PRICE	TOTAL COST
1.1	EX250-S-08-15	**Hot Tap - Adjustable Dept. Insertion Mag Meter - 36"**	1	$ 2,675.00	$ 2,675.00
		316 SSTL, 10"-48", (**Sensor Only**)			
		Valve Assembly, 316 SS	1		
		Reverse Flow			
1.2	FT440W-139	**WALL DISPLAY**	1		$ -
		12-24 Vdc, Loop Power, Dual Scaled Pulse Output			
		& 4-20 mA Outputs			
		120 VAC - Built in Dual Power	1		
		Tags: FE/FIT: **Advise**			
		TOTAL			$ 2,675.00

We are pleased to offer this proposal for furnishing and delivering the above referenced product. Equipment is specifically listed, items required but not listed are to be furnished by others.

Freight and Handling Charges and Taxes
o Prepay and add freight charges - the amount charged will include all freight and handling expenses
o Taxes Excluded and are the responsibility of the buyer

James L. Mommers Midwest Municipal Instrumentation, Inc.

Midwest Municipal Instrumentation Inc.
4391 Bonnymede Ct
Jackson, MI 49201

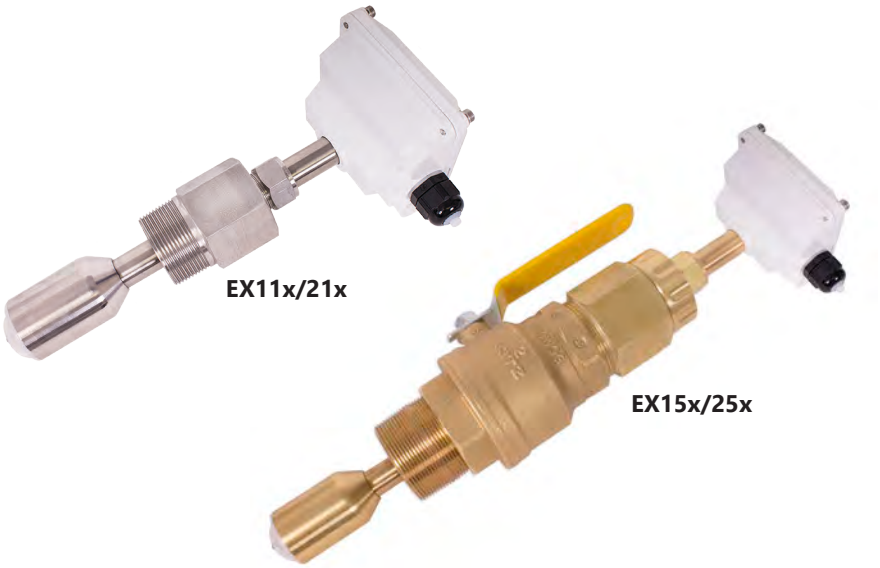
Providing: Seametrics
Your helping hand in all your Municipal Water & Wastewater Needs

Telephone: 517-764-4736
Fax: 517-764-4739
Cell: 517-250-1650
E-mail: jmommersmmi@msn.com
http://www.midwestmunicipalinstr.com

Per Factory Terms & Conditions - see website
http://www2.emersonprocess.com;

EX100/200-SERIES
INSERTION ELECTROMAGNETIC FLOW SENSOR

Seametrics
Precision Flow Measurement
An ONICON Brand



APPLICATIONS

3" - 48" pipe (up to 72" optional)
Clean or "dirty" liquids
Conductive liquids
Municipal
Industrial
Irrigation

Features

- No moving parts
- Durable
- Adjustable depth
- Hot-tap available
- Brass or stainless steel
- Immersibility available
- Reverse flow output available

Contact Your Supplier

The **EX100/200-Series** are adjustable depth insertion magmeters that fit 3" to 48" pipe (up to 72" optional). The complete lack of moving parts of the EX100/200-Series is the source of its reliability. Brass and stainless steel models withstand a variety of temperature, pressure, and chemical conditions. The EX-Series has no rotor to stop turning in dirty water and there are no bearings to wear out. Like all magmeters, when used in chemical injection applications, these meters should be installed upstream of the chemical line (or far enough downstream to allow complete mixing of fluids before the meter). Adapters mate with standard 1-1/2" (11x/21x) or 2" (15x/25x) FNPT threaded fittings such as saddles and weldolets which may be purchased either locally or from Seametrics.

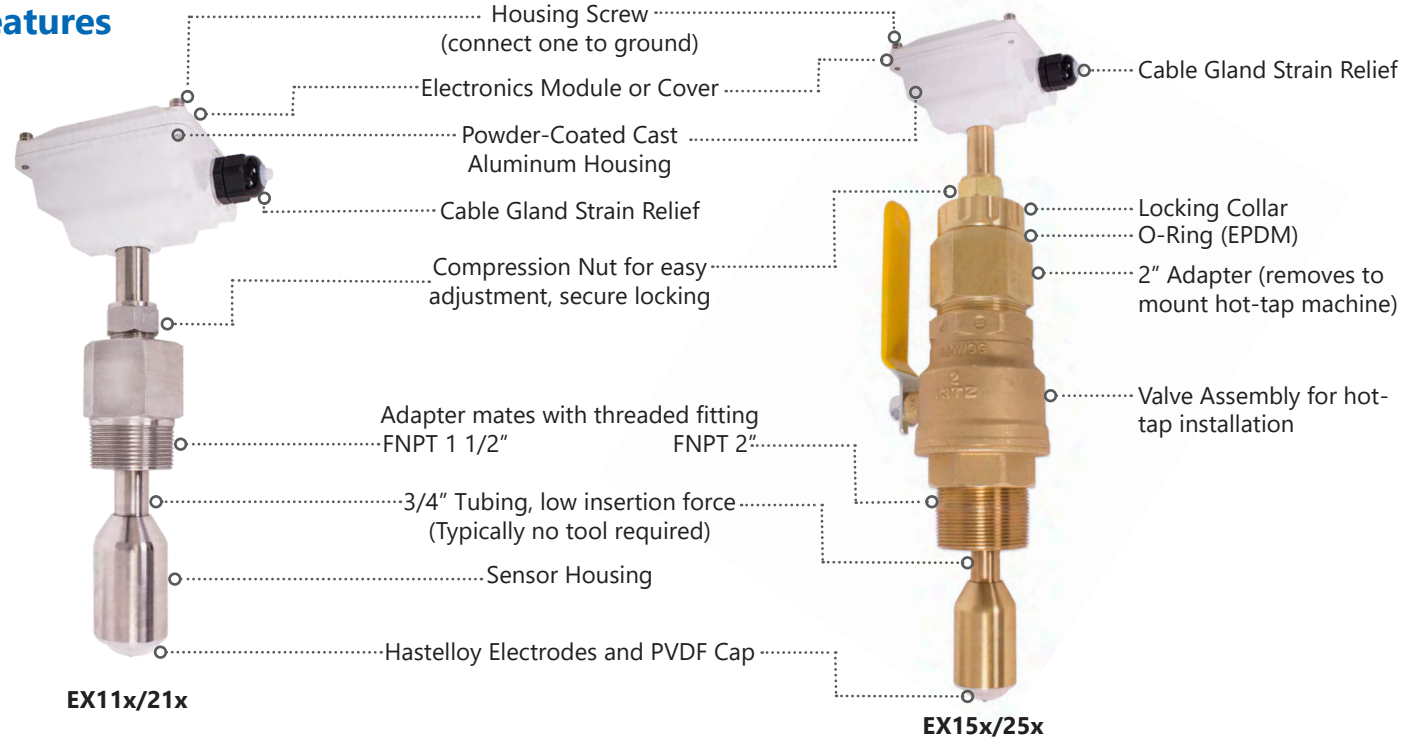
A rapidly reversing magnetic field is produced in the lower housing. As the fluid moves through this field, a voltage is generated that is measured and translated into a frequency signal proportional to flow rate. This square wave signal can be sent directly to a PLC or other control or can be converted using any of the Seametrics family of indicators and converters. A modular system of electronics can be installed directly on the flow sensor or mounted remotely. The FT430 (externally powered with pulse) and the FT440 (loop powered), both provide digital rate and total displays, as well as a programmable pulse; the FT440 also provides a 4-20 mA analog output. The AO55 is a blind analog (4-20 mA) transmitter. Programmable pulse for pump pacing is available with the PD10 (available as wall-mounted unit only).

The "hot-tap" models (EX15x/25x) can be installed or serviced without shutting down the line by means of a 2" full-port isolation valve that comes with a nipple for installation on the pipe fitting; a bronze ball valve is standard, with a 316 stainless steel valve option if needed. In most circumstances, no special tool is required.

Reverse flow output and immersibility are optional.

ISO 9001:2008 Certified Company
PROUDLY MADE IN THE USA

Features

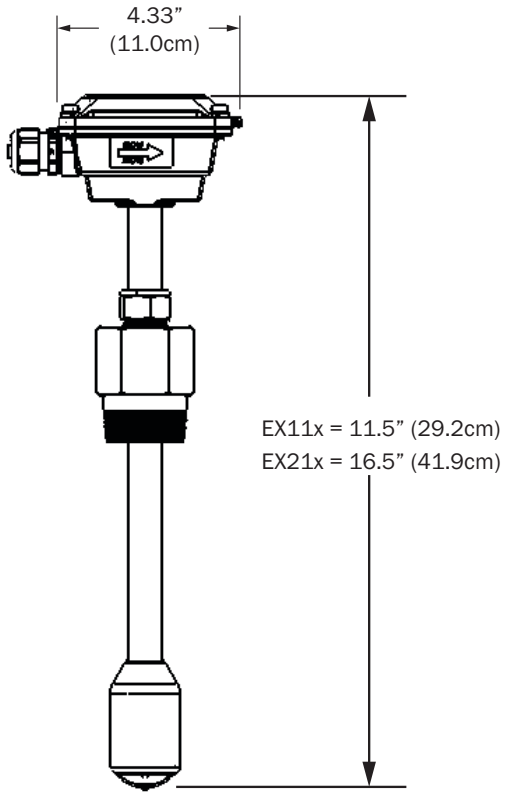


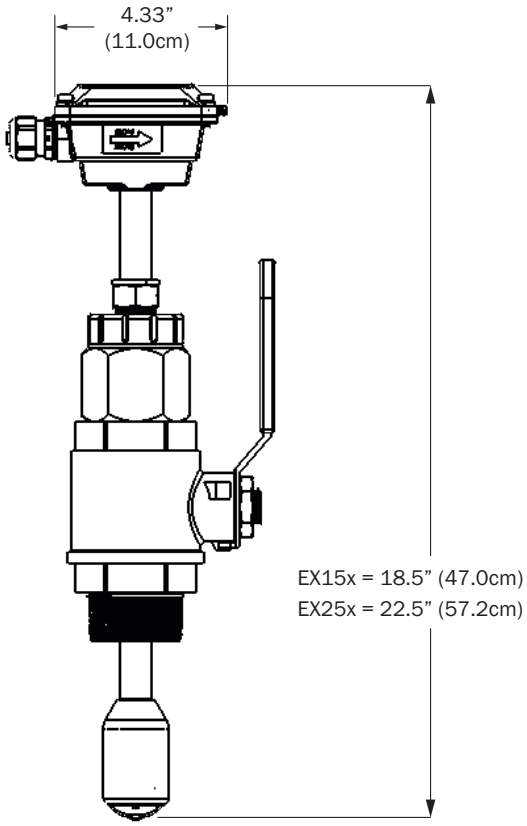
Specifications*

Pipe Size		3" to 48" (up to 72" optional)
Power		**Full Power:** 12 - 24 Vdc, 250mA **Low Power:** 12 - 24 Vdc, 40mA average with 250mA peaks
Materials	**Housing**	Powder-coated cast aluminum
	Tubing/Fitting/Sensor Housing	Brass or 316 Stainless Steel
	Electrodes	Hastelloy
	Electrode Cap	PVDF
	O-Ring *(15x/25x only)*	EPDM
	Valve Assembly *(15x/25x only)*	Bronze (stainless optional) with bronze ball valve
Fitting Size Required		**11x/21x:** 1.5" FNPT **15x/25x:** 2" FNPT
Maximum Pressure		200 psi (14 bar)
Temperature	**Ambient**	0˚ to 160˚ F (-17˚ to 72˚ C)
	Fluid	32˚ to 200˚ F (0˚ to 93˚ C)
Minimum Conductivity		20 microSiemens/cm
Flow Velocity		0.28 - 20 ft/sec (0.08 - 6.09 m/sec)
Accuracy		± 1% of full scale
Output		Square wave pulse, opto-isolated, 500 Hz @ 20 ft/sec 6 mA max, 30Vdc forward flow standard; reverse flow optional
Empty Pipe Detection		Software, defaults to zero flow
Cable		Standard 18' (6m), #22 shielded twisted pair, 4-conn. Max. cable run at 24 Vdc = 1000' (300m); at 12 Vdc = 500' (150m). For other circumstances, contact the factory.
Environmental		See meter mounted electronic specification for rating.

**Specifications subject to change • Please consult our website for current data (www.seametrics.com).*

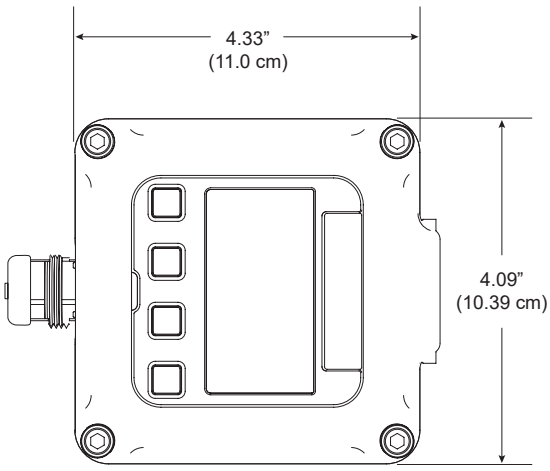
Dimensions





Flow Range

Flow Range (GPM)		
Nominal Pipe Size	**Minimum Flow**	**Maximum Flow**
3	6	440
4	11	783
6	25	1,762
8	44	3,133
10	69	4,895
12	99	7,050
14	134	9,596
16	175	12,533
18	222	15,863
20	274	19,584
24	395	28,200
30	617	44,064
36	888	63,452
48	1,580	112,804



How to Order

	Description	Size	Sensor Material	Options (110/210)	Options (150/250)
Sensor Only	Externally powered (12 - 24Vdc) sensor only.	3" – 10" pipe = EX110 10" – 48" pipe = EX210 Hot Tap 3" – 10" pipe = EX150 10" – 48" pipe = EX250	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Old Style Adapter 1 ½" NPT = -35 *Immersible = -40 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 316 SS Valve Assembly = -08 Reverse Flow Output = -15 *Immersible = -40 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (112/212)	Options (152/252)
AO55 Mounted on Sensor	Externally powered (12 - 24Vdc) sensor with AO55 blind 4-20mA analog transmitter mounted on the sensor.	3" – 10" pipe = EX112 10" – 48" pipe = EX212 Hot Tap 3" – 10" pipe = EX152 10" – 48" pipe = EX252	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (113/213)	Options (153/253)
FT430 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with FT430 rate and total indicator (with pulse outputs) mounted on the sensor.	3" – 10" pipe = EX113 10" – 48" pipe = EX213 Hot Tap 3" – 10" pipe = EX153 10" – 48" pipe = EX253	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Hinged Display Cover = -126	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Dual Relay Output = -98 Hinged Display Cover = -126 Data Logger = -127

	Description	Size	Sensor Material	Options (116/216)	Options (156/256)
DL76 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with self powered DL76 data logger mounted on the sensor.	3" – 10" pipe = EX116 10" – 48" pipe = EX216 Hot Tap 3" – 10" pipe = EX156 10" – 48" pipe = EX256	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (119/219)	Options (159/259)
FT440 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with FT440 rate and total indicator (with pulse and 4-20mA outputs) mounted on the sensor.	3" – 10" pipe = EX119 10" – 48" pipe = EX219 Hot Tap 3" – 10" pipe = EX159 10" – 48" pipe = EX259	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Hinged Display Cover = -126	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Dual Relay Output = -98 Hinged Display Cover = -126 Data Logger = -127

** Immersible to maximum of 3 ft (1m), up to 2 weeks • Roytronic is a registered trademark of Milton Roy Company.*

FT430/440/450
RATE/TOTAL INDICATOR

Seametrics
Precision Flow Measurement
An ONICON Brand

Optional Protective Cover Closed

THE RIGHT INDICATOR FOR

Water Treatment

Water Utility

Industrial Chemical Handling

Features

- Simple Setup
- DC Powered (FT430)
- Loop Powered (FT440)
- Battery Powered (FT450)
- Remote or Flow Sensor Mounted Indicator
- Rugged Plastic Housing
- Non-volatile Memory

Contact Your Supplier

The **FT430/440/450** flow computers are microcontroller-based indicator/transmitters that interface with pulse output flow sensors to compute and display flow rate, flow total, and also generate output signals representing flow. The FT430 and FT450 have one scaled pulse output and one pulse pass through. The FT440 has two scaled pulse outputs. Galvanic isolation is provided for most pulse outputs.

The FT450 is battery powered while the FT430 may be powered by an external DC power source or an optional internal AC power supply*. The FT440 is a "two-wire" or "loop powered" device, meaning that it is powered by the 4-20 mA loop circuit itself. An optional internal AC power supply* is available for the FT440 with dual 24 and 12VDC outputs to power both the loop and sensors requiring more power than the loop can supply.

Pulse and 4-20mA analog outputs can be used to signal external devices, e.g. certain metering pumps and water treatment controls. Alternatively, one or more pulse outputs can be configured as alarm outputs. These flow computers can be password protected to prevent resetting the total or changing configuration settings.

The FT430/440/450 meters are available in wall and meter mount configurations. The FT430 and FT440 models can also be panel mounted. Some configurations can be converted from wall to meter or meter to wall after installation if needed. Consult factory for details.

Order the FT440 only if a 4-20mA output signal is a requirement and the FT450 if internal battery power is needed. Otherwise the FT430 offers the most flexibility.

**Internal power supply is available for the wall mount option only.*

ISO 9001:2008 Certified Company

PROUDLY MADE IN THE USA

Specifications*

		FT430	FT440	FT450
Power		7-30Vdc, 4mA	9-30Vdc, 4mA (4-20 mA when loop-powered)	Lithium "C", 3.6Vdc, replaceable. Life is ~5 years depending on usage.
Display	**Rate**	5-digit autorange	5-digit autorange	5-digit autorange
	Total	8-digit	8-digit	8-digit
Units	**Rate Units**	Gallons/Second/Minute/Hour/Day, Liter/Second/Minute/Hour/Day, Cubic Feet/Second/Minute/Hour/Day, Cubic Meters/Second/Minute/Hour/Day, Mega Liters/Day, Million Gallons/Day, Fluid Oz/Second/Minute/Hour/Day, Barrels/Second/Minute/Hour/Day		
	Total Units	Gallon, Gallon x 1000, Liters, Mega Liter, Cubic Meter, Acre Feet, Cubic Feet, Cubic Feet x 1000, Million Gallon, Acre Inch, Fluid Ounce, Barrels		
Outputs	**Pulse Output 1**	Scaled pulse output, high alarm output or low alarm output. Optoisolated on FT430 and FT440.[1]		
	Pulse Output 2	Pulse pass through	Scaled pulse output, high alarm output or low alarm output.[1]	Pulse pass through
	Loop Power Output	N/A	4-20mA Loop	N/A
Set P Range		0.1 - 99999.9 units/pulse	0.1 - 99999.9 units/pulse	0.1 - 99999.9 units/pulse
Input		5V pulse or contact closure	5V pulse or contact closure	Micropower GMR Sensor (square wave)
Input Range		0.75[2] - 2000Hz	0.75[2] - 2000Hz	0.75[2] - 550Hz
K-Factor Range		.001 - 999999.999	.001 - 999999.999	.001 - 999999.999
Flow Alarm Output Range		0.1 - 99999.9	0.1 - 99999.9	0.1 - 99999.9
Operating Temperature		-5˚ to 55˚ C (23˚ to 131˚ F)	-5˚ to 55˚ C (23˚ to 131˚ F)	-5˚ to 55˚ C (23˚ to 131˚ F)
Non-Operating Temperature		-40˚ to 75˚ C (-40˚ to 158˚ F)	-40˚ to 75˚ C (-40˚ to 158˚ F)	-40˚ to 75˚ C (-40˚ to 158˚ F)
Environmental		NEMA 4X, IP67	NEMA 4X, IP67	NEMA 4X, IP67
Regulatory		CE Mark	CE Mark	CE Mark

** Specifications subject to change • Please consult our website for current data (www.seametrics.com).*
1 Scaled output pulses have a fixed width of 100ms. Maximum pulses per second is 6.5Hz
2 For pulse frequencies <1 Hz, increase setting in SET F menu to 3 or higher.

Features

***Includes password protection for tamper prevention when needed*

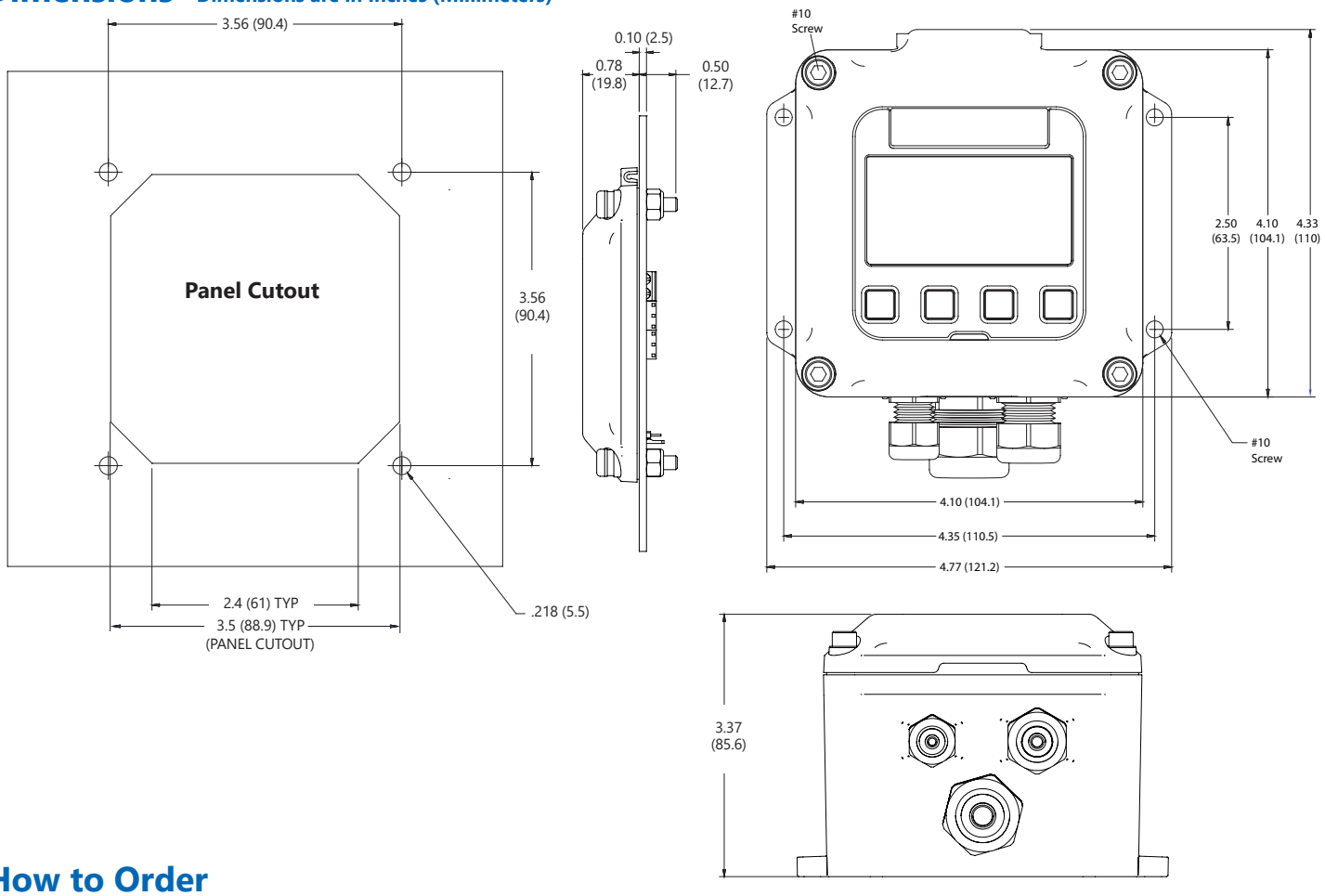
Pulse Output Function Table

PULSE OUTPUT 1 (SCALED)	FT430	FT440	FT450
TYPE	Current sinking	Current sinking	Current sinking
MAX. VOLTAGE	36 Vdc	36 Vdc	36 Vdc
MAX. CURRENT	100 mA	100 mA	100 mA
MAX. FREQUENCY	6.5 Hz	6.5 Hz	6.5 Hz
PULSE WIDTH	100 ms	100 ms	100 ms
ISOLATION	300 V	300 V	NOTE 1
CONFIGURABLE AS ALARM	YES (High or Low)	YES (High or Low)	YES (High or Low)
PULSE OUTPUT 2 (SCALED)	FT430	FT440 (Note 2)	FT450
TYPE	Not Available	Current sinking	Not Available
MAX. VOLTAGE		36 Vdc	
MAX. CURRENT		100 mA	
MAX. FREQUENCY		6.5 Hz	
PULSE WIDTH		100 ms	
ISOLATION		300 V	
CONFIGURABLE AS ALARM		YES (High or Low)	
PULSE OUTPUT 2 (PASS-THROUGH)	FT430	FT440	FT450
TYPE	Current sinking	Not Available	Current sinking
MAX. VOLTAGE	36 Vdc		36 Vdc
MAX. CURRENT	10 mA		100 mA
MAX. FREQUENCY	2000 Hz NOTE 2		550 Hz
PULSE WIDTH	SAME AS SENSOR INPUT		SAME AS SENSOR INPUT
ISOLATION	300 V		NOTE 1
CONFIGURABLE AS ALARM	NO		NO

NOTE 1: 150 V effective isolation when using Seametrics micropower sensors. • NOTE 2: With 2000 ohm or lower pull-up resistance.

Dimensions

Dimensions are in Inches (Millimeters)



How to Order

MODEL

DC-powered indicator = **FT430**

Loop-powered indicator/transmitter = **FT440**

Battery-powered indicator = **FT450**

MOUNTING

Wall mount = **-W**

Panel mount = **-P**

(FT430/FT440 only)

Meter mount = **See appropriate meter specification to order meter mounted units.**

OPTIONS

Tamper-evident = **-32**

Non-resettable total = **-64**

Dual Relay Output (FT430/440 only) = **-98**

Display Cover = **-126**

Built-in 120/240 Vac/12/24 Vdc dual power supply (FT430W/FT440W only) = **-139**

Built-in 120/240 Vac/12 Vdc single power supply (FT430W for use with mechanical or magmeters, FT440W for use with mechanical meters) = **-140**

ACCESSORIES

Display Cover = **102021**
Dual power supply, plug-in, 115 Vac, 12/24 Vdc = **PC42**
LMI pump power cable = **100013**
LMI pulse out cable = **100039**
Power converter, plug-in, 115 Vac, 24 Vdc = **PC3**
FT430 Module = **103591-01**
FT440 Module = **103591-02**
FT450 Module = **103591-03**
FT430/440 Dual Relay Option w/wire adapter = **100557**

ADAPTER KITS

	Part #	Electronics module	Lower wall housing	Lower meter housing
Convert wall to meter mount (MK10)	102632	Blue	Blue	Blue
Convert wall to meter mount (MK15)	103594	White	White	White
Convert meter to wall mount (MK20)	102633	Blue	Blue	Blue
Convert meter to wall mount (MK25)	103396	White	White	White
Adapter kit to mount white electronics to blue housing	103391	White	Blue	Blue
Adapter kit to mount white electronics to blue housing/ Tamper evident	103392	White	Blue	Blue

Seametrics • 19026 72nd Avenue South • Kent, Washington 98032 • USA
(P) 253.872.0284 • (F) 253.872.0285 • 1.800.975.8153 • seametrics.com

LT-65650318r2.1 20180726
7/26/2018

From:	Sarkipato, Ernest (DEQ)
To:	"Mike Enlow"; "Todd Luks"; dwatson@cityofbentonharbormi.gov; momalley@cityofbentonharbormi.gov
Cc:	Onan, Brandon (DEQ); Bolt, Jennifer (DEQ); Bolf, Michael (DEQ)
Subject:	Phosphate system
Date:	Tuesday, March 26, 2019 8:05:38 AM
Attachments:	2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf

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Thanks all for the timely work to get this system up and running. Looking for word from the city it is pumping and picking up ortho in the plant tap.

Also, a reminder that by March 31, 2019 we need to have the following:

-1 lead and copper sample from the entry point to the distribution system

-Submit your proposal for a corrosion control study

See attached ALE letter for the timeline originally sent.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

From:	Ruch, Suzann (EGLE)
To:	Nicholas Leonard; Roper, Cyndi; "charlotte@environmentalcouncil.org"
Cc:	Oswald, Eric (EGLE); Krisztian, George (EGLE); Philip, Kris (EGLE); Onan, Brandon (EGLE)
Subject:	Proposed Dates: Benton Harbor Corrosion Control
Date:	Thursday, December 5, 2019 2:28:07 PM

Good Afternoon:
Topic: Benton Harbor Corrosion Control
Attendees: EGLE: Eric Oswald, George Krisztian, Kris Philip, and Brandon Onan
GLELC – Nick Leonard; NRDC – Cyndi Roper; MEC – Charlotte Jameson
Location: Con Hall - Lansing
Here are some proposed dates/times:

Thursday, December 12: 10:30 a.m. – 12:30 p.m.
Monday, December 16: 10:00 a.m. – 11:00 a.m.
Wednesday, December 18: 1:00 p.m. – 2:00 p.m.
Wednesday, December 18: 3:00 p.m. – 4:00 p.m.
Thursday, December 19: 1:00 p.m. – 2:00 p.m.
Friday, December 20: 11:00 a.m. – 12:00 p.m.

Please advise which day/time works best for your calendar. If nothing works, I'll look for other options, though calendars for EGLE are VERY busy before the holiday.
NOTE: I will be out of the office on Friday, December 6, so it is likely that I will not reply until Monday, 12/9.
Thank you.

Suzann J. Ruch
Senior Executive Management Assistant to Eric Oswald
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
P.O. Box 30817
Lansing, Michigan 48909-8311
517-284-6544 | RuchS@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From:	Sarkipato, Ernest (EGLE)
To:	Darwin Watson
Cc:	momalley@cityofbentonharbormi.gov; Bolf, Michael (EGLE); Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Subject:	RE: BH ACO and Lead and Copper Compliance Status
Date:	Wednesday, May 8, 2019 8:07:05 AM

The corrosion plan below was updated.
We still need a plan for streamlining the rate collection process, which may not be considered overdue.
In addition, 5/15/19 is the due date for upgrading SCADA and also for fixing the chlorine.
Please provide updates for these items, and be aware of the upcoming deadline.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, April 12, 2019 9:54 AM
To: 'Darwin Watson' <dwatson@cityofbentonharbormi.gov>
Cc: momalley@cityofbentonharbormi.gov; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: BH ACO and Lead and Copper Compliance Status
Good morning Darwin,
Thank you for submitting the rate study and a request to extend a few ACO deadlines. In the future, please note Section 4.14 of the ACO requires these requests 10 days prior to the deadline.
I see the requested extensions to the ACO deadlines were granted, and as such I've attached a revised timeline for ACO compliance. The timeline also includes some of the lead and copper Action Level Exceedance dates. Please note: two items remain with a response needed that is now past the due date:
-Corrosion Plan. Based on my recollection of conversations, this proposal from the City was going to rely on Elhorn's plan to conduct a coupon study or set of studies to ensure the treatment rate and chemical selection are optimized to reduce lead release.
-Rates. The ACO requires the city to submit an implementation plan to ensure rates are sufficient to cover costs, per the recent rate study by a qualified consultant.
Please respond as soon as you can on these items, as they are now past due.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Tuesday, March 26, 2019 10:39 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov
Subject: Re: REMINDER

Good Morning Ernie,

Please find attached to this email a copy of the rate studies for water and sewer for the City of Benton Harbor.

Also, please accept this email as a formal request for extensions on the following items outlined in the Administrative Consent Order ("ACO"):

- **Finish upgrades to the SCADA system to store/access regulatory data, and ensure alarms and callouts for high turbidity and low chlorine** - the City requests that this due date be adjusted to **May 15, 2019**. This request is a result of scheduling issues with the vendor needed to install the necessary hardware and software.
- **Install metering capability on finished water**- the City is requesting that the deadline for this be adjusted to **June 15, 2019**. This request is based on challenges with getting equipment from the vendor and also the lead time needed to construct the meter for the application.
- **Have working chlorine analyzer on finished water tap** - the City is requesting that the deadline for this be adjusted to **May 15, 2019**. This request is based on challenges with getting equipment from the vendor and installation of the equipment.
- **Hire licensed operator for distribution system** - the City is requesting that the deadline for this be adjusted to **May 1, 2019**. This request is based on negotiations with the contractor.

If you have any questions, feel free to contact me.

Thanks

On Tue, Mar 26, 2019 at 7:45 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Hi Darwin,
> Please submit a request for extension by 11AM today, as I'm off for two weeks which will span the first ACO deadline.
> Also please submit an update on pumping of phosphate, and any initial residual monitoring data if available.
> Ernie

From:	Sarkipato, Ernest (DEQ)
To:	Mike O"Malley
Cc:	Darwin Watson; Bolf, Michael (DEQ); Bolt, Jennifer (DEQ); Onan, Brandon (DEQ); Thurston, Brian (DEQ)
Subject:	RE: BH ACO and Lead and Copper Compliance Status
Date:	Friday, April 12, 2019 4:36:32 PM
Attachments:	bh phosphate permit 199015.pdf

Hi Mike,

We acknowledge your request to review the population and LCR sampling numbers. I'll try to facilitate internal conversations early next week, and have requested residential account numbers from Wanda to help support an accurate estimate. Regardless, eventually the city must identify a LCR sample pool sufficient to fill 60 bottles, due to the proximity to 10k population.

Thanks for all the other input on the attached timeline. My hope was that would be helpful to get most of the items together into one timeline.

As for the optimal corrosion control treatment study, this is not considered a violation of the ACO however was included as a permit condition on the phosphate construction permit. Please coordinate with Elhorn to submit a plan for the optimization study.

Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, April 12, 2019 12:59 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>; momalley@cityofbentonharbormi.gov; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: Re: BH ACO and Lead and Copper Compliance Status

Ernie,

This is the 1st time I have ever seen this email. So, as you might have guessed, I jumped on it in lieu of anything else to do.

As for the Lead and Copper sampling plan.

I was here, Mentoring Greg Alimenti under a BH/ MDEQ Order Agreement; and actually managed Benton Harbor's 1st Tri-annual Reduced Monitoring Plan.

And, under that same Order Agreement Benton Harbor installed their 1st continuous Chlorine Analyzer on the wall in the laboratory, where I just had a new one installed. And, it was still there in December of 2008 when I came back.

I was gone under the State of MI Appointed Emergency Manager when the Benton Charter went on line as their own water system.

But ZERO experiences as to what BH Water would do with their new found *Medium Distrbution System*.

When I come back in 2016; I find that there are only 2 Stage 2 DBP sites; I had to ask *Why the City was only collecting 1 TOC sample per quarter;*

And the Coliform Collection dropped to 10 samples a month.

And, the Distribution System Certified Operator Oversite Requirement dropped from S1 to S2.

I understand that the plant remained a F1 plant, not on residents served but on size and complexity.

So, I ask you; *Why wasn't the Sampling Requirement for Lead and Copper not adjusted to reflect the "Medium Size' S2 system versus Large Size S1.*

Since the onset of the *ALE;* and the Benton Harbor Water System required to return to a original Lead and Copper Sampling Protocal.

And, the City's decimated financial condition brought on by 2 Sate Appointed Emergency Managers.
I have to insist, that the Benton Harbor water distribution system is required to return to 1991 initial Lead and Copper program as a **Medium Sized system** as defined in the Lead & Copper rules.
I will work very hard to continue with the lead and copper monitoring by collecting 40 samples before June 30, 2019 and 40 more by 12/31/2019.
And, please revise the ACO to reflect this and return it at your earliest convenience.
I left the attachment as an Excel spreadsheet to make it convenient for the changes.
Attached: *MO Response to Compliance from ES.xlsx*
Thank you and have a blessed Easter Season,
Mike O'Malley
Benton Harbor Water Superintendent
On Fri, Apr 12, 2019 at 9:53 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

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Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

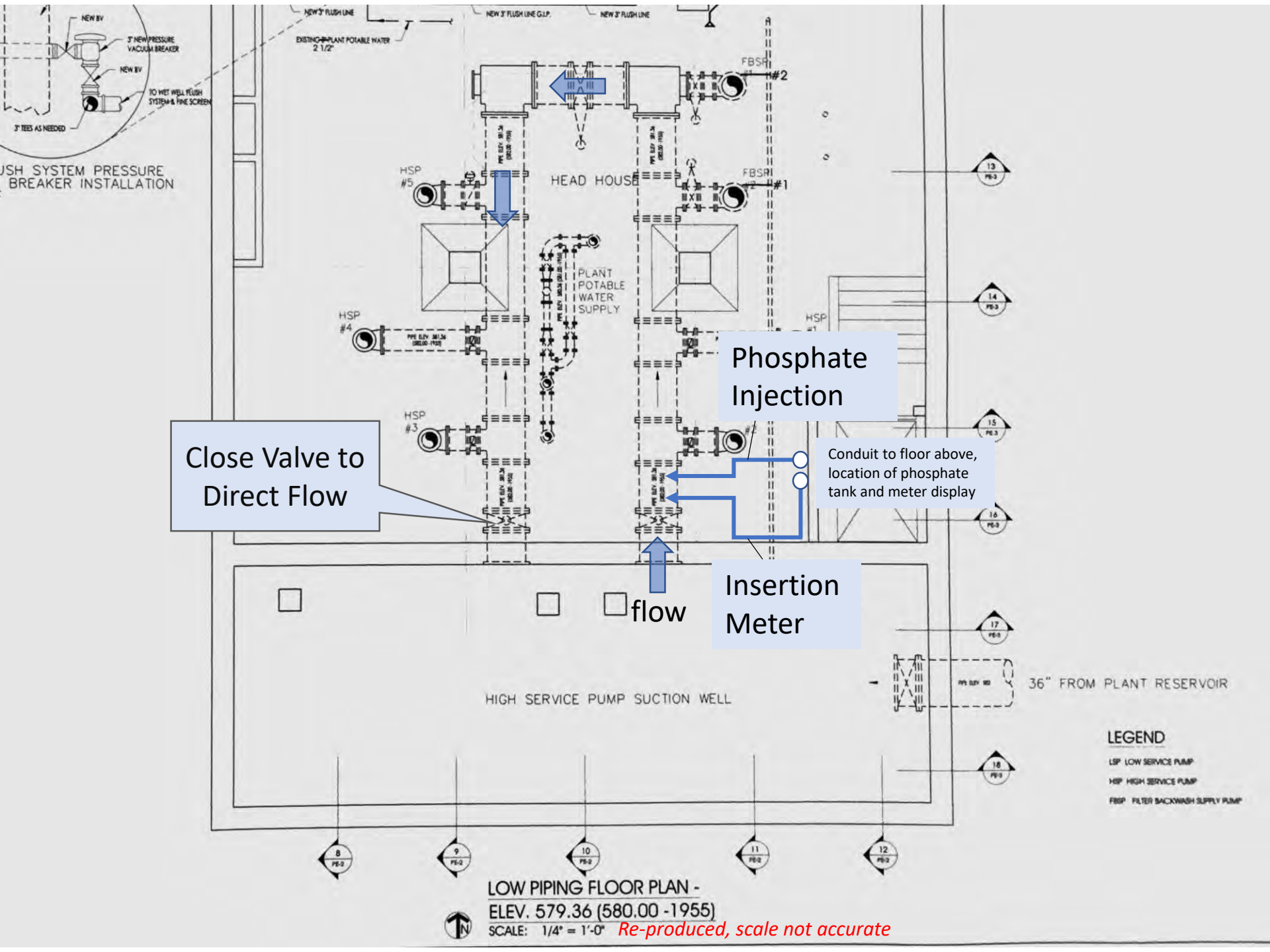
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

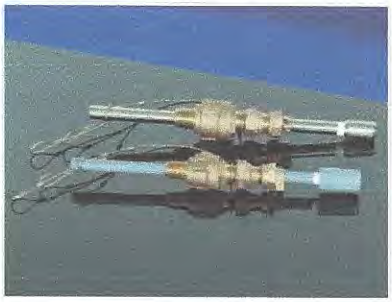
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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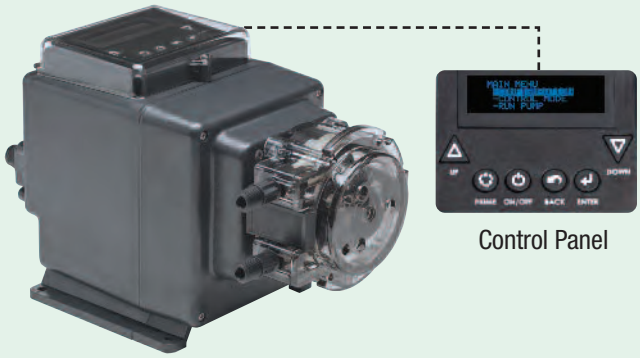
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

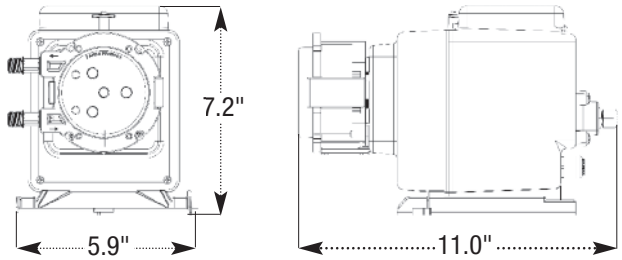
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

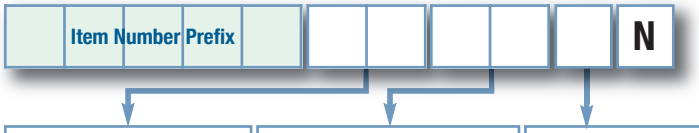
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

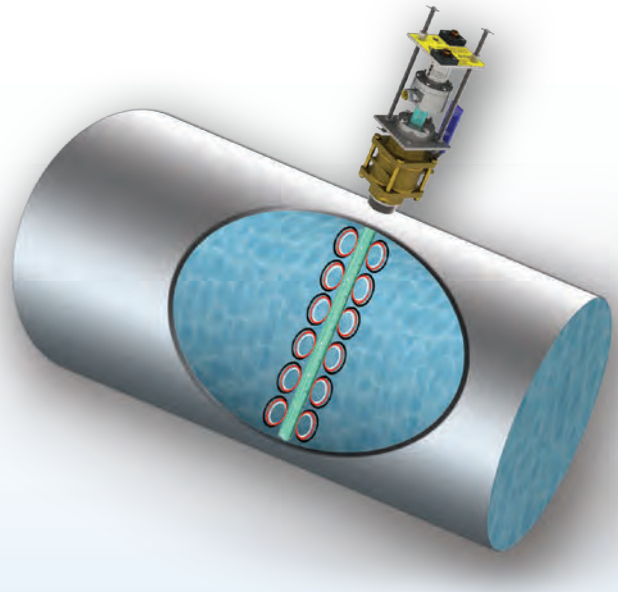
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

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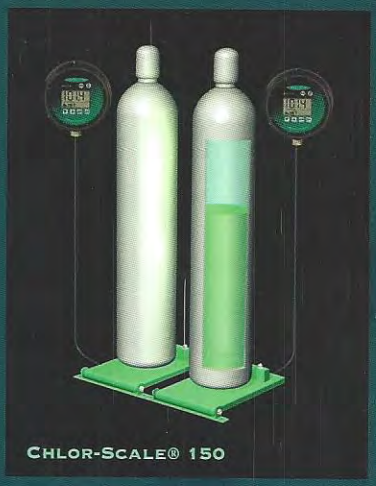
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

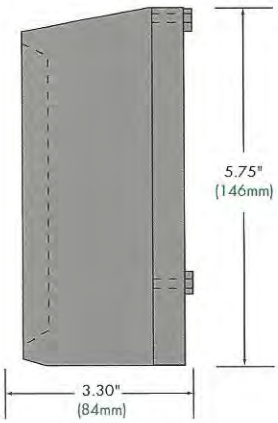
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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From:	Sarkipato, Ernest (DEQ)
To:	Mike O"Malley
Cc:	Darwin Watson; Bolf, Michael (DEQ); Bolt, Jennifer (DEQ); Onan, Brandon (DEQ); Thurston, Brian (DEQ)
Subject:	RE: BH ACO and Lead and Copper Compliance Status
Date:	Friday, April 12, 2019 4:36:35 PM
Attachments:	bh phosphate permit 199015.pdf

Hi Mike,

We acknowledge your request to review the population and LCR sampling numbers. I'll try to facilitate internal conversations early next week, and have requested residential account numbers from Wanda to help support an accurate estimate. Regardless, eventually the city must identify a LCR sample pool sufficient to fill 60 bottles, due to the proximity to 10k population.

Thanks for all the other input on the attached timeline. My hope was that would be helpful to get most of the items together into one timeline.

As for the optimal corrosion control treatment study, this is not considered a violation of the ACO however was included as a permit condition on the phosphate construction permit. Please coordinate with Elhorn to submit a plan for the optimization study.

Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, April 12, 2019 12:59 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>; momalley@cityofbentonharbormi.gov; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: Re: BH ACO and Lead and Copper Compliance Status

Ernie,

This is the 1st time I have ever seen this email. So, as you might have guessed, I jumped on it in lieu of anything else to do.

As for the Lead and Copper sampling plan.

I was here, Mentoring Greg Alimenti under a BH/ MDEQ Order Agreement; and actually managed Benton Harbor's 1st Tri-annual Reduced Monitoring Plan.

And, under that same Order Agreement Benton Harbor installed their 1st continuous Chlorine Analyzer on the wall in the laboratory, where I just had a new one installed. And, it was still there in December of 2008 when I came back.

I was gone under the State of MI Appointed Emergency Manager when the Benton Charter went on line as their own water system.

But ZERO experiences as to what BH Water would do with their new found *Medium Distrbution System*.

When I come back in 2016; I find that there are only 2 Stage 2 DBP sites; I had to ask *Why the City was only collecting 1 TOC sample per quarter;*

And the Coliform Collection dropped to 10 samples a month.

And, the Distribution System Certified Operator Oversite Requirement dropped from S1 to S2.

I understand that the plant remained a F1 plant, not on residents served but on size and complexity.

So, I ask you; *Why wasn't the Sampling Requirement for Lead and Copper not adjusted to reflect the "Medium Size' S2 system versus Large Size S1.*

Since the onset of the *ALE;* and the Benton Harbor Water System required to return to a original Lead and Copper Sampling Protocal.

And, the City's decimated financial condition brought on by 2 Sate Appointed Emergency Managers.
I have to insist, that the Benton Harbor water distribution system is required to return to 1991 initial Lead and Copper program as a **Medium Sized system** as defined in the Lead & Copper rules.
I will work very hard to continue with the lead and copper monitoring by collecting 40 samples before June 30, 2019 and 40 more by 12/31/2019.
And, please revise the ACO to reflect this and return it at your earliest convenience.
I left the attachment as an Excel spreadsheet to make it convenient for the changes.
Attached: *MO Response to Compliance from ES.xlsx*
Thank you and have a blessed Easter Season,
Mike O'Malley
Benton Harbor Water Superintendent
On Fri, Apr 12, 2019 at 9:53 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Good morning Darwin,
> Thank you for submitting the rate study and a request to extend a few ACO deadlines. In the future, please note Section 4.14 of the ACO requires these requests 10 days prior to the deadline. I see the requested extensions to the ACO deadlines were granted, and as such I've attached a revised timeline for ACO compliance. The timeline also includes some of the lead and copper Action Level Exceedance dates. Please note: two items remain with a response needed that is now past the due date:
> -Corrosion Plan. Based on my recollection of conversations, this proposal from the City was going to rely on Elhorn's plan to conduct a coupon study or set of studies to ensure the treatment rate and chemical selection are optimized to reduce lead release.
> -Rates. The ACO requires the city to submit an implementation plan to ensure rates are sufficient to cover costs, per the recent rate study by a qualified consultant.
> Please respond as soon as you can on these items, as they are now past due.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater
> **From:** Darwin Watson <dwatson@cityofbentonharbormi.gov>
> **Sent:** Tuesday, March 26, 2019 10:39 AM
> **To:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> **Cc:** momalley@cityofbentonharbormi.gov
> **Subject:** Re: REMINDER
> Good Morning Ernie,
> Please find attached to this email a copy of the rate studies for water and sewer for the City of Benton Harbor.
> Also, please accept this email as a formal request for extensions on the following items outlined in the Administrative Consent Order ("ACO"):
>
> - **Finish upgrades to the SCADA system to store/access regulatory data, and ensure alarms and callouts for high turbidity and low chlorine** - the City requests that this due date be adjusted to **May 15, 2019**. This request is a result of scheduling issues with the vendor

needed to install the necessary hardware and software.

- **Install metering capability on finished water**- the City is requesting that the deadline for this be adjusted to **June 15, 2019**. This request is based on challenges with getting equipment from the vendor and also the lead time needed to construct the meter for the application.
- **Have working chlorine analyzer on finished water tap** - the City is requesting that the deadline for this be adjusted to **May 15, 2019**. This request is based on challenges with getting equipment from the vendor and installation of the equipment.
- **Hire licensed operator for distribution system** - the City is requesting that the deadline for this be adjusted to **May 1, 2019**. This request is based on negotiations with the contractor.

If you have any questions, feel free to contact me.
Thanks
On Tue, Mar 26, 2019 at 7:45 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Hi Darwin,
> Please submit a request for extension by 11AM today, as I'm off for two weeks which will span the first ACO deadline.
> Also please submit an update on pumping of phosphate, and any initial residual monitoring data if available.
> Ernie

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 199015 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
-No day tank needed per estimated chemical use
-Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
-Insertion meter to interface with chemical dosing pump
-isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
-chemical scale with digital readout (Forceflow XT-600)
-LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ 1/24/19 Date (269) 363-0575 Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

CONTINUATION SHEET FOR SPECIAL CONDITIONS.

CONDITIONS:

1. The city shall submit for approval a proposal for optimal corrosion control study no later than March 31, 2019, in accordance with the city's Action Level Exceedance Letter. The results of the study will be used to determine the optimal treatment practices that minimize corrosion, which may differ slightly from those outlined in this permit.
2. This permit also authorizes an alternate/interim installation of the chemical feed system, to minimize delay of the installation. Prior to installation of the flow-pacing system for the chemical feed pump with flow meter, the city may first install and run the chemical feed pump at a steady flow rate by controlling it with a relay tied to a high service pump, operated at a steady rate.

MDEQ/MMDHD USE ONLY

PERMIT #	DATE	ISSUED TO:
199015	February 25, 2019	City of Benton Harbor

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

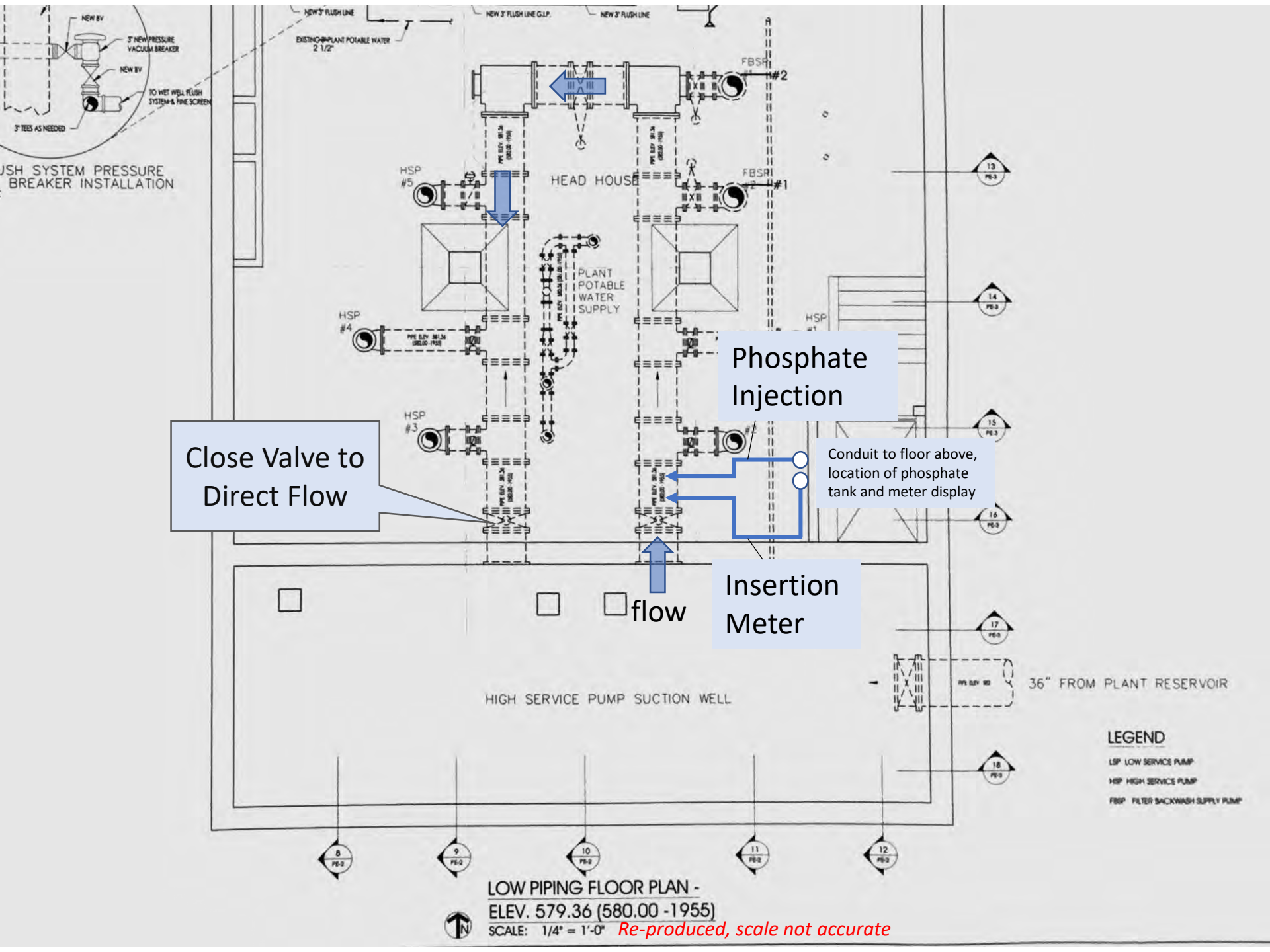
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

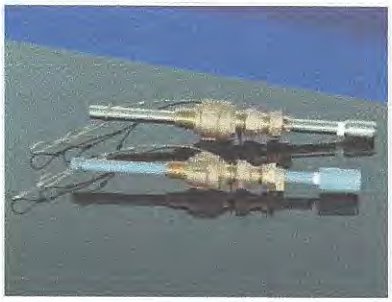
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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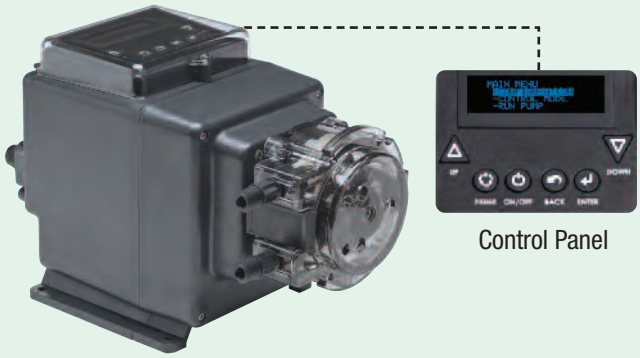
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

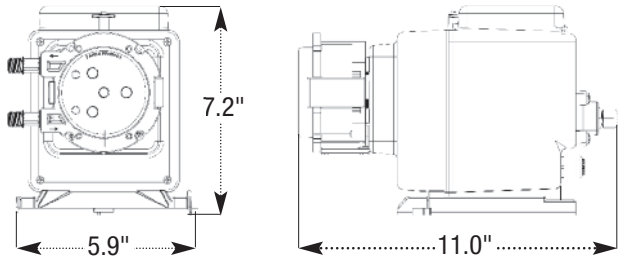
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

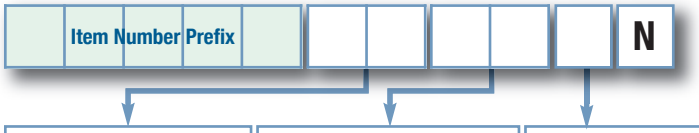
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

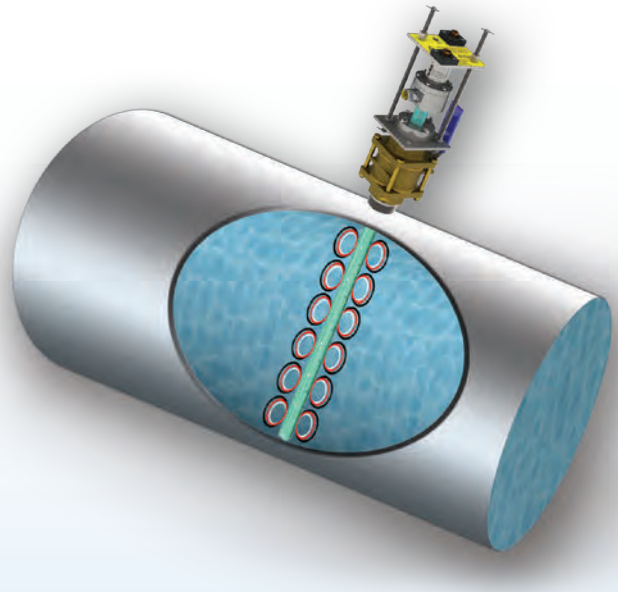
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

Printed in USA

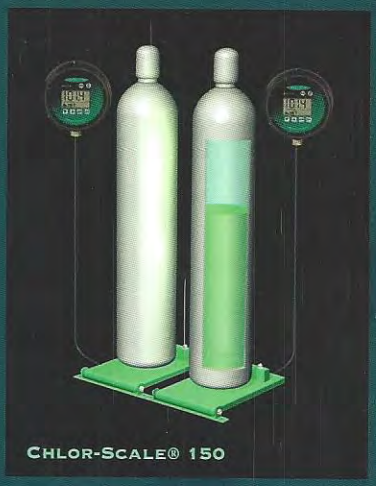
Lit Number 30120-45 Rev 1.3 / 05-13

Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

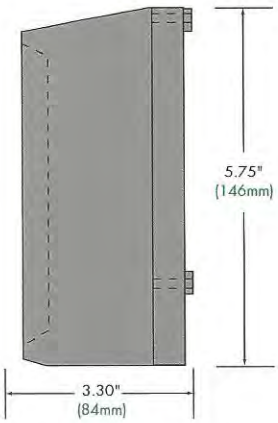
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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From:	Sarkipato, Ernest (EGLE)
To:	Darwin Watson
Cc:	momalley@cityofbentonharbormi.gov; Bolf, Michael (EGLE); Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Subject:	RE: BH ACO and Lead and Copper Compliance Status
Date:	Wednesday, May 8, 2019 8:07:08 AM

The corrosion plan below was updated.
We still need a plan for streamlining the rate collection process, which may not be considered overdue.
In addition, 5/15/19 is the due date for upgrading SCADA and also for fixing the chlorine.
Please provide updates for these items, and be aware of the upcoming deadline.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, April 12, 2019 9:54 AM
To: 'Darwin Watson' <dwatson@cityofbentonharbormi.gov>
Cc: momalley@cityofbentonharbormi.gov; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: BH ACO and Lead and Copper Compliance Status
Good morning Darwin,
Thank you for submitting the rate study and a request to extend a few ACO deadlines. In the future, please note Section 4.14 of the ACO requires these requests 10 days prior to the deadline.
I see the requested extensions to the ACO deadlines were granted, and as such I've attached a revised timeline for ACO compliance. The timeline also includes some of the lead and copper Action Level Exceedance dates. Please note: two items remain with a response needed that is now past the due date:
-Corrosion Plan. Based on my recollection of conversations, this proposal from the City was going to rely on Elhorn's plan to conduct a coupon study or set of studies to ensure the treatment rate and chemical selection are optimized to reduce lead release.
-Rates. The ACO requires the city to submit an implementation plan to ensure rates are sufficient to cover costs, per the recent rate study by a qualified consultant.
Please respond as soon as you can on these items, as they are now past due.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Tuesday, March 26, 2019 10:39 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov
Subject: Re: REMINDER

Good Morning Ernie,

Please find attached to this email a copy of the rate studies for water and sewer for the City of Benton Harbor.

Also, please accept this email as a formal request for extensions on the following items outlined in the Administrative Consent Order ("ACO"):

- **Finish upgrades to the SCADA system to store/access regulatory data, and ensure alarms and callouts for high turbidity and low chlorine** - the City requests that this due date be adjusted to **May 15, 2019**. This request is a result of scheduling issues with the vendor needed to install the necessary hardware and software.
- **Install metering capability on finished water**- the City is requesting that the deadline for this be adjusted to **June 15, 2019**. This request is based on challenges with getting equipment from the vendor and also the lead time needed to construct the meter for the application.
- **Have working chlorine analyzer on finished water tap** - the City is requesting that the deadline for this be adjusted to **May 15, 2019**. This request is based on challenges with getting equipment from the vendor and installation of the equipment.
- **Hire licensed operator for distribution system** - the City is requesting that the deadline for this be adjusted to **May 1, 2019**. This request is based on negotiations with the contractor.

If you have any questions, feel free to contact me.

Thanks

On Tue, Mar 26, 2019 at 7:45 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Hi Darwin,
> Please submit a request for extension by 11AM today, as I'm off for two weeks which will span the first ACO deadline.
> Also please submit an update on pumping of phosphate, and any initial residual monitoring data if available.
> Ernie

From:	Sarkipato, Ernest (EGLE)
To:	Darwin Watson
Cc:	momalley@cityofbentonharbormi.gov; Bolf, Michael (EGLE); Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Subject:	RE: BH ACO and Lead and Copper Compliance Status
Date:	Wednesday, May 8, 2019 8:07:05 AM

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www.michigan.gov/drinkingwater

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> Ernie

From: Bolf, Michael (EGLE)
To: Sarkipato, Ernest (EGLE)
Subject: RE: BH Corrosion Control Study Content For Abonmarche
Date: Wednesday, February 17, 2021 12:03:00 PM
Attachments: image001.png

I'm not sure what the best approach is, but I got the impression from Chris Cook that he was looking for some of the technical content of what a study should consist of. I agree we don't want to be overly prescriptive and the consultant should choose the methodology, but perhaps the RFP should list more of these technical points as items that should be considered when determining the method. The intent of my bullet points was to list considerations, not to say they must do all of these things.

This is new to me too, but for the purpose of an RFP, I think we need enough technical content to satisfy EPA, but write it in a way that allows the consultant to consider the technical points and create their own proposal.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Tuesday, February 16, 2021 9:43 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Re: BH Corrosion Control Study Content For Abonmarche

Thanks. I was going to run a draft by Brandon, and copy you. Lots of your thoughts below seem like great components of a study, and my approach was going to err on the side of letting the consultant choose the methodology. Ill try and blend the two.

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Tuesday, February 16, 2021 3:59:11 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: BH Corrosion Control Study Content For Abonmarche

Ernie,

Some of this might be beyond the scope of a corrosion control study, but here is a quick brain dump:

- Verify DSMI. Update if necessary
- Statistical analysis of historic Pb/Cu data (i.e. look at subsequent samples from the same sample sites).
- Analysis of distribution system pipe scales on various materials
- Gather a broad data set on distribution and plant tap WQPs
    - Focus on PO4 dose and distribution concentration variability
    - Focus on Cl dose and residual variability
    - Focus on pH
- Solubility test (Brandon has an example from Kalamazoo)
- Pipe loops
- Comparison of nearby water system water quality. What can we learn from neighboring conventional plants with similar source, treatment, and DSMs.
- Evaluate single family home water use trends. This is a bit out of the box, but could be a significant contributor to high lead numbers.

Here are a few firms that have experience. There is no problem with sharing names of firms with experience as long as we don't recommend a particular one.

- Black & Veatch
- Fishbeck
- Carus
- Cornwell

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From:	Onan, Brandon (EGLE)
To:	Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE)
Cc:	Sylvester, Matthew (EGLE)
Subject:	RE: BH Corrosion Study
Date:	Friday, March 5, 2021 7:58:25 AM
Attachments:	2021-03-03 BH Corrosion RFP_onan comments_20210305.docx image001.png image002.png image003.png image004.png

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Comments tracked in the attached.
I do not think a reading list needs to be provided to a firm who has the burden of providing their experience and understanding of the topic area in order to be awarded the RFP. If we give them the reading list we have essentially helped to qualify them by telling them where to focus their energy. It is up to the contractor bidding to provide evidence that they have the recourses, and or knowledge of the resources, needed to meet the RFP requirements.
Just my two cents,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, March 5, 2021 7:34 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Subject: FW: BH Corrosion Study
I have made changes based on our conversation with Eric and George and Jeni at the weekly BH call (attached).

From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, March 3, 2021 4:30 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Subject: FW: BH Corrosion Study
Attached is the near-final RFP for BH corrosion study. Abonmarche has two questions, here's my proposed reply.

1. I don't think the EPA's OCCT technical rec document is appropriate to reference in this effort. I could send abonmarche the attached list of reading from EPA, which was provided in relationship to the August 2020 OCCT study workshop w/ Arcadis?
2. I think Abonmarche is feeling this open-ended type of RFP will result in an influx of miss-the-mark proposals. He may be right, though I think it would be easy to sort through those efficiently if that's the case.

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 3, 2021 3:47 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us)

<emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie,
Please find attached, a draft version of the Corrosion Study RFP. I had a few additional comments listed below.

1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 25, 2021 10:36 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

Jason,
Our approach would probably be to allow the qualified consultant to propose the timeline, as it will depend on what methodologies they are proposing. If we give a bookend of 12 months, that will likely constrain their options. Can we extend that out to at least 18 months, but also indicate periodic check-ins?
Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, February 24, 2021 1:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: BH Corrosion Study

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Ernie,
What would be a realistic timeframe to expect this type of corrosion study to be completed? Does it tie into any requirements from EGLE to the city in terms of hard deadlines? We had mentioned 12 months on the EPA application (expected to be completed by March 2022), which was on our EPA application from the fall.
Thanks,

Jason W. Marquardt, PE
Senior Project Manager
D 269.926.4565
O 269.927.2295 ext. 171
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abonmarche.com
ABONMARCHE

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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT

City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be fully completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Commented [OB(1]: This may not be a long enough time frame for the proposed final report

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in ~~the previous~~ October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, further study is required to identify the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items shall be described and addressed in the Corrosion Study report to be provided to the City upon completion.

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (this will require an assessment of previous sample site codes to allow for data comparison)
3. Analyze key water quality parameters (WQPs):
    a. Phosphate (PO_4) dose and distribution concentration variability
    b. Chlorine (Cl) dose and residual variability
    c. pH and impacts on corrosion indices
4. Analysis of distribution system pipe scales on various materials
5. Solubility tests for a comparative study of treatment methods
6. Pipe loop testing and the effectiveness of corrosion treatment
7. Comparison with analogous water system water quality and corrosion control strategies
8. Evaluate single family home water use trends

Commented [SE(2]: Considered?

Commented [OB(3R2]: No, because this is in regards to the final report…not the proposal

Commented [OB(4]: This is going to drive the project time line.

City of Benton Harbor
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Benton Harbor, MI 49022
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For additional technical references, please refer to Attachment A

Commented [OB(5]: We should not be providing this. If the city is the experts on CCT studies with all the necessary references, then why are they putting out an RFP?

Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – March TBD
Consultant Award – April 2021
Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Commented [OB(6]: This may not be long enough due to the proposed report discussing pipe loop studies.

Terms and Conditions of this RFP:

1. Proposals must be submitted by 10:00 am on March TBD. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

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5. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, “Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

6. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

From:	Sarkipato, Ernest (EGLE)
To:	Jason Marquardt
Cc:	Chris Cook; Ellis Mitchell (emitchell@bhcity.us)
Subject:	RE: BH Corrosion Study
Date:	Thursday, March 11, 2021 1:53:00 PM
Attachments:	image001.png image002.png image003.png image004.png 2021-03-09 BH Corrosion RFP_onan comments_sark response.docx

Please see attached. I realize it's been over a week, so we can discuss our proposed changes to the RFP.

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 3, 2021 3:47 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

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Ernie,
Please find attached, a draft version of the Corrosion Study RFP. I had a few additional comments listed below.

1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
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Subject: RE: BH Corrosion Study
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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT
City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be substantially completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

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Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Note: some study components, such as a pipe loop if included, will likely remain in place for the city's use and continue to provide useful optimization data after this due date. In this case, the report should include recommendations on continued utilization of these components.

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   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

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Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

From: Sarkipato, Ernest (EGLE)
To: Koch, David S.
Cc: Onan, Brandon (EGLE)
Subject: RE: Benton Harbor - Corrosion Control
Date: Monday, April 19, 2021 4:20:00 PM

HI David. I think we'd like to see a project proposal that is multi-phase, and would potentially be able to be picked back up in the future should the need arise. The first phase might be fairly limited as you suggest below, due to limitations on the current funding source.

From: Koch, David S. <KochDS@bv.com>
Sent: Monday, April 19, 2021 3:09 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: We have received the RFP, and it seemed a bit opposite of what we last talked about with you and Jason – i.e., not just a desktop evaluation. Am I missing anything? Thanks.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 25, 2021 1:31 PM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

No it has not been issued, so it's a timely discussion.

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 25, 2021 1:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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I'll check availability, and get back to you. When you say addendum, does that suggest the RFP has been issued? I have not seen it, but it seems this is important enough to hold off on issuing an RFP until settled?

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 25, 2021 12:30 PM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

I'd like to set up a call with you, Jason M from Abonmarche, and our Corrosion specialist Brandon Onan. Would you be open to that? I would assume that any findings/decisions would then be codified into the RFP as an addendum or similar.

Ernie

From: Koch, David S. <KochDS@bv.com>
Sent: Wednesday, March 24, 2021 4:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: We've been talking about this, and since the RFP not yet issued (or at least we haven't seen it yet), wanted to put a bug in your ear on a concern we have. It's around what can be done, and what value can be gained from that, for a budget of $50k.

This stems from the EPA's final Lead and Copper Rule Revisions (LCRR), and even though the new administration plans a review of what was promulgated in January, I don't believe there's any expectation of significant changes. And though Michigan's recent LCR has its own requirements too, the Federal still apply. And the key part of that is the LCCR requirement that systems with 90th percentile lead levels greater than the new lead trigger level of 10 ppb (ug/L) conduct a corrosion control study to optimize corrosion control treatment. The LCRR further details that corrosion control studies for systems with lead service lines MUST involve pipe loop testing with harvested lead service lines. Benton Harbor would fall in this category with the known presence of lead service lines and recent LCR 90th percentile lead levels exceeding the action level of 15 ppb (ug/L). There are a host of conditions that must be tested including, increasing the pH/alkalinity of the finished water, testing orthophosphate addition at differing feed dosages.

This pipe loop testing will be significantly in excess of $50k. And it is valuable and needed, not only per the LCRR, but also in the best means of addressing the issues at Benton Harbor. Pipe loop testing will provide concrete data to make decisions on how to optimize corrosion control treatment, where as a desktop study (what could be done within $50k) would only be useful in identifying alternative water chemistries to test and predicting theoretical metal solubilities. A plan of starting with a desktop study would only prolong the time before an alternative "optimized" corrosion control treatment could be installed because pipe loop testing would still be required. Since lead is a health risk, any delay in getting the optimal corrosion control treatment installed is putting the community at risk. We strongly believe that Benton Harbor start pipe loop testing as soon as possible based on the EPA's final LCRR requirements to deliver the fastest and most accurate approach to optimized corrosion control treatment. It will take time to get their LSLs replaced, and optimized corrosion control is needed until they can get to that milestone of all LSLs replaced.

If you'd like to talk further about this, and/or have any questions on need, how to, etc., for these pipe loop studies, I can get our corrosion control practice leader on a call.

David S. Koch, P.E.*
Associate Vice President
*Licensed in IL, MI, WI
Black & Veatch
2 N. Riverside Plaza, Suite 2050, Chicago, IL 60606
D +1 312-683-7829 **M** +1 616-308-7165
E KochDS@bv.com

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From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, March 19, 2021 11:40 AM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

Ah ha! The internet, indeed. I can confirm, the ballpark for the BH study based on documents submitted to the EPA for the grant is also $50k (coincidentally the same as the other contract, which I'm not very familiar with).

From: Koch, David S. <KochDS@bv.com>
Sent: Friday, March 19, 2021 11:52 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: One quick question hoping you can answer related to our brief discussion the other day – I was trying to recall a specific. You had mentioned $50K as a budget when we were talking, and I thought you meant that as the budget for BH's corrosion control study. But later, found something publicly available that says Cornwell's budget for the State contract for overall support (so although you didn't want to say who was selected – the internet comes thru!) is $50k. So make me question if I had heard correctly of not – i.e., maybe you had been referring to the Cornwell contract and not the BH budget amount? Are you able to confirm?

(And although not multi-tasking as I write this email, I am going into a series of meetings/calls starting at the top of the hour…)

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>

Sent: Thursday, March 18, 2021 3:28 PM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

Heehee I understand. Updates would be easier on the phone, that's all. We do hope you will consider putting in a bid for a corrosion optimization study on the BH water system!

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 18, 2021 4:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Thanks Ernie – I assume that was your call I just missed! I'm tied up in another call (multi-tasking with some emails…don't tell anyone…).

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 18, 2021 3:25 PM
To: Koch, David S. <KochDS@bv.com>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

I'll call.

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 18, 2021 4:23 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Benton Harbor - Corrosion Control

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Ernie/Mike: Benton Harbor and their challenges with their water system seem to have dropped a bit off our radar since we were discussing capacity assessment needs late last year, but I had heard some recent rumors, and just trying to determine what the situation might be, and if any opportunity for BV to help. In general, the rumors I've heard were that an RFP is imminent for a corrosion control study for them, funding from the grant that they received last year. I had tried connecting with Mike O'Malley late last year as well (specific to LCR, LSLR, etc.), but he seemed to drop into incommunicado, and I just recently heard he may no longer be with the City and that the State may have had to step in to get someone (private company) in responsible charge for their water system.

So wondering if you might be able to offer any insight? Much appreciated, in advance. Thanks.

David S. Koch, P.E.*
Associate Vice President
*Licensed in IL, MI, WI
Black & Veatch
2 N. Riverside Plaza, Suite 2050, Chicago, IL 60606
D +1 312-683-7829 **M** +1 616-308-7165
E KochDS@bv.com

Building a World of Difference.®

From:	Sarkipato, Ernest (EGLE)
To:	Koch, David S.
Subject:	RE: Benton Harbor - Corrosion Control
Date:	Thursday, March 25, 2021 2:30:00 PM

No it has not been issued, so it's a timely discussion.

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 25, 2021 1:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
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Subject: RE: Benton Harbor - Corrosion Control

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Ernie

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Sent: Wednesday, March 24, 2021 4:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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To: Koch, David S.
Subject: RE: Benton Harbor - Corrosion Control
Date: Thursday, March 25, 2021 1:29:00 PM

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From: Sarkipato, Ernest (EGLE)
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Date: Wednesday, March 24, 2021 4:45:00 PM

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Subject: Benton Harbor - Corrosion Control

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Ernie/Mike: Benton Harbor and their challenges with their water system seem to have dropped a bit off our radar since we were discussing capacity assessment needs late last year, but I had heard some recent rumors, and just trying to determine what the situation might be, and if any opportunity for BV to help. In general, the rumors I've heard were that an RFP is imminent for a corrosion control study for them, funding from the grant that they received last year. I had tried connecting with Mike O'Malley late last year as well (specific to LCR, LSLR, etc.), but he seemed to drop into incommunicado, and I just recently heard he may no longer be with the City and that the State may have had to step in to get someone (private company) in responsible charge for their water system.

So wondering if you might be able to offer any insight? Much appreciated, in advance. Thanks.

David S. Koch, P.E.*
Associate Vice President
*Licensed in IL, MI, WI
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2 N. Riverside Plaza, Suite 2050, Chicago, IL 60606
D +1 312-683-7829 **M** +1 616-308-7165
E KochDS@bv.com

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From: Koch, David S.
To: Sarkipato, Ernest (EGLE)
Cc: Onan, Brandon (EGLE)
Subject: RE: Benton Harbor - Corrosion Control
Date: Monday, April 19, 2021 5:31:09 PM

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I appreciate the input – thanks.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, April 19, 2021 3:21 PM
To: Koch, David S. <KochDS@bv.com>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control
HI David. I think we'd like to see a project proposal that is multi-phase, and would potentially be able to be picked back up in the future should the need arise. The first phase might be fairly limited as you suggest below, due to limitations on the current funding source.

From: Koch, David S. <KochDS@bv.com>
Sent: Monday, April 19, 2021 3:09 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: We have received the RFP, and it seemed a bit opposite of what we last talked about with you and Jason – i.e., not just a desktop evaluation. Am I missing anything? Thanks.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 25, 2021 1:31 PM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control
No it has not been issued, so it's a timely discussion.

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 25, 2021 1:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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I'll check availability, and get back to you. When you say addendum, does that suggest the RFP has been issued? I have not seen it, but it seems this is important enough to hold off on issuing an RFP until settled?

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 25, 2021 12:30 PM
To: Koch, David S. <KochDS@bv.com>

Subject: RE: Benton Harbor - Corrosion Control

I'd like to set up a call with you, Jason M from Abonmarche, and our Corrosion specialist Brandon Onan. Would you be open to that? I would assume that any findings/decisions would then be codified into the RFP as an addendum or similar.

Ernie

From: Koch, David S. <KochDS@bv.com>
Sent: Wednesday, March 24, 2021 4:35 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: We've been talking about this, and since the RFP not yet issued (or at least we haven't seen it yet), wanted to put a bug in your ear on a concern we have. It's around what can be done, and what value can be gained from that, for a budget of $50k.

This stems from the EPA's final Lead and Copper Rule Revisions (LCRR), and even though the new administration plans a review of what was promulgated in January, I don't believe there's any expectation of significant changes. And though Michigan's recent LCR has its own requirements too, the Federal still apply. And the key part of that is the LCCR requirement that systems with 90th percentile lead levels greater than the new lead trigger level of 10 ppb (ug/L) conduct a corrosion control study to optimize corrosion control treatment. The LCRR further details that corrosion control studies for systems with lead service lines MUST involve pipe loop testing with harvested lead service lines. Benton Harbor would fall in this category with the known presence of lead service lines and recent LCR 90th percentile lead levels exceeding the action level of 15 ppb (ug/L). There are a host of conditions that must be tested including, increasing the pH/alkalinity of the finished water, testing orthophosphate addition at differing feed dosages.

This pipe loop testing will be significantly in excess of $50k. And it is valuable and needed, not only per the LCRR, but also in the best means of addressing the issues at Benton Harbor. Pipe loop testing will provide concrete data to make decisions on how to optimize corrosion control treatment, where as a desktop study (what could be done within $50k) would only be useful in identifying alternative water chemistries to test and predicting theoretical metal solubilities. A plan of starting with a desktop study would only prolong the time before an alternative "optimized" corrosion control treatment could be installed because pipe loop testing would still be required. Since lead is a health risk, any delay in getting the optimal corrosion control treatment installed is putting the community at risk. We strongly believe that Benton Harbor start pipe loop testing as soon as possible based on the EPA's final LCRR requirements to deliver the fastest and most accurate approach to optimized corrosion control treatment. It will take time to get their LSLs replaced, and optimized corrosion control is needed until they can get to that milestone of all LSLs replaced.

If you'd like to talk further about this, and/or have any questions on need, how to, etc., for these pipe loop studies, I can get our corrosion control practice leader on a call.

David S. Koch, P.E.*
Associate Vice President
*Licensed in IL, MI, WI
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E KochDS@bv.com

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From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, March 19, 2021 11:40 AM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

Ah ha! The internet, indeed. I can confirm, the ballpark for the BH study based on documents submitted to the EPA for the grant is also $50k (coincidentally the same as the other contract, which I'm not very familiar with).

From: Koch, David S. <KochDS@bv.com>
Sent: Friday, March 19, 2021 11:52 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Ernie: One quick question hoping you can answer related to our brief discussion the other day – I was trying to recall a specific. You had mentioned $50K as a budget when we were talking, and I thought you meant that as the budget for BH's corrosion control study. But later, found something publicly available that says Cornwell's budget for the State contract for overall support (so although you didn't want to say who was selected – the internet comes thru!) is $50k. So make me question if I had heard correctly of not – i.e., maybe you had been referring to the Cornwell contract and not the BH budget amount? Are you able to confirm?
(And although not multi-tasking as I write this email, I am going into a series of meetings/calls starting at the top of the hour…)

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 18, 2021 3:28 PM
To: Koch, David S. <KochDS@bv.com>
Subject: RE: Benton Harbor - Corrosion Control

Heehee I understand. Updates would be easier on the phone, that's all. We do hope you will consider putting in a bid for a corrosion optimization study on the BH water system!

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 18, 2021 4:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

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Thanks Ernie – I assume that was your call I just missed! I'm tied up in another call (multi-tasking with some emails…don't tell anyone…).

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 18, 2021 3:25 PM
To: Koch, David S. <KochDS@bv.com>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor - Corrosion Control

I'll call.

From: Koch, David S. <KochDS@bv.com>
Sent: Thursday, March 18, 2021 4:23 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Benton Harbor - Corrosion Control

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Ernie/Mike: Benton Harbor and their challenges with their water system seem to have dropped a bit off our radar since we were discussing capacity assessment needs late last year, but I had heard some recent rumors, and just trying to determine what the situation might be, and if any opportunity for BV to help. In general, the rumors I've heard were that an RFP is imminent for a corrosion control study for them, funding from the grant that they received last year. I had tried connecting with Mike O'Malley late last year as well (specific to LCR, LSLR, etc.), but he seemed to drop into incommunicado, and I just recently heard he may no longer be with the City and that the State may have had to step in to get someone (private company) in responsible charge for their water system.
So wondering if you might be able to offer any insight? Much appreciated, in advance. Thanks.

David S. Koch, P.E.*
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E KochDS@bv.com

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From:	Thurston, Brian (EGLE)
To:	Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE)
Subject:	RE: Benton Harbor - review required
Date:	Wednesday, May 5, 2021 5:02:00 PM
Attachments:	image001.png

yes

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Tuesday, May 4, 2021 11:01 AM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor - review required
Yes, no issues with that from my end, and I think it's supported by the work plan.

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Tuesday, May 4, 2021 10:59 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor - review required
Is everyone OK with me adding the 3 requirements Mike set out?
Eric

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Tuesday, May 4, 2021 9:18 AM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: Re: Benton Harbor - review required
I had similar thoughts on first reading. The appendix language seems to drift from the ACO outline a bit. I've attached the full work plan, which I think does a better job of outlining the approach for the study (following the ACO requirements), including Mike's points below.
I would like to try adding some language from the work plan into the Appendix A, if that sounds appropriate.
Ernie

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Tuesday, May 4, 2021 8:27:58 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor - review required
I believe this is what came in from Benton Harbor. We can add that language to the requirements in the appendix.
Eric

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Tuesday, May 4, 2021 8:26 AM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor - review required

Eric,
Do you know what the source of the wording in Appendix A is? Seems to be missing a few key points:

- Identify the level of service and water quality goals
- Identify the optimal organizational structure for the water system
- Evaluation of water supply alternatives (i.e. what partnership opportunities exist to best meet level of service goals in the long run?)

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Monday, May 03, 2021 6:11 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: Fwd: Benton Harbor - review required
Take a quick look especially at appendix A and let me know if you have any comments. This is ready to go out.

Sent from my iPhone

Begin forwarded message:

> **From:** "McDonald, Paul (EGLE)" <mcdonaldp@michigan.gov>
> **Date:** May 3, 2021 at 5:18:13 PM EDT
> **To:** "Oswald, Eric (EGLE)" <OswaldE1@michigan.gov>
> **Subject: Benton Harbor - review required**
>
> Good evening Eric,
> Per our conversation, the agreement is attached. Standard language until you get to the top of page 8 where it begins on what we need your review/approval on.
> Thanks,
> Paul

From:	Bolf, Michael (EGLE)
To:	Nelson, Maureen (EGLE)
Subject:	RE: Benton Harbor AACO Deadlines
Date:	Thursday, March 4, 2021 3:50:00 PM

Sounds good. Thank Maureen.

From: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Sent: Thursday, March 04, 2021 2:19 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Benton Harbor AACO Deadlines

Good afternoon,

I added a few deadlines to the enforcement tracking calendar for the requirements in the paragraphs that have hard deadlines (paragraphs 2.11, 2.13, and 2.14, kind of). I can't add any others because they are all contingent upon the approval of the capacity study and the corrosion control study, which are the bulk of the remainder of the requirements.

Please let me know if you have any questions.

Thanks,
Maureen

--
Maureen Nelson
Enforcement Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-242-8328 | NelsonM2@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From:	Darold L. Harlan
To:	Sarkipato, Ernest (EGLE); emitchell@bhcity.us; Marcus Muhammad
Cc:	EGLE-DWEH-Grand-Rapids; Robert Jones; Kimberly Thompson; Oswald, Eric (EGLE); Thurston, Brian (EGLE); Bolf, Michael (EGLE); Nelson, Maureen (EGLE); George Regan; Catherine Winn
Subject:	RE: Benton Harbor AACO Update
Date:	Monday, January 11, 2021 9:39:00 AM
Attachments:	image001.png

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Ernie,

As per our discussion on January 29th, could we please update the ACO to show the due date for the completion of filter to waste valves to September 30th 2021? I believe we all came to an agreement that the City had more critical issues that need attention at this time. With the limited funding available we feel this should fall down a few notches on our priority list.

Thanks,

Darold Harlan

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, January 11, 2021 8:58 AM
To: emitchell@bhcity.us; Marcus Muhammad <mmuhammad@bhcity.us>
Cc: EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>; Robert Jones <rjones@fv-operations.com>; Kimberly Thompson <kthompson@bhcity.us>; Darold L. Harlan <dharlan@fv-operations.com>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; George Regan <gregan@fv-operations.com>; Catherine Winn <cwinn@fv-operations.com>
Subject: Benton Harbor AACO Update

Honorable Mayor and Mr. City Manager,

Please find attached a progress update on the City of Benton Harbor drinking water ACO. I'm happy to present an update to the City Commission as needed.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
616-307-0261
www.Michigan.gov/communitywater

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From: Bolf, Michael (EGLE)
To: London, Bob (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE); Philip, Kris (EGLE); Sarkipato, Ernest (EGLE)
Cc: Oswald, Eric (EGLE); Krisztian, George (EGLE); Nelson, Maureen (EGLE)
Subject: RE: Benton Harbor CCT
Date: Friday, February 7, 2020 12:18:45 PM

All,

A higher ortho dose will likely prove to be the optimum treatment strategy, but I think Bob is concerned that the state is being too prescriptive and as a result the city may not consider all options in the CC study. There is merit in having a comprehensive study by a third party that evaluates the alternatives and provides justification why the selected alternative is the best. The evaluation of alternatives may be as simple as a few statements why many of the other strategies will not be effective in this situation. The focus may still be on the type and dose of phosphate product, but will include an evaluation of other treatments. In the unlikely event they propose an exotic treatment strategy we disagree with, we still don't have to approve it. You might consider a slight change to the following paragraph:

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system, but without further study it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c). This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on ~~a range of phosphate chemicals and dosages to optimize~~ identifying optimum corrosion control treatment for the city of Benton Harbor's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: London, Bob (EGLE) <LONDONR@michigan.gov>
Sent: Friday, February 07, 2020 10:31 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: Re: Benton Harbor CCT

After discussing the letter further with Brandon, my revised comment #2 is as follows:

2. We are designating treatment initially to attempt to make a quick and meaningful improvement to Benton Harbor's treated water as it relates to corrosivity. I concur with the treatment designation. We are also requiring an optimization study. The study should follow the requirements of Rule 604 f(3), meaning that other treatment alternatives (in addition to a phosphate-based inhibitor) should be considered in the study. The wording of the letter appears to direct them toward selecting orthophosphate addition. Orthophosphate addition may very well be the recommended treatment for OCCT, but I don't believe there's a reason to word the letter to diminish the other possible options. The City will have an orthophosphate feed system in place to protect the water system while they work on the study, so the study should be comprehensive. I don't support the wording related to the direction of the study as it is currently written.

From: London, Bob (EGLE)
Sent: Monday, February 3, 2020 11:23 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Nelson, Maureen

(EGLE) <NelsonM2@michigan.gov>
Subject: RE: Benton Harbor CCT

Here are my comments:

1. In 2017 when we designated treatment for the Genesee County water plant, we assigned interim WQPs for the plant tap. We assigned a "target residual," a "90 percent range," and "100 percent range." Of the three, only the "100 percent range" was regulatory (100 percent of their residuals had to fall within the range, except they were allowed 9 excursion days in any 6-month monitoring period per our rules). Here is a screen shot from the letter we sent them:

distribution system (water plant tap):

Parameter	Target	90 percent range*	100 percent range*
pH (standard units)	7.5	7.3 – 7.8	7.1 – 7.9
Orthophosphate residual (mg/l)	2.5	2.2 – 2.9	2.1 – 3.7
Free chlorine residual (mg/l)	1.0 – 1.7	1.0 – 1.9	1.0 – 2.0

*At least 90 percent of your monthly sample results should fall within the 90 percent range for each parameter. One hundred percent of your monthly sample results must fall within the 100 percent range for each parameter, except that nine (9) excursion days are allowed during each WQP monitoring period. An excursion day is a day during which one or more result is outside the allowable range

We did this so they would practice controlling their residuals within a reasonable range – to get them ready for the future when they would have actual enforceable WQP ranges. They also needed to start preparing for distribution system WQPs, which aren't nearly as easy to control as point-of-entry WQPs. My recommendation is to assign interim WQPs for both the plant tap and the distribution system…even if you don't make any of them enforceable yet, I think it's a valuable operational tool for them to have a target and range.

2. The letter directs the City to undertake a corrosion control study per 604f(3)(c). That sub-rule states that several treatment options (pH/alkalinity adjustment, calcium hardness adjustment, and the use of corrosion inhibitors) must be evaluated. The system must also evaluate constraints that might make a particular treatment option unfeasible. Basically, the sub-rule places the burden of eliminating possible treatment options on the water system. The draft letter appears to steer the City toward the use of phosphate-based inhibitors. My opinion is that we should not bias the direction of the study in the letter. Discussions about the likely direction can certainly take place, but the City does need to follow the requirements of the rule.

Bob London
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
989-450-7834
londonr@michigan.gov
michigan.gov/EGLE

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>

Sent: Monday, February 03, 2020 9:54 AM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; London, Bob (EGLE) <LONDONR@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: Benton Harbor CCT

All,

Ernie and I have drafted a letter to Benton Harbor mandating a change in treatment. Please review the letter and provide comment. Currently this letter has my signature block on it but I am open to suggestions on who this letter should come from. We want to get this letter to the supply ASAP.

Letter is at the following link: T:\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\District 93\Benton Harbor\Communication\Draft_Benton Harbor OCCT update_20200203.docx

Thanks for your timely response,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From: Onan, Brandon (EGLE)
To: London, Bob (EGLE); Thurston, Brian (EGLE); Philip, Kris (EGLE); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE)
Cc: Oswald, Eric (EGLE); Krisztian, George (EGLE); Nelson, Maureen (EGLE)
Subject: RE: Benton Harbor CCT
Date: Thursday, February 6, 2020 1:38:22 PM

Hey Bob,
Responding to your second comment below, I wrote the letter to be more focused on inhibitor treatment (namely orthophosphate treatment) because of the following reasons:

- The EPA has expressed that they no longer consider calcium hardness adjustment (ie. calcium carbonate stabilization) as an effective CCT.
- In the current state that the Benton Harbor treatment plant is in, and in light of some of there TMF issues, I am not comfortable entertaining the idea of pH/alkalinity adjustments as an options for CCT. Varying changes to orthophosphate levels, while not ideal, do not necessarily result in a large scale release, but even small shifts in pH can have very large and immediate impacts to the distribution system.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: London, Bob (EGLE) <LONDONR@michigan.gov>
Sent: Monday, February 3, 2020 11:23 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: RE: Benton Harbor CCT
Here are my comments:

1. In 2017 when we designated treatment for the Genesee County water plant, we assigned interim WQPs for the plant tap. We assigned a "target residual," a "90 percent range," and "100 percent range." Of the three, only the "100 percent range" was regulatory (100 percent of their residuals had to fall within the range, except they were allowed 9 excursion days in any 6-month monitoring period per our rules). Here is a screen shot from the letter we sent them:

distribution system (water plant tap):

Parameter	Target	90 percent range*	100 percent range*
pH (standard units)	7.5	7.3 – 7.8	7.1 – 7.9
Orthophosphate residual (mg/l)	2.5	2.2 – 2.9	2.1 – 3.7
Free chlorine residual (mg/l)	1.0 – 1.7	1.0 – 1.9	1.0 – 2.0

*At least 90 percent of your monthly sample results should fall within the 90 percent range for each parameter. One hundred percent of your monthly sample results must fall within the 100 percent range for each parameter, except that nine (9) excursion days are allowed during each WQP monitoring period. An excursion day is a day during which one or more result is outside the allowable range.

We did this so they would practice controlling their residuals within a reasonable range – to get them ready for the future when they would have actual enforceable WQP ranges. They also needed to start preparing for distribution system WQPs, which aren't nearly as easy to control as point-of-entry WQPs. My recommendation is to assign interim WQPs for both the plant tap and the distribution system…even if you don't make any of them enforceable yet, I think it's a valuable operational tool for them to have a target and range.

2. The letter directs the City to undertake a corrosion control study per 604f(3)(c). That sub-rule states that several treatment options (pH/alkalinity adjustment, calcium hardness adjustment, and the use of corrosion inhibitors) must

be evaluated. The system must also evaluate constraints that might make a particular treatment option unfeasible. Basically, the sub-rule places the burden of eliminating possible treatment options on the water system. The draft letter appears to steer the City toward the use of phosphate-based inhibitors. My opinion is that we should not bias the direction of the study in the letter. Discussions about the likely direction can certainly take place, but the City does need to follow the requirements of the rule.

Bob London
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
989-450-7834
londonr@michigan.gov
michigan.gov/EGLE

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Monday, February 03, 2020 9:54 AM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; London, Bob (EGLE) <LONDONR@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: Benton Harbor CCT

All,

Ernie and I have drafted a letter to Benton Harbor mandating a change in treatment. Please review the letter and provide comment. Currently this letter has my signature block on it but I am open to suggestions on who this letter should come from. We want to get this letter to the supply ASAP.

Letter is at the following link: T:\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\District 93\Benton Harbor\Communication\Draft_Benton Harbor OCCT update_20200203.docx

Thanks for your timely response,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From: Bolf, Michael (EGLE)
To: London, Bob (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE); Philip, Kris (EGLE); Sarkipato, Ernest (EGLE)
Cc: Oswald, Eric (EGLE); Krisztian, George (EGLE); Nelson, Maureen (EGLE)
Subject: RE: Benton Harbor CCT
Date: Friday, February 7, 2020 12:18:51 PM

All,

A higher ortho dose will likely prove to be the optimum treatment strategy, but I think Bob is concerned that the state is being too prescriptive and as a result the city may not consider all options in the CC study. There is merit in having a comprehensive study by a third party that evaluates the alternatives and provides justification why the selected alternative is the best. The evaluation of alternatives may be as simple as a few statements why many of the other strategies will not be effective in this situation. The focus may still be on the type and dose of phosphate product, but will include an evaluation of other treatments. In the unlikely event they propose an exotic treatment strategy we disagree with, we still don't have to approve it. You might consider a slight change to the following paragraph:

The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system, but without further study it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c). This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on ~~a range of phosphate chemicals and dosages to optimize~~ identifying optimum corrosion control treatment for the city of Benton Harbor's water system. Reference to analogous water systems alone will not suffice to meet this requirement.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: London, Bob (EGLE) <LONDONR@michigan.gov>
Sent: Friday, February 07, 2020 10:31 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: Re: Benton Harbor CCT

After discussing the letter further with Brandon, my revised comment #2 is as follows:

2. We are designating treatment initially to attempt to make a quick and meaningful improvement to Benton Harbor's treated water as it relates to corrosivity. I concur with the treatment designation. We are also requiring an optimization study. The study should follow the requirements of Rule 604 f(3), meaning that other treatment alternatives (in addition to a phosphate-based inhibitor) should be considered in the study. The wording of the letter appears to direct them toward selecting orthophosphate addition. Orthophosphate addition may very well be the recommended treatment for OCCT, but I don't believe there's a reason to word the letter to diminish the other possible options. The City will have an orthophosphate feed system in place to protect the water system while they work on the study, so the study should be comprehensive. I don't support the wording related to the direction of the study as it is currently written.

From: London, Bob (EGLE)
Sent: Monday, February 3, 2020 11:23 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: RE: Benton Harbor CCT

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Thanks for your timely response,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor

Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From:	Sylvester, Matthew (EGLE)
To:	Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Subject:	RE: Benton Harbor Compiled L/C Data
Date:	Thursday, July 30, 2020 9:39:10 AM
Attachments:	Benton Harbor LC_WQP Data.xlsx

Please see the attached excel file with compiled Benton Harbor data.
-Matt

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, July 30, 2020 9:37 AM
To: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor Compiled L/C Data
I'd prefer to see the data analysis before hand…
-----Original Appointment-----
From: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Sent: Thursday, July 30, 2020 9:34 AM
To: Sylvester, Matthew (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE)
Subject: Benton Harbor Compiled L/C Data
When: Thursday, July 30, 2020 1:00 PM-2:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting
Good morning gentlemen,
This meeting is for the discussion of some data I have compiled for Benton Harbor to attempt to show some trends for L/C results over the last 18 months or so. Please let me know if you would like to reschedule, but it appeared that this time slot was open on everyone's schedule.
-Matt

Join Microsoft Teams Meeting

+1 248-509-0316 United States, Pontiac (Toll)

Conference ID: 925 000 063#

Local numbers | Reset PIN | Learn more about Teams | Meeting options

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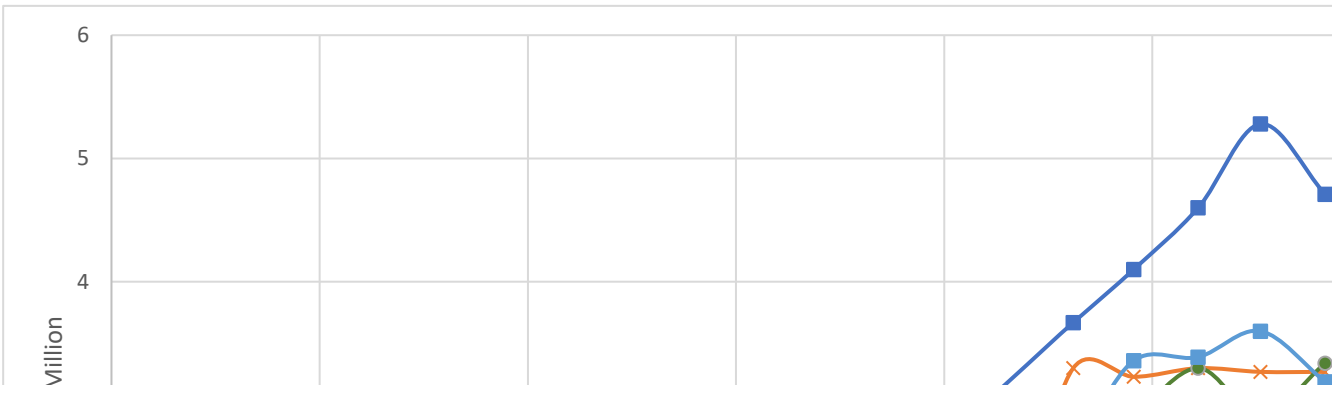
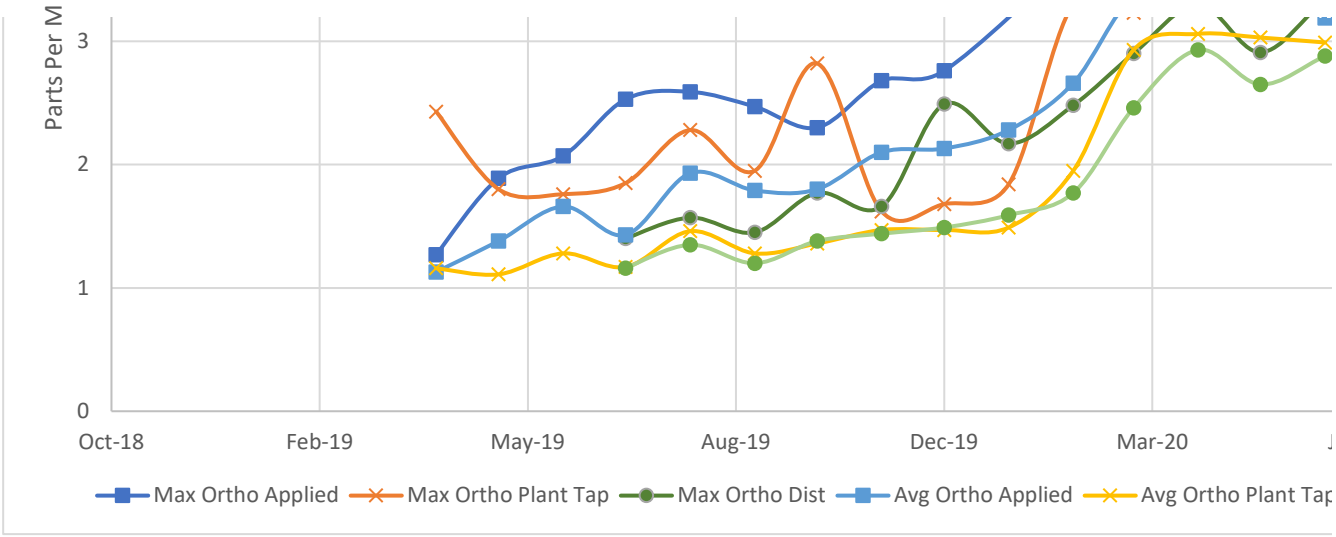
Benton Harbor

2019	WSSN	Pumpage	Date of	Orthophosphate (mg/L)				pH	
				Min:	Max:			Min:	Max:
MONTH	600	MGD	Max and Min	App	Tap	Distro	Days outside range	Raw	Plt Tap
Jan-19	**Total**	32.757							
Date Rec'd:	**Ave**	1.057						7.9	7.9
	Max	1.406	1/25/2019					8.1	8
2/9/2019	**Min**	0.828	1/13/2019					7.8	7.7
Feb-19	**Total**	39.026							
Date Rec'd:	**Ave**	1.394						7.9	7.8
	Max	1.744	2/11/2019					8.2	8
3/10/2019	**Min**	0.971	2/28/2019					7.8	7.7
Mar-19	**Total**	33.376							
Date Rec'd:	**Ave**	1.077						7.9	7.6
	Max	1.266	3/14/2019					8.1	8
4/10/2019	**Min**	0.888	3/4/2019					7.8	7.5
Apr-19	**Total**	29.558							
Date Rec'd:	**Ave**	0.985		1.13	1.16			8.1	8
	Max	1.145	4/24/2019	1.27	2.43			8.2	8.2
5/10/2019	**Min**	0.825	4/14/2019	0.57	0.29			7.8	7.8
May-19	**Total**	31.086							
Date Rec'd:	**Ave**	1.003		1.38	1.11			8	8
	Max	1.115	5/16/2019	1.89	1.8			8.2	8.3
6/7/2019	**Min**	0.870	5/5/2019	0.16	0.11			7.9	7.8
Jun-19	**Total**	31.210							
Date Rec'd:	**Ave**	1.040		1.66	1.28			8.1	8.1
	Max	1.340	6/28/2019	2.07	1.76			8.2	8.3
7/10/2019	**Min**	0.950	6/2/2019	0.62	0.18			7.9	7.9
Jul-19	**Total**	35.247							
Date Rec'd:	**Ave**	1.137		1.43	1.17	1.16		8.1	8.1
	Max	1.540	7/29/2019	2.53	1.85	1.4		8.3	8.3
8/12/2019	**Min**	0.975	7/6/2019	0.13	0.13	0.86		7.9	7.8
Aug-19	**Total**	34.177							
Date Rec'd:	**Ave**	1.103		1.93	1.46	1.35		8.1	8.1
	Max	1.213	8/10/2019	2.59	2.28	1.57		8.3	8.3
9/9/2019	**Min**	1.008	8/18/2019	1.04	1.05	1.07		7.9	7.9
Sep-19	**Total**	32.080							
Date Rec'd:	**Ave**	1.069		1.79	1.28	1.2		8.1	8.1
	Max	1.222	9/7/2019	2.47	1.95	1.45		8.3	8.3
10/10/2019	**Min**	0.940	9/1/2019	1.19	0.52	0.63		8	7.9
Oct-19	**Total**	30.840							
Date Rec'd:	**Ave**	0.995		1.8	1.36	1.38		8.1	8
	Max	1.155	10/14/2019	2.3	2.82	1.77		8.3	8.2
11/7/2019	**Min**	0.870	10/26/2019	0.85	0.77	0.78		7.9	7.9
Nov-19	**Total**	30.098							

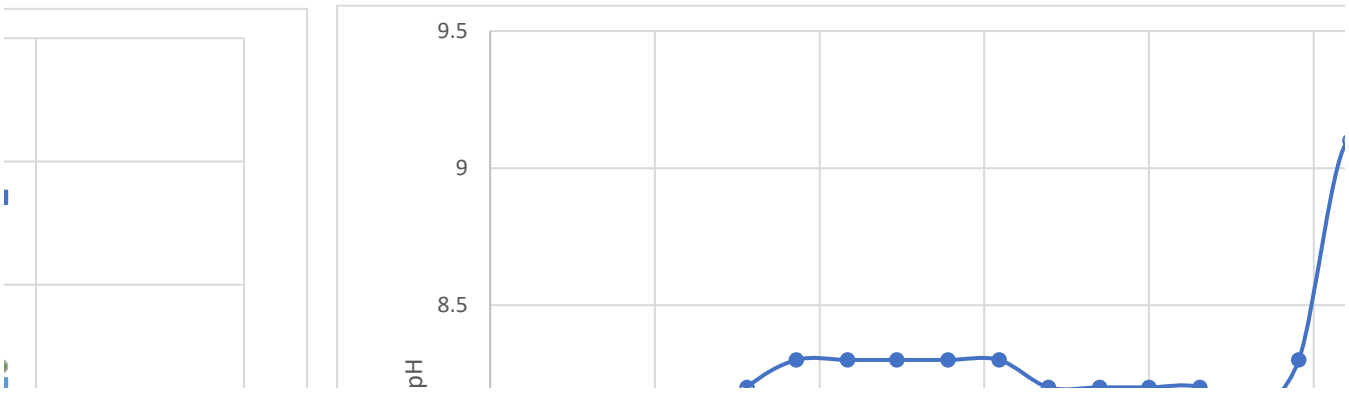
Date Rec'd:	Ave	1.003		2.1	1.47	1.44		8.1	8.1
	Max	1.098	11/20/2019	2.68	1.62	1.66		8.3	8.2
12/10/2019	Min	0.755	11/2/2019	0.79	0.81	1.24		7.9	7.8
Dec-19	Total	30.355							
Date Rec'd:	Ave	0.979		2.13	1.47	1.49		8.1	8
	Max	1.113	12/6/2019	2.76	1.68	2.49		8.2	8.2
1/10/2020	Min	0.890	12/20/2019	0.84	0	1.22		8	7.6
Jan-20	Total	31.540							
Date Rec'd:	Ave	1.017		2.28	1.49	1.59		8.00	8.00
	Max	1.123	1/26/2020	3.67	1.84	2.17		8.20	8.20
2/7/2020	Min	0.903	1/16/2020	1.29	0.00	1.31		7.90	7.70
Feb-20	Total	29.515							
Date Rec'd:	Ave	1.018		2.66	1.95	1.77		8.00	8.00
	Max	1.258	2/24/2020	4.10	3.30	2.48		8.20	8.10
3/7/2020	Min	0.848	2/14/2020	1.58	0.87	1.34		7.90	7.80
Mar-20	Total	30.670							
Date Rec'd:	Ave	0.989		3.36	2.93	2.46		8.10	8.10
	Max	1.138	3/22/2020	4.60	3.23	2.90		8.30	8.30
4/9/2020	Min	0.788	3/29/2020	1.78	0.59	1.29		7.90	7.90
Apr-20	Total	27.693							
Date Rec'd:	Ave	0.923		3.39	3.06	2.93		8.20	8.10
	Max	1.113	4/14/2020	5.28	3.30	3.30		8.30	9.10
5/8/2020	Min	0.805	4/16/2020	0.00	2.74	2.59		8.00	7.90
May-20	Total	28.728							
Date Rec'd:	Ave	0.927		3.60	3.03	2.65		8.10	8.10
	Max	1.093	5/4/2020	4.71	3.27	2.91		8.30	8.30
6/4/2020	Min	0.793	5/24/2020	1.73	2.58	1.79		7.90	7.90
Jun-20	Total	29.520							
Date Rec'd:	Ave	0.984		3.19	2.99	2.88		8.10	8.10
	Max	1.105	6/4/2020	5.10	3.27	3.34		8.30	8.30
7/10/2020	Min	0.868	6/2/2020	1.18	2.42	2.52		8.00	7.90
		Total	Average	2.26	1.81	1.86		8.06	8.01
			Max	5.28	3.30	3.34		8.30	9.10
			Min	0.00	0.00	0.63		7.80	7.50



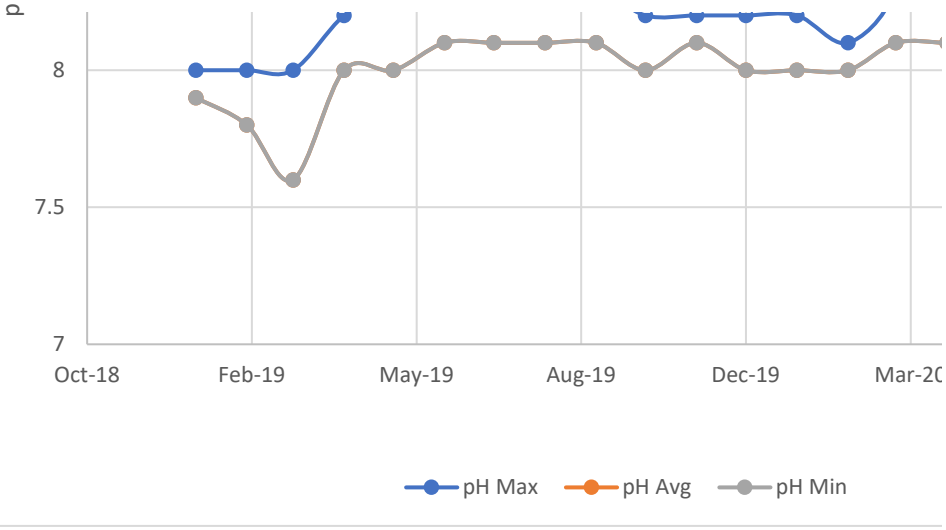

Parts Per M
3
2
1
0
Oct-18
Feb-19
May-19
Aug-19
Dec-19
Mar-20
Max Ortho Applied
Max Ortho Plant Tap
Max Ortho Dist
Avg Ortho Applied
Avg Ortho Plant Tap

	Hardness (as mg/L CaCO3)		Alkalinity (as mg/L CaCO3)			Chloride (mg/L)		Magnesium (mg/L)	
	Min:	Max:	Min:	Max:		Min:	Max:	Min:	Max:
Days outside range	Raw	Plt Tap	Raw	Plt Tap	Days outside range	Plt Tap	Days outside range	Plt Tap	Days outside range
	174	166	124	117		24		12.7	
	210	190	145	124		27		19	
	146	142	109	106		21		6	
	170	160	121	114		23		11.4	
	204	194	153	131		27		17	
	142	144	105	102		18		6	
	181	176	126	121		24		13.4	
	208	210	151	129		28		18	
	146	142	106	107		22		4	
	177	171	129	124		23		11.6	
	212	192	163	139		26		17	
	152	146	110	111		21		6	
	165	157	117	111		23		12.4	
	182	170	134	122		24		17	
	152	142	104	101		22		8	
	151	145	114	108		23		11.3	
	168	160	131	119		24		16	
	130	126	106	101		22		5	
	147	142	110	104		22		11.7	
	160	152	118	111		24		15	
	134	130	104	100		21		5	
	155	150	113	108		24		12.2	
	182	172	129	122		26		16	
	138	132	106	103		23		6	
	153	148	111	105		24		11.1	
	170	158	121	109		27		14	
	136	136	106	101		22		6	
	160	152	118	109		23		11.5	
	194	164	145	124		25		16	
	138	140	107	100		20		7	

	174	168	126	117		24	12.7	
	198	188	154	127		26	17	
	142	146	111	106		22	5	
	172	165	128	120		24	10.9	
	208	188	147	133		26	17	
	144	150	111	105		22	5	
	175	168	126	117		23	12.10	
	214	192	146	127		25	21.00	
	140	146	106	109		22	5.00	
	176	171	128	120		25	12.40	
	218	196	156	135		26	18.00	
	142	148	111	104		23	3.00	
	178	170	133	121		24	12.80	
	206	196	156	130		27	17.00	
	146	150	109	113		23	6.00	
	181	176	133	127		25	13.20	
	232	200	168	138		26	19.00	
	148	152	115	110		23	6.00	
	163	157	124	118		24	12.50	
	204	186	148	127		27	19.00	
	132	130	107	104		22	7.00	
	150	146	112	106		23	12.00	
	168	158	125	114		27	17.00	
	136	132	107	100		21	6.00	
	166.7	160.4	121.8	114.8		23.6	12.1	
	232.0	210.0	168.0	139.0		27.5	21.0	
	130.0	126.0	104.0	100.0		18.0	3.0	



Jun-20
Sep-20
Avg Ortho Dist


8
7.5
7
Oct-18
Feb-19
May-19
Aug-19
Dec-19
pH Max
pH Avg
pH Min

Calcium (mg/L)		H2O Temp (°C)	
Min:	Max:	Min:	Max:
Plt Tap	Days outside range	Plt Tap	Days outside range
45.7		6	
53		12	
42		3	
45.6		4	
61		12	
40		2	
48.8		5	
59		12	
39		0	
49.7		8	
59		12	
40		5	
42.3		10	
47		14	
39		8	
39.7		14	
46		17	
36		9	
37.5		16	
46		23	
34		9	
40.1		18	
47		23	
35		9	
41.1		16	
47		20	
36		9	
42.1		15	
51		19	
37		9	

46.7		9	
55		13	
38		7	
48.4		6	
57		9	
42		5	
47.40		5.00	
55.00		12.00	
41.00		0.00	
48.00		4.00	
63.00		12.00	
38.00		3.00	
47.00		6.00	
57.00		12.00	
42.00		3.00	
49.10		9.00	
59.00		12.00	
41.00		7.00	
42.50		11.00	
50.00		13.00	
37.00		9.00	
38.60		14.00	
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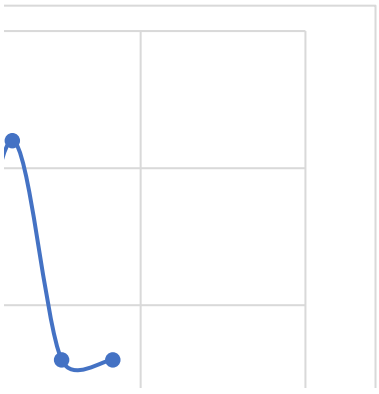
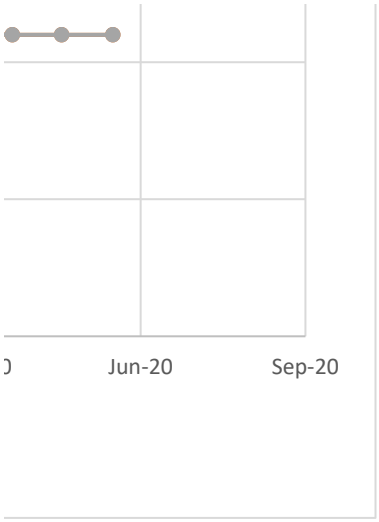
34.0		0.0	




Jun-20
Sep-20

From:	Thurston, Brian (EGLE)
To:	Oswald, Eric (EGLE)
Subject:	RE: Benton Harbor Contracts
Date:	Thursday, September 24, 2020 9:40:18 AM
Attachments:	image001.png

I understand.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E.
Field Operations Section Manager
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
231-590-3430 | thurstonb@michigan.gov

Follow Us | **Michigan.gov/EGLE**

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Thursday, September 24, 2020 9:39 AM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor Contracts

Thanks Brian, I am worried about the timing for Benton Harbor.

From: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Sent: Thursday, 24 September, 2020 09:38
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: RE: Benton Harbor Contracts

Eric,

I am working on the EPA grant with Kelly. If we get this funding we will have $ available to support that activities at systems less than 10,000 population to address TMF deficiencies.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E.
Field Operations Section Manager
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
231-590-3430 | thurstonb@michigan.gov

Follow Us | **Michigan.gov/EGLE**

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Thursday, September 24, 2020 8:40 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: Benton Harbor Contracts

Ernie, do we have estimates for the TMF and CCT studies? I am looking for 2021 money to help fund these efforts. I know we are still working scope and details. We can discuss at 11.
Eric

From:	Jason Marquardt
To:	Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject:	RE: Benton Harbor Corrosion Optimization Study - Questions
Date:	Wednesday, April 28, 2021 12:44:50 PM
Attachments:	2021-04-28 BH Corrosion Addendum #1.docx

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernie/Brandon,
See attached and below in regards to #3 as I believe I have this stated properly for the City and the expectation from potential consultants.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Kimberly Thompson <kthompson@bhcity.us>
Sent: Friday, April 23, 2021 2:10 PM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Subject: Fwd: Benton Harbor Corrosion Optimization Study - Questions

Kimberly Thompson, City Clerk
City of Benton Harbor
200 E. Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8408
Fax: (269) 927-0480

---------- Forwarded message ---------
From: **Cheslek, Heather A.** <CheslekHA@bv.com>
Date: Fri, Apr 23, 2021 at 7:47 AM
Subject: Benton Harbor Corrosion Optimization Study - Questions
To: kthompson@bhcity.us <kthompson@bhcity.us>

Good Morning Kim,
Please see the below questions from Black & Veatch associated with Corrosion Optimization Study for Benton Harbor. My colleague and I will be participating in this morning's pre-proposal call and would appreciate any information on the below questions. Thank you.

1. What are the proposal selection criteria and does each have a specific weighting?
2. Is this a publicly available RFP, or is it an invitation only RFP? If invite only, can you please share who has been invited?
3. Does Benton Harbor have capacity to assist with harvesting of pipes for use in potential pipe

loops, and/or construction of potential pipe loops, and/or monitoring and sampling of the potential pipe loops?

Heather Cheslek, P.E.* (She/Her/Hers)
Client Director and Sr Project Manager, Water Business
*Licensed in MI and IN
Black & Veatch
3351 Claystone Street SE, Suite G-100, Grand Rapids, MI 49546
D +1 616-710-3446 **O** +1 616-459-2360 **M** +1 317-417-8041 **F** +1 616-459-2810
E CheslekHA@BV.com
Building a World of Difference.®
Please consider the environment before printing my email
Please note that the information and attachments in this email are intended for the exclusive use of the addressee and may contain confidential or privileged information. If you are not the intended recipient, please do not forward, copy or print the message or its attachments. Notify me at the above address, and delete this message and any attachments. Thank you.
CONFIDENTIALITY NOTICE: This e-mail and any attachments are for the exclusive and confidential use of the intended recipient. If you are not the intended recipient, please do not read, distribute or take action in reliance upon this message. If you have received this e-mail in error, please notify us immediately and promptly delete this message and its attachments from your computer system. We do not waive any work product privilege by the transmission of this message.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

City of Benton Harbor
Addendum # 1

Project Name: Benton Harbor Corrosion Optimization Study

Date: April 29, 2021

The following items are changes to and/or clarifications to the above reference project. The Bidder will acknowledge receipt of this Addendum in the appropriate space provided below and include this Addendum with their submitted proposal.

1. All proposals must be delivered by May 13 at 10:00 am to:

   City of Benton Harbor
   Attn: City Clerk, Kimberly Thompson
   200 E. Wall Street
   Benton Harbor, MI 49022

   No electronic copies will be accepted. Electronic copies of the proposal may be requested during the proposal evaluation period after May 13th.

2. The proposal selection criteria will be based on the following categories:

   - Qualifications of the Firm 40 points
   - Qualifications of the Staff 10 points
   - Project Understanding 50 points

3. The current proposal holder list has been attached to this addendum.

4. For the purposes of this requested RFP, the City of Benton Harbor does not currently have capacity to assist with harvesting of pipes for potential pipe loops, or construction funding to install pipe loops with sampling and monitoring. These services may be reference and estimated within the study of the selected consultant.

Please acknowledge receipt of this addendum by signing below and attaching to submitted proposal.

_____
DATE

_____
BIDDING FIRM

_____
AUTHORIZED REPRESENTATIVE

From:	Sarkipato, Ernest (EGLE)
To:	emitchell
Cc:	Mike O"Malley; Darold Harlan; rrice; Bolf, Michael (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Subject:	RE: Benton Harbor Corrosion Treatment Check-in
Date:	Friday, May 1, 2020 2:17:39 PM

I anticipate continuing this discussion regarding the status of the corrosion treatment in Benton Harbor, particularly upon receiving the monthly report for April.

From: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Sent: Sunday, April 19, 2020 1:53 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; rrice <rrice@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Corrosion Treatment Check-in

Good morning all. Ernie, you have said a lot in this email, and before any reply, I will meet with the City Water Team, discuss each item, develop a Team consensus, and get our reply to you as soon as possible.

Please let me know if you questions or concerns.

Ellis

On Fri, Apr 17, 2020, 5:03 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Recently we received the March Operation Report from Operator In Charge Mr. O'Malley for the City of Benton Harbor's water treatment plant. This is the first full month of treatment after changing to the new phosphate chemical as directed by our letter dated February 13, 2020, attached. The increase in phosphate in the distribution system is notable in the samples collected by Mr. O'Malley and staff, and we appreciate the time and effort to steer the corrosion treatment in this direction. The purpose of our request and our shared goal continues to be an expedited path to minimizing impacts to public health from lead in drinking water. Based on the operational data in March, we had some observations for the city:
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> Again, we fully understand there is time needed to work out the kinks of a new chemical and new target. To help the city achieve the target dose consistently, the following are some suggestions:
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improvements to increase pump output. This might include *increasing the pump tubing size* or it may be necessary to *install a larger pump*.

B. The variability of the chemical treatment may be reduced by *implementing the full functionality of the pump and insertion meter* (i.e. flow-pacing the pump). This system was intended to function independently, basing the chemical added on the presence and amount of water flow through high service pumping. I believe this could be done by a *qualified instrumentation/controls integrator*.

C. We would like to offer assistance in continuing the conversation regarding a corrosion study. While the new treatment chemical and higher target is based on analogous systems with success in curbing lead release, it is necessary to select the best treatment for the City of Benton Harbor. An initial conversation has been held with Dr. Dave Cornwell, and a follow-up call can also be arranged at the city's request.

All in all, we would like to thank the city and Mr. O'Malley for the progress thus far, and hope to offer our assistance in keeping that momentum. I have drafted this email on behalf of our team at EGLE, in an attempt to respect Mr. Mitchell's request that communication from our department funnel through me to the extent practical. If you would like to arrange a discussion of this email and the corrosion treatment, I would be very happy to arrange that.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

---------- Forwarded message ----------
From: "Mike O'Malley" <momalley@cityofbentonharbormi.gov>
To: "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov>, "Onan, Brandon (EGLE)" <OnanB@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>, Darold Harlan <dharlan@fv-operations.com>, emitchell <emitchell@cityofbentonharbormi.gov>, Daniel McGinnis <dmcginnis@cityofbentonharbormi.gov>, Michael Clark <mclark@cityofbentonharbormi.gov>, Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>, "Dr R. Johansen" <rjohansen@bchdmi.org>, Nicki Britten <nbritten@bchdmi.org>
Bcc:
Date: Mon, 24 Feb 2020 23:02:38 +0000
Subject: Re: What constitutes "Gentle Flushing"

Thanks for the info.
Some of you may wonder why you are on the copy line. I believe if I reference someone or something done by someone, I add them to the copy line.
If you read through this, you will see where you fit in to this email.
Dr. Johanson, Nicki Britten, Chief McGinnis, and Deputy Police Chief Michael Clark.
Unfortunately this email is from Mike O'Malley, Operator IN Charge and not by the City Manager, Mr. Ellis Mitchell.
This is my take on the situation, and may not be Ellis Mitchell's opinion, but he is copied (as agreed) on this email.
The switch over from 70/30 OPP to 90/10 OPP was Friday 02 21 2020 in the morning.
It took Darold all day Thursday and me all day Friday to get the West Suction Line closed nearly 100%
Proof for this valve being closed; was a flow through the new meter of 2,604 gpm which is roughly equal to 3.75 MGD, which is very close to what the High Service pump is expected to deliver.
Unfortunately, the new demanded feed rate of 3.0 mg/L as P requires the pump to function at Top Speed, (100%) speed the original Pump is designed for.
The Permit Change is something different and will take me awhile to properly fill out. I propose the permit that exists is still in force and has only been altered by the type of Chemical Make Up percentages "ORTHO"
I am working on it today. Maybe, you can send me a blank form of the one you used and I can copy/paste the appropriate existing conditions and basically only to add the new chemical treatment.
As you know the Orthopolyphosphate treatment scheme was decided upon by the EGLE staff with the recommendation of Elhorn Engineering.
The State also agreed to allow Benton Harbor to use the MDEQ Pilot Grant Funding to reimburse the expenditures that were incurred, Thank You.
EGLE pushed to have the OPP treatment in place before the proposed Suction Line Meter was installed, due to its long lead time.
Elhorn Engineering delivered the 1st set of 55-gallon barrels; set up the pump and injection point, and put in a Rack of various metals to determine the rate of decay.
This all started to take effect 3/26/2019.
A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.
With no background data, the results are not really worth noticing, just yet. But the Mild Steel decay was most troublesome at the Outside location. The lead result was pretty small, as well as the copper at both locations.
Hence, your letter drove us to remove the 2nd Rack on 2/17/2020 and send the coupons in for analysis.
If, you had requested, or If you had waited a bit longer with the NOTICE; we may have seen results that indicated that the original corrosion treatment program was working enough to wait out the 18-Month time frame that we were told would be when a relatively full exchange would be evident.

Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."
To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " *The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years*". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!
As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio. *It was probably written before EPA knew about this chemical blend.
And, before the Dramatic Change in the Lead Rules.
I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).
And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; **and should not be**, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.
As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product. However either one of the treatment chemicals they supply is the same price but different results. Unfortunately, some would see this as a conflict of interest.
And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.
If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.
It appeared in your letter, that other systems have been involved in this type of corrosion treatment. Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.
Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with high water levels, the residential portions of Benton Harbor are on top of the hills.
However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions., And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.

At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.
After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.
Sincerely,
Mike O'Malley
Benton Harbor Water Operator IN Charge.
On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike,
> Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:
> -The goal is to bring the newly treated water throughout the distribution system
> -The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.
> -It's best to start at the water plant and move to the ends of the system
> -For example, on a 6" pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it's a dead end run. As you can see, it can be easy to get into the scouring velocity range.
> -At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing level. Then, next day, move further into the system.
> I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.
> Hopefully that is helpful information,
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Friday, February 21, 2020 4:56 PM
> **To:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** What constitutes "Gentle Flushing"

From:	Sarkipato, Ernest (EGLE)
To:	emitchell
Cc:	Mike O"Malley; Darold Harlan; rrice; Bolf, Michael (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Subject:	RE: Benton Harbor Corrosion Treatment Check-in
Date:	Friday, May 1, 2020 2:17:43 PM

I anticipate continuing this discussion regarding the status of the corrosion treatment in Benton Harbor, particularly upon receiving the monthly report for April.

From: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Sent: Sunday, April 19, 2020 1:53 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; rrice <rrice@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Corrosion Treatment Check-in

Good morning all. Ernie, you have said a lot in this email, and before any reply, I will meet with the City Water Team, discuss each item, develop a Team consensus, and get our reply to you as soon as possible.

Please let me know if you questions or concerns.

Ellis

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Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

---------- Forwarded message ----------
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Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>, Darold Harlan <dharlan@fv-operations.com>, emitchell <emitchell@cityofbentonharbormi.gov>, Daniel McGinnis <dmcginnis@cityofbentonharbormi.gov>, Michael Clark <mclark@cityofbentonharbormi.gov>, Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>, "Dr R. Johansen" <rjohansen@bchdmi.org>, Nicki Britten <nbritten@bchdmi.org>
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Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."
To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " *The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years*". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!
As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio. *It was probably written before EPA knew about this chemical blend.
And, before the Dramatic Change in the Lead Rules.
I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).
And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; **and should not be**, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.
As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product. However either one of the treatment chemicals they supply is the same price but different results. Unfortunately, some would see this as a conflict of interest.
And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.
If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.
It appeared in your letter, that other systems have been involved in this type of corrosion treatment. Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.
Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with high water levels, the residential portions of Benton Harbor are on top of the hills.
However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions., And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.

At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.
After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.
Sincerely,
Mike O'Malley
Benton Harbor Water Operator IN Charge.
On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike,
> Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:
> -The goal is to bring the newly treated water throughout the distribution system
> -The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.
> -It's best to start at the water plant and move to the ends of the system
> -For example, on a 6" pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it's a dead end run. As you can see, it can be easy to get into the scouring velocity range.
> -At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing level. Then, next day, move further into the system.
> I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.
> Hopefully that is helpful information,
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Friday, February 21, 2020 4:56 PM
> **To:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** What constitutes "Gentle Flushing"

From: Sarkipato, Ernest (DEQ)
To: Bolf, Michael (DEQ); Onan, Brandon (DEQ)
Subject: RE: Benton Harbor DHHS sequential data
Date: Monday, March 4, 2019 3:16:18 PM
Attachments: image001.png
image002.png

I asked Steve Crider that last week. He indicated they do not have a reliable record or account of which sites have LSLs. He cited a very limited amount of exposed pipe in the basement as a main contributor.

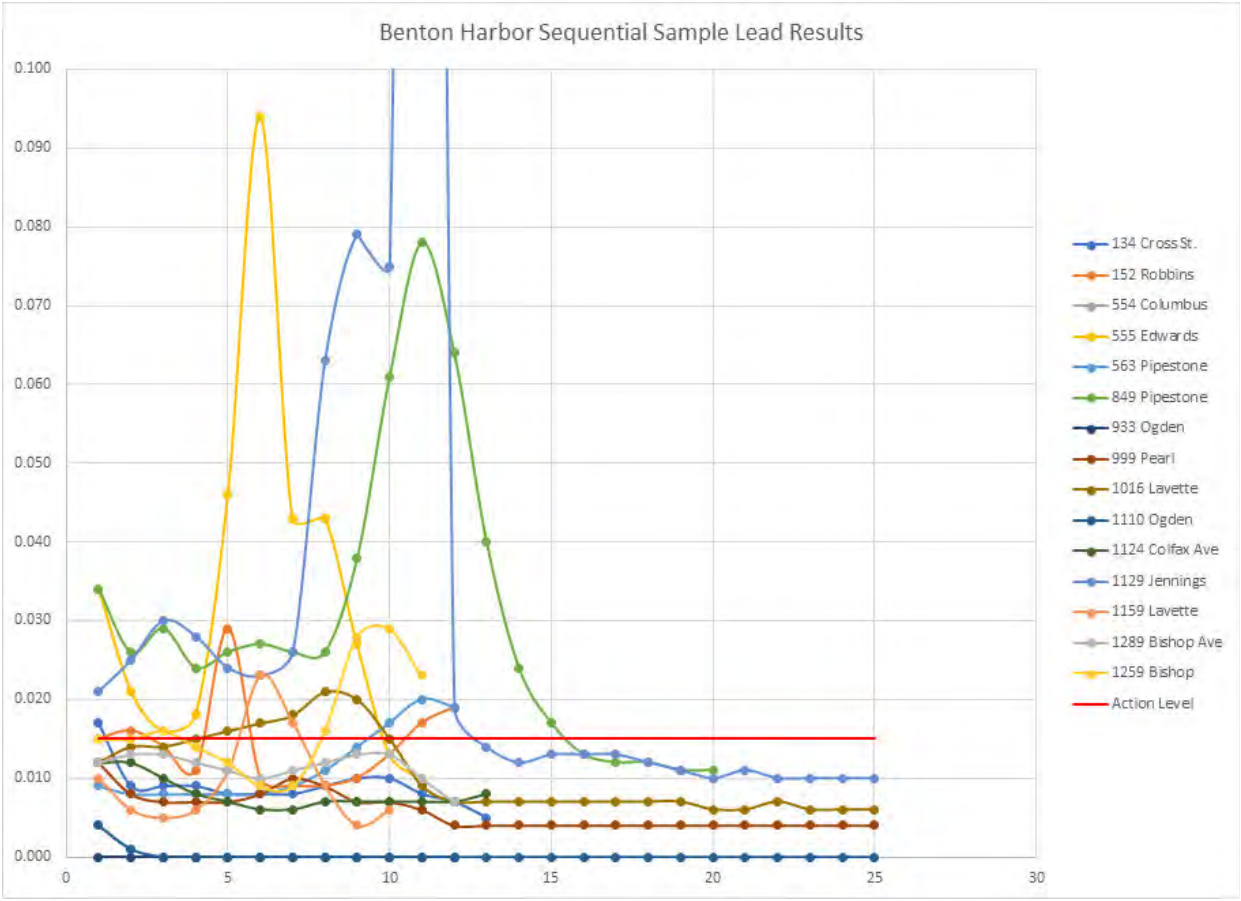
From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Sent: Monday, March 4, 2019 2:45 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor DHHS sequential data

Thanks Brandon. Are all of these sample site thought to be front customers with lead service lines?

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

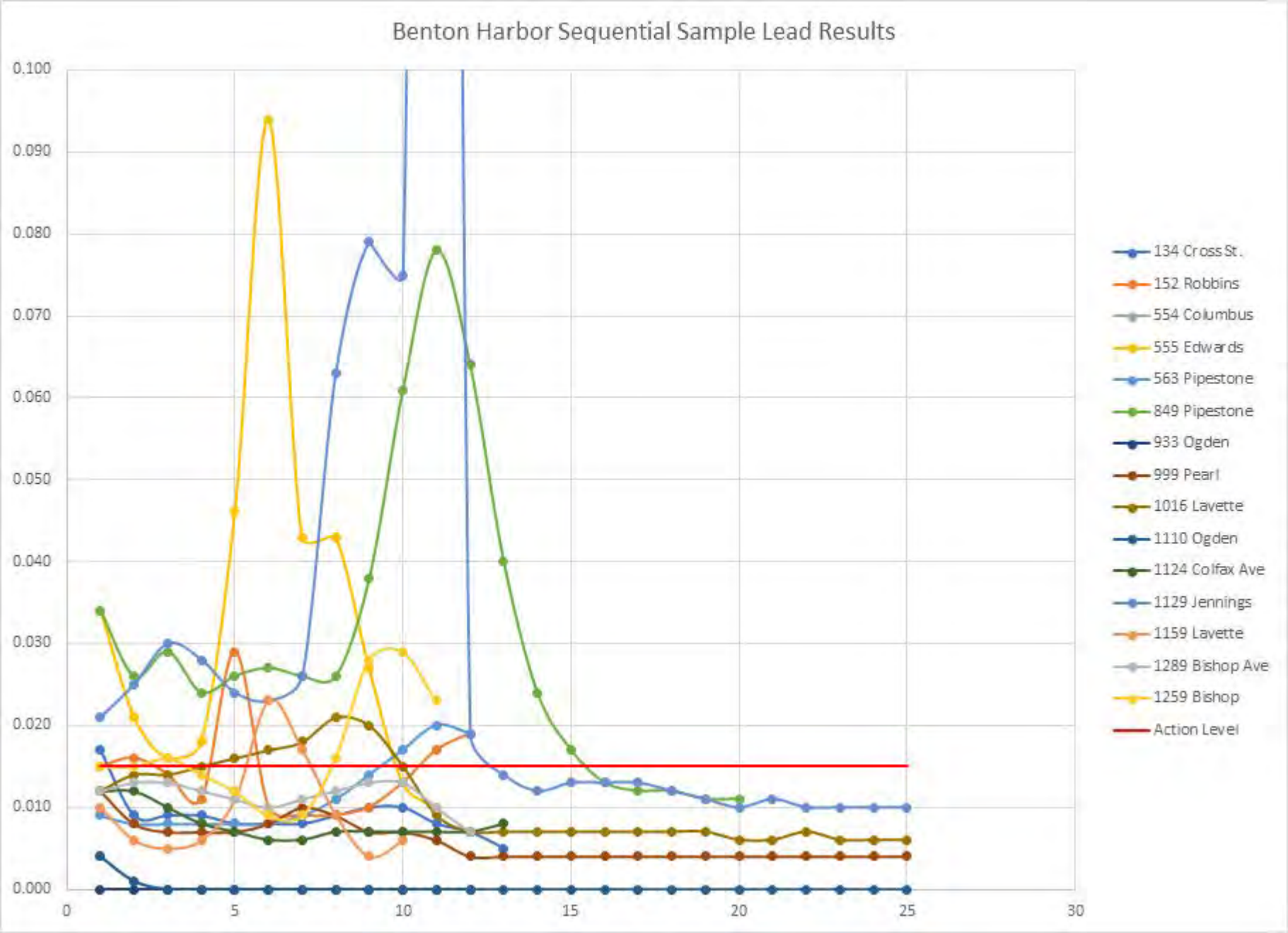
From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Wednesday, February 27, 2019 12:26 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Philip, Kris (DEQ) <PHILIPK@michigan.gov>
Cc: Crider, Steven (DHHS) <CriderS1@michigan.gov>
Subject: Benton Harbor DHHS sequential data

All, below is a chart of the data that DHHS recently provided us via email to Ernie. We can see that there are some spikes that are relatively high but the data looks to be consistent with what would be expected from dissolved lead, not particulate, as the numbers do not rise and fall with one sample. The numbers tend to go up in the service line and then drop off once we begin pulling water in from the main. I do not think there is any major take homes from this data. It just confirms that treatment for corrosion control is prudent and that we are on the correct path.
Also as a side note, out of the 15 homes sampled, 5 of them had no lead detected over the action level in any of the samples, and only one home had two samples that exceeded the copper action level.



Let me know if you have any questions.
Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov


Benton Harbor Sequential Sample Lead Results
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
0
5
10
15
20
25
30
134 Cross St.
152 Robbins
554 Columbus
555 Edwards
563 Pipestone
849 Pipestone
933 Ogden
999 Pearl
1016 Lavette
1110 Ogden
1124 Colfax Ave
1129 Jennings
1159 Lavette
1289 Bishop Ave
1259 Bishop
Action Level

From:	Onan, Brandon (DEQ)
To:	Oswald, Eric (DEQ); Lachance, Amy (DEQ); Sarkipato, Ernest (DEQ); Bolf, Michael (DEQ); Thurston, Brian (DEQ)
Subject:	RE: Benton Harbor Draft Bubble Up
Date:	Monday, January 14, 2019 10:22:56 AM
Attachments:	BH Bubble Up_BMO comments.docx

Attached is the word document with my comments, and Eric's comment below, tracked.
Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Sent: Monday, January 14, 2019 8:38 AM
To: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>
Subject: RE: Benton Harbor Draft Bubble Up

Let's add something like the highlighted sentence to the line below letting management know they will be adding corrosion control chemicals in the near future:

Benton Harbor has no previous action level exceedance on record, does not currently add a corrosion inhibitor, and according to operational records has not experienced changes in source water or treatment. We are currently working with the city to add interim corrosion control measures while they conduct a study to optimize corrosion control in their distribution system.

Eric

From: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Sent: Monday, January 14, 2019 8:20 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Subject: RE: Benton Harbor Draft Bubble Up

Thanks Ernie – I made the changes on the attached and will pass along once Brian and Brandon get a chance to take a look.

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Sunday, January 13, 2019 7:02 PM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Subject: Re: Benton Harbor Draft Bubble Up

Thank you so much for doing the legwork on this draft. I have some detailed comments on the following section, the rest looked good to me. Given the nature of the definition of OCCT, I did remove the phrase mike suggested, instead noting there

have been no major shifts in water quality or treatment. I also inserted a few lines here and there regarding the public notifications in the city, due to various reasons.

For the Background/Details Section:

The Benton Harbor Water Treatment Plant provides drinking water to just under 10,000 residents in Berrien County. They intake water from Lake Michigan and utilize conventional surface water treatment techniques prior to distribution to their customers.

An October 2018 Sanitary Survey detailed nine significant deficiencies in the water system, which have the potential to directly or vicariously impact public health. A draft Administrative Consent Order with a compliance schedule has been provided to the City to address the outstanding issues, but this has not been signed to date. Additionally, several monitoring, reporting and public notice violations have taken place during 2018. These have resulted in three mailings to water customers updating on the compliance status of the water system.

Benton Harbor's 2018 lead and copper monitoring resulted in lead ALE, declared in October 2018. Of the 30 residential lead samples taken, nine were over the current lead action level of 15 parts per billion (ppb). This resulted in a 90th percentile value of 22 ppb. In response, the city has collected several hundred additional samples at residences throughout the City, many with results above 15 ppb. Benton Harbor has no previous action level exceedance on record, does not currently add a corrosion inhibitor, and according to operational records has not experienced changes in source water or treatment.

Public advisory and public education documents have been distributed as required. It is believed that all results have been communicated directly to the homeowners. The city has verbally committed to delivery of alternate water to homes with elevated results, though records have not been kept. DWMAD staff have recently learned that callers to the City are being told that the City is delivering "clean water right to the tap and you should have no trouble drinking it (after flushing)".

From: Bolf, Michael (DEQ)
Sent: Saturday, January 12, 2019 6:03 PM
To: Lachance, Amy (DEQ); Sarkipato, Ernest (DEQ); Thurston, Brian (DEQ); Onan, Brandon (DEQ)
Cc: Oswald, Eric (DEQ)
Subject: RE: Benton Harbor Draft Bubble Up

My comment is minor, but what were you intending to convey when saying, "… consistent with other Lake Michigan water treatment plants in the area"? I know many of the West MI WTPs with Lake MI intakes do not provide corrosion control treatment, but I'm less familiar with the SW plants.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Sent: Saturday, January 12, 2019 3:07 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>;

Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Subject: Benton Harbor Draft Bubble Up
Please review. I tried to stay high-level. Might be easiest to just call me Monday with comments before I officially send to Eric. Ignore the formatting issues – Suzann will have to fix them; this form is a bear! Thanks - Amy

☒ FYI ☐ ACTION

BUBBLE-UP REPORT TEMPLATE
Facility Name: Benton Harbor Water Treatment Plant
County: Berrien

Issue: State the issue or situation of concern. Be clear, factual and concise. Include dates of actions which occurred.

The DWMAD continues to work with the City of Benton Harbor (City) on ~~outstanding~~ compliance issues ~~and a lead Action Level Exceedance (ALE)~~ at their water treatment plant and a lead Action Level Exceedance (ALE). Recent communication with the City has indicated that they are not following through on their original public commitments (not required by law) to provide bottled water or filters to residents with high lead results. Additionally, although the City has mass-mailed required lead ALE language, DWMAD has recently learned that some direct communication by the City to its public may not be consistent with the health risks associated with lead exposure. DWMAD staff, along with DHHS and the Berrien County Health Department, has offered to partner with the City to do additional sequential sampling and directly provide accurate supplementary public health information to Benton Harbor residents, but City officials have thus far rejected these offers and not provided addresses of all high lead results. In summary, while the City is making slow progress toward addressing their non-compliance issues, they have not entered into an ~~binding~~ enforceable compliance schedule and are not ~~taking~~ perusing all avenues to provide accurate information to their public.

Brief background/details: Provide concerns raised, DEQ actions with dates/timeline. Do use abbreviations.

The Benton Harbor Water Treatment Plant provides drinking water to just under 10,000 residents in Berrien County. They intake water from Lake Michigan and utilize conventional surface water treatment techniques prior to distribution to their customers.

An October 2018 Sanitary Survey detailed nine significant deficiencies in the plant, which have the potential to directly ~~or vicariously~~ impact public health. A draft Administrative Consent Order with a compliance schedule has been provided to the City to address the outstanding issues, but this has not been signed to date. Additionally, several monitoring, reporting and public notice violations have taken place during 2018. These have resulted in three mailings to water customers updating them on the compliance status of the water system.

Benton Harbor's 2018 lead and copper monitoring resulted in a lead ALE, declared in October 2018. Of the 30 residential lead samples taken, nine were over the current lead action level of 15 parts per billion (ppb). This resulted in a lead 90th percentile value of 22 ppb. In response to citizen requests, the City has collected several hundred additional samples, many with results above 15 ppb. Benton Harbor has no previous action level exceedance on record, does not currently add a corrosion inhibitor, and according to operational records has not experienced changes in source water or treatment. DEQ is currently working with the city to add interim corrosion control treatment measures while they conduct a study to optimize corrosion control in their distribution system.

Public advisory and public education documents have been distributed as required. It is believed that all results have been communicated directly to the homeowners. The city has verbally committed to delivery of alternate water to homes with elevated results, though records have not been kept. DWMAD staff have recently learned that callers to the City are being told that the City is delivering "clean water right to the tap and you should have no

Entities involved in the situation: List people involved and affiliations; e.g., legislator, media, business owner.

Most communications have involved DHHS, Berrien County Health Department, the water supply and the DEQ. Ernie Sarkipato is the DWMAD engineer for this supply.

Senator:	Kim LaSata	☐ Involved	☒ Not Involved
Rep:	Pauline Wendzel	☐ Involved	☒ Not Involved

Recommendation for next steps (if appropriate):

DWMAD staff, along with DHHS and BCHD, ~~is~~ are attempting to obtain the City's written communications to homeowners, along with the addresses of the high results. Further attempts will be made to partner with the City to provide accurate health information to the residents, as well as conducting sequential sampling at some homes to determine the effectiveness of flushing. DWMAD will also continue to follow up on the non-compliance issues, with emphasis on assisting the City in establishing corrosion control treatment to address the lead levels, as well as the remaining public education and transparency tasks triggered by the ALE. DWMAD enforcement staff will continue to pursue that the City ~~the~~ ent~~ry~~er into ~~of the~~an Administrative Consent Order to establish a compliance schedule for the supply.

Submitted by: Amy Lachance Date: January 14, 2019
Reviewed by: Eric Oswald Date: January 14, 2019

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Philip, Kris (EGLE); Klein, Jeremy (EGLE)
Cc:	Thurston, Brian (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE)
Subject:	RE: Benton Harbor Draft Responses
Date:	Wednesday, June 10, 2020 10:42:12 AM

Reminder to comment on three (now four) draft letters, and an update below:

4. Rate collections and rate increases: Mr. Mitchell indicates they are beginning the process to draft a formal rate collection procedure. This procedure will then be reviewed by the CM and brought before the commission. I indicated this process must be completed prior to the ACO item being satisfied. A response was drafted to this effect.

From: Sarkipato, Ernest (EGLE)
Sent: Tuesday, June 9, 2020 3:15 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Kris Philip (DEQ) (PHILIPK@michigan.gov) <PHILIPK@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: Benton Harbor Draft Responses
Below is a summary of our responses. Please comment on letters 1-3 by Thursday if you could.
The following three responses are on the T drive. I'd like to get these out this week due to the end of June being a sampling deadline.

1. SOC reduction request
2. LCR reduction request
3. Corrosion study plan request

The following are still in draft form in discussions with myself and Mike Bolf:

4. Cross connection plan
5. Rate collections and rate increases

-----Original Appointment-----
From: Sarkipato, Ernest (EGLE)
Sent: Monday, April 13, 2020 1:11 PM
To: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Kris Philip (DEQ) (PHILIPK@michigan.gov); Klein, Jeremy (EGLE)
Cc: Thurston, Brian (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE)
Subject: BH Check-in Weekly
When: Thursday, June 4, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting
A flurry of submittals from Mr. O'Malley should be discussed today:

1. SOC sampling in 2020 request to reduce sampling. **Jeremy**, if you could please be ready to summarize the recent history w/ SOC sampling.
2. LCR sampling in 2020 – official request to reduce based on assumed population. **Group** discussion.
3. ACO – Corrosion Control Study. **Brandon**, probably in the LCR Unit's court to guide our response to this.

4. ACO – Improve Collections. **Ernie** take the lead on this one for our discussion.
5. ACO – Cross Connection Control. **Ernie** take the lead on this one.

Join Microsoft Teams Meeting

+1 248-509-0316 United States, Pontiac (Toll)

Conference ID: 952 600 290#

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From:	Bolf, Michael (EGLE)
To:	Sarkipato, Ernest (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Philip, Kris (EGLE); Klein, Jeremy (EGLE)
Cc:	Thurston, Brian (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE)
Subject:	RE: Benton Harbor Draft Responses
Date:	Thursday, June 11, 2020 11:50:43 AM

Ernie,

I have reviewed and commented on each of them. I added a third comment pointing out the concerns of using your current chemical feed vendor for the CC study rather than an actual third party. I attempted to write it in a way that cautions them, but ultimately leaves the choice up to them. Another set of eyes on that one would be appreciated.

Also Kris or Jeremy may want to do some fact checking on the edits I made regarding SOCs. My comments are based on an understanding that quarterly is the standard monitoring frequency and systems with satisfactory results and no MVs can qualify for a reduced triennial schedule.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, June 10, 2020 10:42 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: RE: Benton Harbor Draft Responses

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Jeremy (EGLE) <KLEINJ1@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: Benton Harbor Draft Responses

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2. LCR reduction request
3. Corrosion study plan request

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4. Cross connection plan
5. Rate collections and rate increases

-----Original Appointment-----
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Sent: Monday, April 13, 2020 1:11 PM
To: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Kris Philip (DEQ) (PHILIPK@michigan.gov); Klein, Jeremy (EGLE)
Cc: Thurston, Brian (EGLE); Krisztian, George (EGLE); Oswald, Eric (EGLE)
Subject: BH Check-in Weekly
When: Thursday, June 4, 2020 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

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From:	mike@michonline.net
To:	Onan, Brandon (DEQ)
Cc:	momalley@cityofbentonharbormi.gov; Sarkipato, Ernest (DEQ)
Subject:	RE: Benton Harbor Equipment
Date:	Monday, December 3, 2018 11:24:31 AM
Attachments:	image001.png XT400-600.pdf corpstopNEW.pdf S-Series-Sales-Brochure (2).pdf

Hi Brandon, I hope you had a good weekend? As requested, I am providing information you requested. Item One : XT-600 Scale: $2150 Item Two: Stenner “S” series pump Module # 53007 (40 gallon a day): $980.00 Item Three: Quill Injection, I had a question on this and asked Mike O’Malley to send me a picture of the proposed corporation stop. If necessary we have a ¾ corporation stop at $290.00 The installation, calibration, set up , and training cost: $550.00 The total equipment cost would be $3970.00 The chemical cost for Carus 8600 in a 55 gallon drum is $495.00 per drum. I have attached information on the equipment for your review. Thanks again for the opportunity. Mike Enlow, Elhorn Eng. Co.

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Friday, November 30, 2018 4:29 PM
To: mike@michonline.net
Subject: Benton Harbor Equipment

Hey Mike,

Sorry for the delay, I think I’ve found a solution to my flow sensor issues so all I’m going to need from Elhorn now (support wise) is for a peristaltic pump that accepts a 4-20 mA signal for pumping variability (approximately 30 gpd), a scale, an injection quill for a 1” corporation stop and the necessary tubing and chemicals. I’m anticipating pumping right out of a 50 gallon drum sitting on a

scale less than 75 feet from the injection point.

If you could get me a ballpark quote for these items by maybe noonish on Monday I would appreciate it.

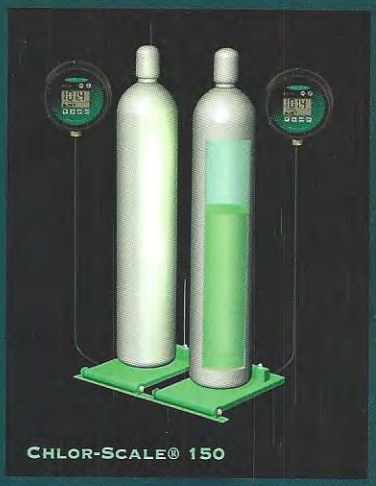
Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing , MI 48909
(p) 616.307.6736
onanb@michigan.gov

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

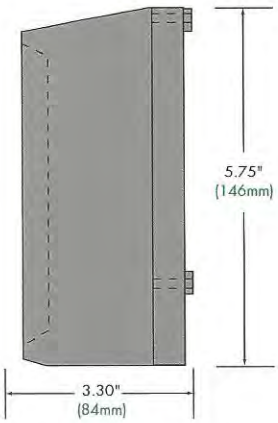
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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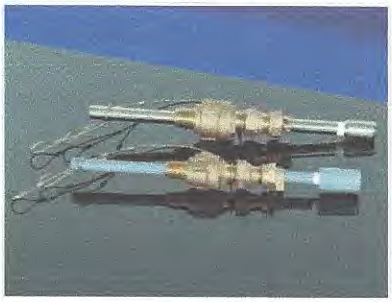
Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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From:	Courtney Davis
To:	Bolt, Jennifer (EGLE); Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nick Margaritis; Thurston, Brian (EGLE); Crider, Steven (DHHS); Lachance, Amy (EGLE); Onan, Brandon (EGLE); DARWIN WATSON; momalley@cityofbentonharbormi.gov; Marcus Muhammed; DARWIN WATSON; kthompson@cityofbentonharbormi.gov; dharlan@fv-operations.com
Cc:	de la Rambelje, Laura (DHHS); Ward, Kristin (DHHS); Manente, Susan (DHHS); Che, Xun (DHHS-Contractor); Pavone, Anthony (DHHS); Groetsch, Kory J. (DHHS); LyonCallo, Sarah (DHHS); MacKenzie-Taylor, Deb (DHHS)
Subject:	RE: Benton Harbor Lead Compliance
Date:	Tuesday, July 23, 2019 1:15:04 PM

Thank you for the summary Jeni. One small correction that I want to make sure is noted in bullet 4.

The Berrien County Health Department has requested a variance for filter distribution for City of Benton Harbor residents. It is the department's wish to continue to make water filters available for ALL city residents who would like one and to provide replacement cartridges for them until such a time as corrosion control work is determined effective by EGLE. Additionally, BCHD has distributed roughly 2000 filters to-date and any of these residents would be 'grandfathered' in to any potential changes and continue to receive replacement filters as well.

Variance request was submitted to MDHHS on 7/22/19.

Courtney

Courtney L. Davis, MPH

Deputy Health Officer

Berrien County Health Department

(269) 927-5607

cdavis@bchdmi.org

-----Original Message-----
From: Bolt, Jennifer (EGLE) [mailto:BOLTJ@michigan.gov]
Sent: Tuesday, July 23, 2019 12:43 PM
To: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nick Margaritis; Thurston, Brian (EGLE); Crider, Steven (DHHS); Lachance, Amy (EGLE); Onan, Brandon (EGLE); DARWIN WATSON; momalley@cityofbentonharbormi.gov; Marcus Muhammed; DARWIN WATSON; kthompson@cityofbentonharbormi.gov; dharlan@fv-operations.com
Cc: de la Rambelje, Laura (DHHS); Ward, Kristin (DHHS); Manente, Susan (DHHS); Che, Xun (DHHS-Contractor); Pavone, Anthony (DHHS); Courtney Davis; Groetsch, Kory J. (DHHS); LyonCallo, Sarah (DHHS); MacKenzie-Taylor, Deb (DHHS)
Subject: RE: Benton Harbor Lead Compliance

Here's a quick summary of the conference call we had yesterday regarding Benton Harbor's recent set of lead and copper sample results.

On the call today we discussed,

• The Public Advisory (PA) and Public Education (PE) requirement, can be

accomplished with the same document if partnered with a press release or press conference

O EGLE will develop a draft PE and send it shortly to Benton Harbor

O EGLE will review a final draft of the PE before it is distributed

• The Public Education (PE) distribution requirements include additional activities to reach vulnerable subpopulations

O DHHS and Berrien County Health Department with assist with distribution of the PE

• The logistic of handling requests for sampling and questions

O Berrien County Health Department will employ their 1-800 number to be the primary contact for callers and direct questions to Benton Harbor or EGLE as necessary

• Home with high lead levels

O Benton Harbor will provide addresses to DHHS for the 12 high home in this round of sampling

O Berrien County Health Department and DHHS are discussing expanding the filter eligibility and distribution detailed below

O At this time, Berrien Co HD will distribute filters (provided by DHHS) to homes with high lead levels that have children or pregnant women, who meet ANY of the following criteria:

- Receive WIC, or
- Receive Medicaid, or
- Are in financial need

• Customer requested sampling should be used as an opportunity to find more Tier 1 sites for compliance sampling

O The 1st and 5th liter sampling methodology should be used for any home with a lead service line

O Benton Harbor should be building a list of 90 sampling sites for their Sampling Site Plan due January 1st, 2020

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | Michigan.gov/drinkingwater
Follow Us | Michigan.gov/EGLE

-----Original Appointment-----
From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, July 19, 2019 10:55 AM
To: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nick Margaritis; Thurston, Brian (EGLE); Crider, Steven (DHHS); Lachance, Amy (EGLE); Onan, Brandon (EGLE); DARWIN WATSON; Bolt, Jennifer (EGLE)
Cc: de la Rambelje, Laura (DHHS); Ward, Kristin (DHHS); Manente, Susan (DHHS); Che, Xun (DHHS-Contractor); Pavone, Anthony (DHHS); Courtney Davis; Groetsch, Kory J. (DHHS); LyonCallo, Sarah (DHHS); MacKenzie-Taylor, Deb (DHHS)
Subject: Benton Harbor Lead Compliance
When: Monday, July 22, 2019 3:00 PM-4:00 PM Customized Time Zone.
Where: Conference Call

A call with the city, EGLE, and health agencies to discuss the city of

Benton Harbor’s lead and copper compliance sampling for the first half of 2019.

Call-in Number : 888-273-3658
Access Code: 1348701

Host Pwd: 4683

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc:	Ellis Mitchell
Subject:	RE: Benton Harbor News Article
Date:	Wednesday, November 20, 2019 8:43:51 AM

Hi Mike, I have not seen the 7 tap samples you mention, and again you did not consult the experts (EGLE, DHHS, BCHD) on the data prior to making your statements to the commission and to the media. One of the best indicators of the corrosion control treatment (CCT) we can look at is the progression of samples from a particular site from one round to the next. For example, if you have a consistent site coding, we can look at these sites from six months ago, and again now, and if lead release is consistently on the downturn that is a pretty good indication. The CSMR is more to look for changes in source/treatment that could indicate a problem, and does not in itself have much bearing on the CCT. The Orthophosphate residual data is encouraging for sure, but what we want to see is conclusive evidence it's working.

I understand the need for more samples, but don't agree with the strategy of using this article and your statements, which may not be defensible, as a means to garner additional sample volunteers. If I was a resident in the city and saw the lead problem is getting better, I may actually be LESS likely to volunteer. There is no real substitute for the old fashioned ways of working the community/neighborhood partners, mailing letters, going door to door, offering incentives, etc.

Regarding your repeated request to reduce the required number of samples from 60, this was decided by EGLE at the beginning of the year. It was a judgement call to keep the tier that was previously determined, and was based on the population number being very close to 10,000, the nature of the population in the city (lots of rentals, somewhat transient), and the need for a good dataset for your community that is undergoing an action level exceedance for lead. We are not willing to entertain your request at this time.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Monday, November 18, 2019 2:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: Re: Benton Harbor News Article

Truth be told, I was a little bit ahead of the game.

I am assuming you saw the results as I used the MDEQ Laboratory which of course, you also probably noticed that the lab screwed up 1 sample for me.

What you do not know, is that I had the homeowners fill me an extra bottle.

So I could do some chemistry OPP residuals, Chloride and Sulphate.

And, I had 8 samples of those.

So, my enlightenment had more to do with those:

OPP Residuals were good, many at 1.5 mg/L
And your favored Chloride/Sulfate Ratio was less than 1.0 at All 8 sites.
And, all sites were from people 8 out of 30 some that agreed to be tested from the June sampling.
I liken that to success, even if only 1 or 2 sites had lower values for lead.
I needed Commissioners and the press to bolster my success rate for getting volunteers.
I have had 2 yes calls to sampling!
That article was not near as helpful. But maybe more will call.
I am soon going to send out 81 more requests, from sites that I have vetted for possible lead service lines.
Here is you chance!
The Benton Harbor Water System serves less than 10,000 people, regardless of what number you use.
As that; the MDEQ Sampling requirement states that a population less than 10,000 water consumers is required to take
40 Lead and Copper Samples and 4 Water Quality Parameters, (with only Chloride/Sulfate Ratio required).
Please return to us a statement authorizing the above request.
Thank you very much,
Mike O'Malley
Benton Harbor Water Superintendent
and Benton Harbor Water Operator IN Charge.
On Mon, Nov 18, 2019 at 10:23 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Good morning Mike / Ellis,
> I was interested to see the below article which covered some comments from Mr. O'Malley at a City committee meeting last week. His statements are somewhat encouraging (finding lower results from 7 samples), and I hope the article results in a lot more volunteers for sampling. However the statements are also a bit concerning. We have learned that we need to wait and see the whole picture before making any conjectures on treatment efficacy. It might be best to coordinate media releases like this with our department. You may not be aware, but there is some external scrutiny of the City's corrosion study right now. We need to be careful about how we interpret all lead test data, and about how we continue the corrosion control treatment study into the future.
> https://www.heraldpalladium.com/news/local/official-bh-making-inroads-with-lead-in-water/article_c0ae841d-9116-5ab8-9712-7e60ed18e3df.html
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

From:	Onan, Brandon (DEQ)
To:	Sarkipato, Ernest (DEQ)
Cc:	Bolf, Michael (DEQ); Thurston, Brian (DEQ); London, Bob (DEQ)
Subject:	RE: Benton Harbor Permit for CCT
Date:	Monday, February 25, 2019 1:42:15 PM
Attachments:	image001.png

I believe that everyone on the peer review team during our previous conference call on Friday February 22, agreed with that interim approach.

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Monday, February 25, 2019 1:34 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
Subject: RE: Benton Harbor Permit for CCT

Thank you Brandon. I propose adding another permit condition to allow for a more simplistic interim installation, to run the chem pump at a steady state and lock it in with a relay to a single high service pump. This should be easily accomplished while we wait the lead time for the meter.

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Friday, February 22, 2019 12:45 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
Subject: Benton Harbor Permit for CCT

As per our conference call, the overall consensus from the PRT is for the current permit to construct to be issued with a special condition to the permit that addresses the lack of a corrosion control study plan post installation. Through our conversations with the City and Elhorn Engineering, we know a coupon study to identify optimum dose for the proposed product is to be conducted. The PRT would like the plan for said coupon study to be proposed to the department for evaluation and comment. This way we can try and make sure that the data received after the study will allow the department to make a determination on optimized dose.

If you have any questions please feel free to ask, and PRT if I have missed any pertinent comments from our call please feel free to interject them now.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From:	Onan, Brandon (DEQ)
To:	Sarkipato, Ernest (DEQ)
Cc:	Bolf, Michael (DEQ); Thurston, Brian (DEQ); London, Bob (DEQ)
Subject:	RE: Benton Harbor Permit for CCT
Date:	Monday, February 25, 2019 1:42:16 PM
Attachments:	image001.png

I believe that everyone on the peer review team during our previous conference call on Friday February 22, agreed with that interim approach.

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Monday, February 25, 2019 1:34 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
Subject: RE: Benton Harbor Permit for CCT

Thank you Brandon. I propose adding another permit condition to allow for a more simplistic interim installation, to run the chem pump at a steady state and lock it in with a relay to a single high service pump. This should be easily accomplished while we wait the lead time for the meter.

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Friday, February 22, 2019 12:45 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
Subject: Benton Harbor Permit for CCT

As per our conference call, the overall consensus from the PRT is for the current permit to construct to be issued with a special condition to the permit that addresses the lack of a corrosion control study plan post installation. Through our conversations with the City and Elhorn Engineering, we know a coupon study to identify optimum dose for the proposed product is to be conducted. The PRT would like the plan for said coupon study to be proposed to the department for evaluation and comment. This way we can try and make sure that the data received after the study will allow the department to make a determination on optimized dose.

If you have any questions please feel free to ask, and PRT if I have missed any pertinent comments from our call please feel free to interject them now.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
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Michigan Department of Environmental Quality
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P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From: Bolf, Michael (DEQ)
To: London, Bob (DEQ); Onan, Brandon (DEQ)
Cc: Sarkipato, Ernest (DEQ); Thurston, Brian (DEQ)
Subject: RE: Benton Harbor Phosphate Addition
Date: Friday, February 22, 2019 9:59:25 AM

Yes, check calanders.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

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From: London, Bob (DEQ) <LONDONR@michigan.gov>
Sent: Friday, February 22, 2019 9:52 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition

I'm available between noon and 2:15 today

Sent from my iPhone

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>
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> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov
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> Sent: Thursday, February 21, 2019 5:13 PM
> To: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
> Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ)
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> Subject: Re: Benton Harbor Phosphate Addition
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> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> DEQ-Drinking Water and Municipal Assistance Division
> 616-307-0261
>
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>
> If you should have any questions with this e-mail please contact me to discuss.
>
> Sincerely,
> Brian E. Thurston, P.E., Community Water Supply Section Manager
> (Acting) Drinking Water & Municipal Assistance Division Michigan
> Department of Environmental Quality
> E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
> Direct: (231) 590-3430
> Fax (231) 775-4050
>
> Cadillac District Office
> 120 W. Chapin Street
> Cadillac, Michigan 49601
> [DEQ]
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> deq&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314cf2ca9008d6
> 98d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C6368644389626216
> 74&sdata=%2FKjoF%2FOQM%2FAcT0wVC3IZ2D%2Fxdzh8TMoWZlzgwd9ozHU%3D&am
> p;reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3
> A%2F%2Fwww.michigan.gov%2Fdeq&data=02%7C01%7CBOLFM%40michigan.gov%
> 7Cc5482ec4b0314cf2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%
> 7C0%7C0%7C636864438962621674&sdata=3F%2FKOtdZLITv3WhvGawt%2F0ombiS
> SDm1VmuokMyd%2BD54%3D&reserved=0>
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> From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
> Sent: Thursday, February 21, 2019 3:14 PM
> To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov>
> Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> Subject: RE: Benton Harbor Phosphate Addition
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> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
>
> From: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Sent: Thursday, February 14, 2019 2:20 PM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
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> Do either of you have any further comments or discussion points on this permit review? I would like to get back with Ernie on this as he is trying to move the project forward.
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> Thanks,
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Onan, Brandon (DEQ)
> Sent: Thursday, February 7, 2019 11:38 AM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.
>
> I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.
>
> I'm calculating it in the following manor: [(ppm PO4
> total)*(MGD*8.34)]/[0.33*11.4] = gpd of product
>
> The following table is setup the same as the one on page 12 utilizing
> the equation above
>
>
> MGD
>
> ppm PO4 total
>
> 2
>
> 3
>

> 5
>
> 8
>
> 1
>
> 4.4
>
> 6.7
>
> 11.1
>
> 17.7
>
> 2
>
> 8.9
>
> 13.3
>
> 22.2
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> 35.5
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> 3
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> 13.3
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> 20.0
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> 33.3
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> 53.2
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>
> Based off this I think the pump selection still holds for up to 5 MGD
> but will be inadequate for 8 MGD
>
> Brandon Onan, P.E.

> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Sent: Thursday, February 7, 2019 10:00 AM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> Brandon,
>
> I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.
>
> Can you shine some light on this?
>
> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
>
> From: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Sent: Tuesday, February 05, 2019 8:34 AM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: FW: Benton Harbor Phosphate Addition
> Importance: High
>
> Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.
>
> Thanks,
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
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> From: Sarkipato, Ernest (DEQ)
> <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
> Sent: Monday, February 4, 2019 1:53 PM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Cc: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>

> Subject: RE: Benton Harbor Phosphate Addition
>
> The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division Department of
> Environmental Quality
> 616-307-0261 mobile
>
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
> f2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864
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> D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=ht
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> aoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> From: Sarkipato, Ernest (DEQ)
> Sent: Friday, January 25, 2019 3:22 PM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Cc: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Subject: PRT: Benton Harbor Phosphate Addition
>
> Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.
>
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division Department of
> Environmental Quality
> 616-307-0261 mobile
>
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
> f2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864
> 438962631682&sdata=pLOJu2T%2Bx7SSl%2BXdJW6glwy85wg62W3zmD%2BLCdG30
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> a36raoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> <bh phosphate application 1_24_19.pdf> <image003.png>

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To: London, Bob (DEQ); Onan, Brandon (DEQ)
Cc: Sarkipato, Ernest (DEQ); Thurston, Brian (DEQ)
Subject: RE: Benton Harbor Phosphate Addition
Date: Friday, February 22, 2019 9:59:20 AM

Yes, check calanders.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

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> Brian E. Thurston, P.E., Community Water Supply Section Manager
> (Acting) Drinking Water & Municipal Assistance Division Michigan
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> E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
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> 74&sdata=%2FKjoF%2FOQM%2FAcT0wVC3IZ2D%2Fxdzh8TMoWZlzgwd9ozHU%3D&am
> p;reserved=0<https://na01.safelinks.protection.outlook.com/?url=http%3
> A%2F%2Fwww.michigan.gov%2Fdeq&data=02%7C01%7CBOLFM%40michigan.gov%
> 7Cc5482ec4b0314cf2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%
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> but will be inadequate for 8 MGD
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> Brandon Onan, P.E.

> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
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> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Sent: Thursday, February 7, 2019 10:00 AM
> To: Onan, Brandon (DEQ)
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> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
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> 616-307-0261 mobile
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> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
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> D&reserved=0<https://na01.safelinks.protection.outlook.com/?url=ht
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> aoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
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> From: Sarkipato, Ernest (DEQ)
> Sent: Friday, January 25, 2019 3:22 PM
> To: Onan, Brandon (DEQ)
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> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
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> a36raoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> <bh phosphate application 1_24_19.pdf> <image003.png>

From:	Onan, Brandon (DEQ)
To:	Sarkipato, Ernest (DEQ)
Cc:	Bolf, Michael (DEQ)
Subject:	RE: Benton Harbor Phosphate Addition
Date:	Wednesday, February 13, 2019 2:00:52 PM
Attachments:	RE Benton Harbor Phosphate Addition.msg dose calc check.xlsx

Ernie,

The attached email is what I sent back to Mike and Brian. I've also attached the spreadsheet I used to make the table. You can compare these with what you had done previously.

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Wednesday, February 13, 2019 12:45 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition

Maybe the error in the spreadsheet is in the 33% as P ... could be as PO4?

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 4, 2019, at 1:52 PM, Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

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616-307-0261 mobile

www.michigan.gov/drinkingwater

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<bh phosphate application 1_24_19.pdf>

From: Onan, Brandon (DEQ) []
To: Bolf, Michael (DEQ) [BOLFM@michigan.gov]; Thurston, Brian (DEQ) [THURSTONB@michigan.gov]
CC:
Subject: RE: Benton Harbor Phosphate Addition
Sent: Thursday, February 07, 2019 12:38:24

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

MGD

ppm PO4 total

2

3

5

8

1

4.4

6.7

11.1

17.7

2

8.9

13.3

22.2

35.5

3

13.3

20.0

33.3

53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

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www.michigan.gov/drinkingwater

8.34 0.33 11.4

ppm	MGD 2	3	5	8
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2	8.9	13.3	22.2	35.5
3	13.3	20.0	33.3	53.2

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PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: Darwin Watson, City Manager 200 East Wall Street Benton Harbor, MI 49022 **WSSN**: 600	Permit Stamp Area (DEQ use only)	
2. **Owner's Contact Person** (provide name for questions): Contact: Mike O'Malley Title: Water Plant Superintendent Phone: 269-927-8470		
3. **Project Name** (Provide phase number if project is segmented): Phosphate Corrosion Inhibitor Installation	4. **Project Location** (City, Village, Township): City of Benton Harbor	5. **County** (location of project): Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc:

Issued by: _____

Reviewed by: _____

☐ **If this box is marked see attached special conditions.**

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
- -No day tank needed per estimated chemical use
- -Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
- -Insertion meter to interface with chemical dosing pump
- -isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
- -chemical scale with digital readout (Forceflow XT-600)
- -LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:

Chemical Supplier:
Mike Enlow, Elhorn Engineering Co.
517-204-2845
mike@michonline.net

8. Indicate who will provide project construction inspection:
☒Organization listed in Box 1.
☐Engineering firm listed in Box 7.
☐Other - name, address, and phone number listed below.

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ Date 1/24/19 Phone (269) 363-0575

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

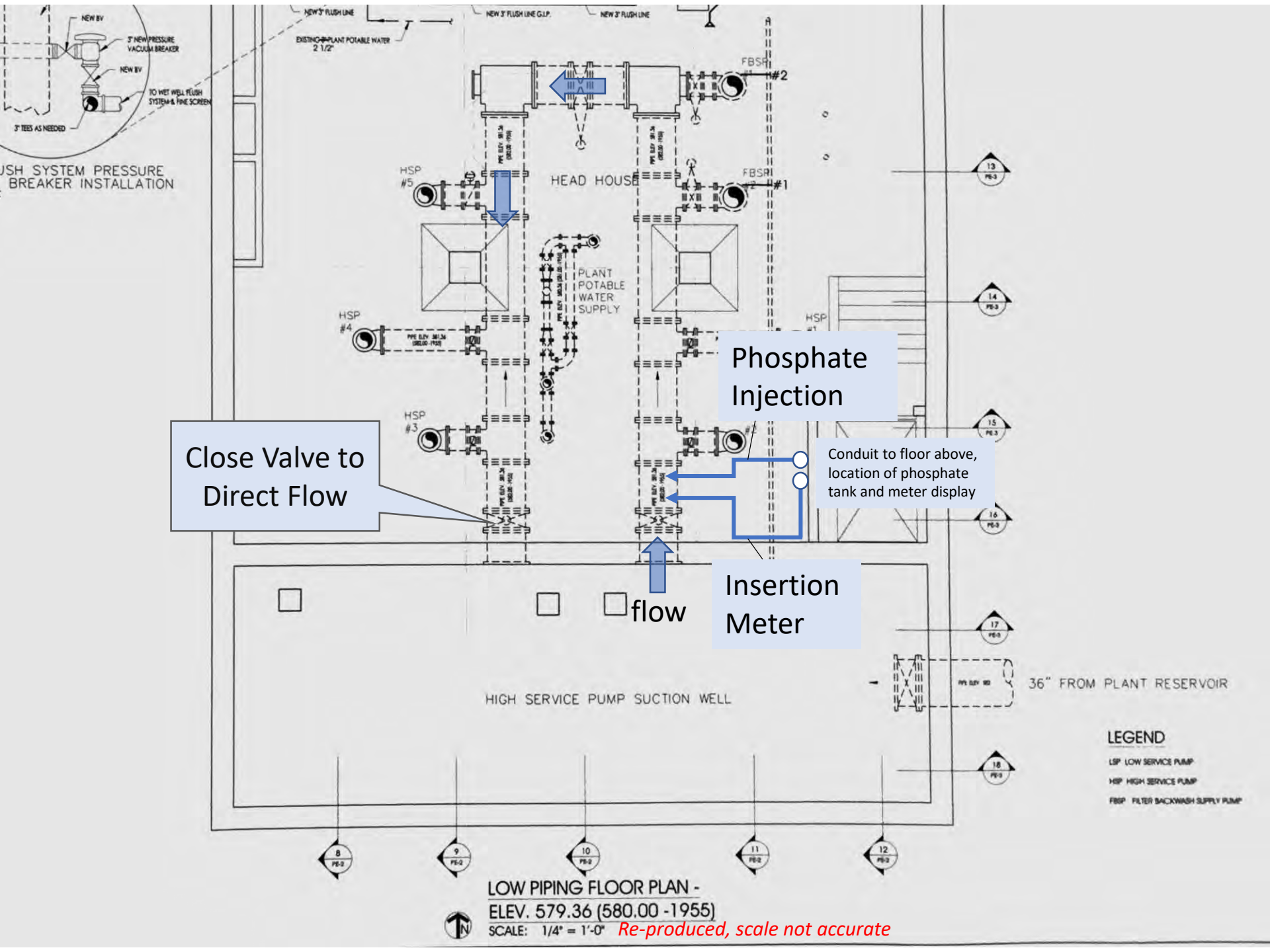
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4 lbs/gal
Strength	33%	total P			

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	6.33	9.50	15.84	25.34
	2 mg/L as PO4	12.67	19.00	31.67	50.67
	3 mg/L as PO4	19.00	28.50	47.51	76.01

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

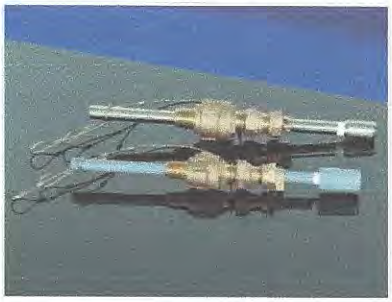
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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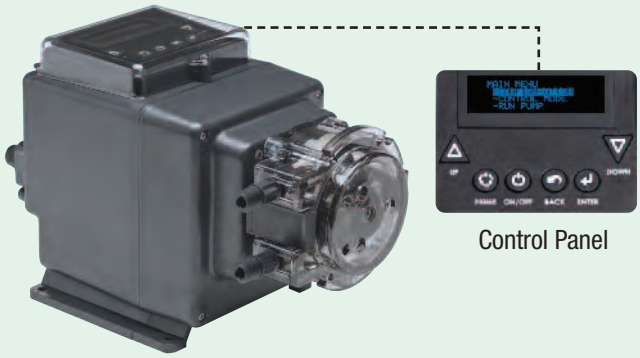
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

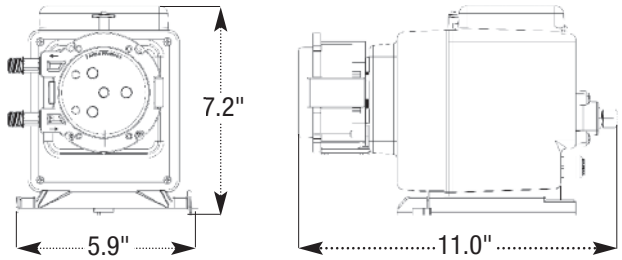
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

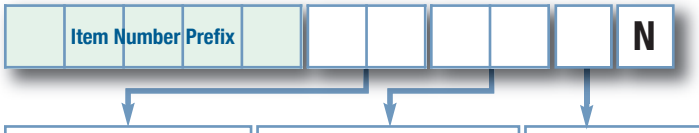
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

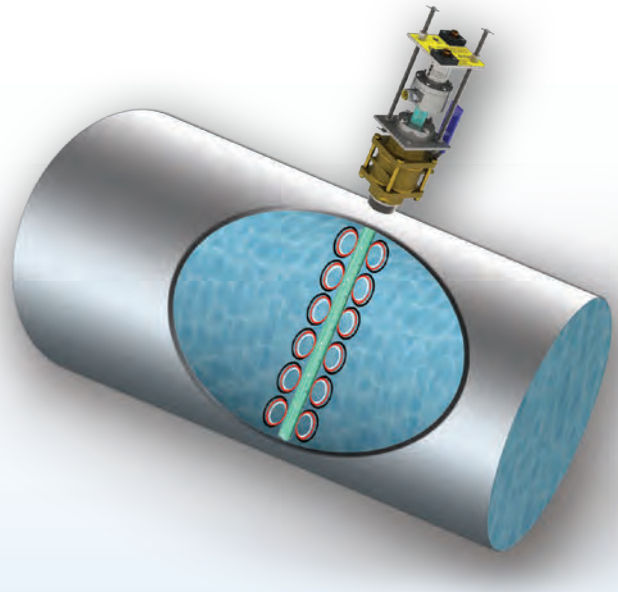
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

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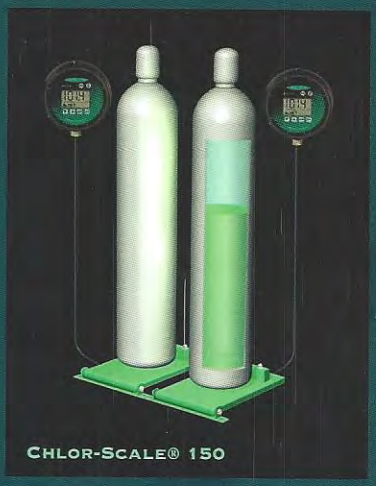
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

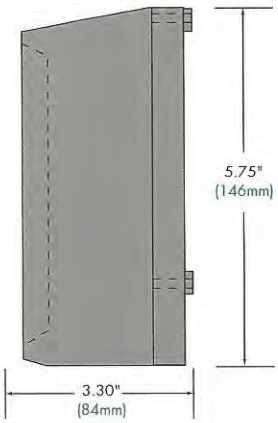
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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From: Bolf, Michael (DEQ)
To: London, Bob (EGLE); Onan, Brandon (EGLE)
Cc: Sarkipato, Ernest (EGLE); Thurston, Brian (EGLE)
Subject: RE: Benton Harbor Phosphate Addition
Date: Friday, February 22, 2019 9:59:26 AM

Yes, check calanders.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

-----Original Message-----
From: London, Bob (DEQ) <LONDONR@michigan.gov>
Sent: Friday, February 22, 2019 9:52 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition

I'm available between noon and 2:15 today

Sent from my iPhone

> On Feb 22, 2019, at 8:30 AM, Onan, Brandon (DEQ) <OnanB@michigan.gov> wrote:
>
> I think we need to get on the phone and discuss this. We should only need about 10 minutes. Is there a time we can make this happen?
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov
>
> -----Original Message-----
> From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> Sent: Thursday, February 21, 2019 5:13 PM
> To: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
> Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ)
> <BOLFM@michigan.gov>; London, Bob (DEQ) <LONDONR@michigan.gov>
> Subject: Re: Benton Harbor Phosphate Addition
>
> I appreciate the PRT input and will continue to wait for consensus. FYI, the recommendation from Elhorn was for 1.5 mg/L as total PO4, which was discussed with them in a meeting. I recall their concerns being the poly portion of the blend may be too high and counterproductive above this amount. I wonder if Mike Enlow would provide supporting science for this!?
>
> Have other recent proposals been for 100% ortho, as opposed to a blended product? This could explain the different approach.
>
> One more comment, I believe the coupon test to follow would then quantify lead release at different dosages,

resulting in the optimal designation by DEQ.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> DEQ-Drinking Water and Municipal Assistance Division
> 616-307-0261
>
> On Feb 21, 2019, at 4:47 PM, Thurston, Brian (DEQ) <THURSTONB@michigan.gov> wrote:
>
> As far as I can tell the proposal is for approximately 1.05 ppm PO4 as Orthophosphate to address a city with Pb service lines and known Pb ALE. We have seen through recent sequential service line sampling that the city has a significant Pb issue. In my opinion this proposed treatment is not in line with other recent OCCT proposals of 3.1 ppm as Orthophosphate for a community with known Pb service lines and Pb ALE.
>
> The issue discussed below shows the proposed chemical feed cannot feed the proposed dose at all plant flow conditions. It appears the pump is undersized. This needs to be addressed in the permit. What about a two pump system?
>
> The attached permit submittal does not show how the consultant is planning to reach OCCT. In my opinion, a higher initial dose of Orthophosphate is need to quickly establish a protective film in the Pb service lines. I do not support the proposal as submitted. Maybe additional documentation has been submitted and not included in this permit package that addresses my concerns.
>
> If you should have any questions with this e-mail please contact me to discuss.
>
> Sincerely,
> Brian E. Thurston, P.E., Community Water Supply Section Manager
> (Acting) Drinking Water & Municipal Assistance Division Michigan
> Department of Environmental Quality
> E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
> Direct: (231) 590-3430
> Fax (231) 775-4050
>
> Cadillac District Office
> 120 W. Chapin Street
> Cadillac, Michigan 49601
> [DEQ]
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> deq&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314cf2ca9008d6
> 98d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C6368644389626216
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> SDm1VmuokMyd%2BD54%3D&reserved=0>
>
> From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
> Sent: Thursday, February 21, 2019 3:14 PM
> To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov>
> Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> Subject: RE: Benton Harbor Phosphate Addition
>
> Brandon,
>
> I agree with your explanation and have no further concerns. As long as the permit or the AL exceedance

communication spells out the WQP monitoring requirements, I think this permit can be issued. I suspect OCCT ranges will be set subsequently once we have monitoring data available after the phosphate has been in use for a while.
>
> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
>
> From: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Sent: Thursday, February 14, 2019 2:20 PM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> Do either of you have any further comments or discussion points on this permit review? I would like to get back with Ernie on this as he is trying to move the project forward.
>
> Thanks,
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Onan, Brandon (DEQ)
> Sent: Thursday, February 7, 2019 11:38 AM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.
>
> I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.
>
> I'm calculating it in the following manor: [(ppm PO4
> total)*(MGD*8.34)]/[0.33*11.4] = gpd of product
>
> The following table is setup the same as the one on page 12 utilizing
> the equation above
>
>
> MGD
>
> ppm PO4 total
>
> 2
>
> 3
>

> 5
>
> 8
>
> 1
>
> 4.4
>
> 6.7
>
> 11.1
>
> 17.7
>
> 2
>
> 8.9
>
> 13.3
>
> 22.2
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> 35.5
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> 3
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> 13.3
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> 20.0
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> 33.3
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>
> Based off this I think the pump selection still holds for up to 5 MGD
> but will be inadequate for 8 MGD
>
> Brandon Onan, P.E.

> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Sent: Thursday, February 7, 2019 10:00 AM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: RE: Benton Harbor Phosphate Addition
>
> Brandon,
>
> I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.
>
> Can you shine some light on this?
>
> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> 906-630-4107 (mobile)
>
> From: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Sent: Tuesday, February 05, 2019 8:34 AM
> To: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ)
> <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
> Subject: FW: Benton Harbor Phosphate Addition
> Importance: High
>
> Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.
>
> Thanks,
>
> Brandon Onan, P.E.
> Corrosion Control Engineer
> Drinking Water & Municipal Assistance Division Michigan Department of
> Environmental Quality
> (p) 616.307.6736
> onanb@michigan.gov<mailto:onanb@michigan.gov>
>
> From: Sarkipato, Ernest (DEQ)
> <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
> Sent: Monday, February 4, 2019 1:53 PM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Cc: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>

> Subject: RE: Benton Harbor Phosphate Addition
>
> The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division Department of
> Environmental Quality
> 616-307-0261 mobile
>
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
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> aoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> From: Sarkipato, Ernest (DEQ)
> Sent: Friday, January 25, 2019 3:22 PM
> To: Onan, Brandon (DEQ)
> <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
> Cc: Bolf, Michael (DEQ)
> <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
> Subject: PRT: Benton Harbor Phosphate Addition
>
> Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.
>
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division Department of
> Environmental Quality
> 616-307-0261 mobile
>
> https://na01.safelinks.protection.outlook.com/?url=www.michigan.gov%2F
> drinkingwater&data=02%7C01%7CBOLFM%40michigan.gov%7Cc5482ec4b0314c
> f2ca9008d698d53dec%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636864
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> ZQ%3D&reserved=0<https://na01.safelinks.protection.outlook.com/?ur
> l=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CBOL
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> d966a892ef47225d1%7C0%7C0%7C636864438962631682&sdata=Km17xBxS5WOzG
> a36raoYfqDkZjQ2SB9IX%2B7ACJRhZJE%3D&reserved=0>
>
>
> <bh phosphate application 1_24_19.pdf> <image003.png>

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; Bolt, Jennifer (EGLE)
Cc:	Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov
Subject:	RE: Benton Harbor Phosphate Residuals
Date:	Thursday, June 13, 2019 9:22:09 AM

Mike – Sounds like the 60 lead/copper samples is the biggest challenge right now, in addition to staffing. We'd be willing to provide some assistance in any way possible. Just say the word, I could potentially be there first thing tomorrow morning for a few hours to help. We could make phone calls, organize records, whatever you think; anything in an effort to help the city complete this first round of sampling by June 30.
Ernie
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, June 13, 2019 9:11 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Phosphate Residuals
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I almost lost it Since this, the lead, The order. I put off the Lead sampling requirement until recently, now I have to go full speed ahead on finding 60 homes.
I have 4 right now. 100 letters 4 responses. We are going to go door to door next and hope for the best!
I have some help. But with the 3 of them 1 is new to Benton Harbor; and 2 are new to water.
The feed rate and record keeping (I that I have spent 2 months writing).
There was an issue in putting barrels on as the others went down to nothing. It got taken care of, when I got back on Monday.
Heck, Abonmarche is chomping at the bit for ME to tell them what I spent against the Pilot Grant. I am going to use the extention to put that off.
Heck, I haven't even looked back at the Asset Mgt requirements you and that woman have insisted on.
So, you know: The background corrosion coupon rack will not function as you think it will. Like I said you should have thought of that before we started.
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The Sheet I created you do not even like. It took me 3 days to re-configure the record keeping while having to write a MOR on time. Denny took a vacation, I really do not know what that is, but he was he was not here to help.
The Bacti page with METER and OPP is the same in May as it was in April. Residuals IN PLANT.
Mike O'Malley
Benton Harbor Water Superintendent.
On Thu, Jun 13, 2019 at 8:45 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mr. O'Malley – some feedback from EGLE folks and a question:

Feedback- There are some days when the dosed phosphate is much lower than the agreed upon target. Eventually, we are going to be setting ranges for acceptable levels, with only 9 excursions allowed in a 6 month period. This will likely include alkalinity, pH, and phosphate. We will be discussing with you in the near future.
Question- Is the last column a distribution sample site or at the water plant?
Ernie

From: Sarkipato, Ernest (EGLE)
Sent: Monday, June 10, 2019 8:47 AM
To: momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov
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For clarity, the last column on the phosphate page is ortho residual. The next-to-last column is the calculated dose, as total phosphate, assuming 33% product strength.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, June 7, 2019 5:24 PM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR May 2019
Please see attached: *MI 0600 Benton Harbor MOR 2019.pdf*
.
Thank you,
Mike O'Malley
Benton Harbor Water Superintendent

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE)
Cc:	Bolf, Michael (EGLE); Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov
Subject:	RE: Benton Harbor Phosphate Residuals
Date:	Thursday, June 13, 2019 8:45:37 AM

Mr. O'Malley – some feedback from EGLE folks and a question:
Feedback- There are some days when the dosed phosphate is much lower than the agreed upon target. Eventually, we are going to be setting ranges for acceptable levels, with only 9 excursions allowed in a 6 month period. This will likely include alkalinity, pH, and phosphate. We will be discussing with you in the near future.
Question- Is the last column a distribution sample site or at the water plant?
Ernie

From: Sarkipato, Ernest (EGLE)
Sent: Monday, June 10, 2019 8:47 AM
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Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov
Subject: Benton Harbor Phosphate Residuals
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Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, June 7, 2019 5:24 PM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR May 2019
Please see attached: *MI 0600 Benton Harbor MOR 2019.pdf*
.
Thank you,
Mike O'Malley
Benton Harbor Water Superintendent

From:	Bolf, Michael (EGLE)
To:	Sarkipato, Ernest (EGLE); momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE)
Cc:	Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov
Subject:	RE: Benton Harbor Phosphate Residuals
Date:	Monday, June 10, 2019 1:18:39 PM

Good news. As the pipe coatings start to form, we should see a reduction in lead/copper concentrations. When the AVG distribution residuals are consistently equivalent to the calculated doses, that is one indicator that the coatings have been established. This may take a few months so we'll keep an eye on the reports. Thanks for the update.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, June 10, 2019 8:47 AM
To: momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov
Subject: Benton Harbor Phosphate Residuals

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Ernie Sarkipato, P.E.
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Drinking Water and Environmental Health Division
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616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
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To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley

<momalley@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR May 2019

Please see attached: *MI 0600 Benton Harbor MOR 2019.pdf*

.
Thank you,

Mike O'Malley
Benton Harbor Water Superintendent

From:	Onan, Brandon (EGLE)
To:	Mike O"Malley
Cc:	Sarkipato, Ernest (EGLE); Thurston, Brian (EGLE); Darwin Watson
Subject:	RE: Benton Harbor Phosphate Residuals
Date:	Thursday, June 13, 2019 11:35:31 AM

Thank you for the email but I still need to talk to you Mike. I have people lined up to come and help you get your sampling efforts completed before the end of the month.

Brandon Onan, P.E.
Acting Corrosion Control Engineer Specialist
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, June 13, 2019 11:31 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Phosphate Residuals

Ernie,

I have already asked you for help and been denied.

The 2015 Sanitary Survey, the last one to be done with detail. Put the Water Population for the City of Benton Harbor at 9,670 people. All MDEQ population based Monitoring requirements except for Lead and Copper were based upon this population figure! Gary Wozniak reviewed and submitted this complete document to Stewart Beach and Darwin Watson, some time in 2015. It was likely that Stewart had to collect 30 tri-annual samples by September 2015 and neither he or Gary even discussed it, what the heck 30 samples was easier to get than to go back and review the original 1991 Lead and copper legislation.

Jump forward, we collected 30 samples in 2018, best I could do, using more than 1/2 of Stewart's list, he did not do, but had Denny do. Thankfully, Denny knew where the records were and I worked off of them.

Then comes the action level! In the 1st few days of all the excitement with the City, MDEQ, Berrien County, etc.; I started bringing up the fact that starting over meant starting over but at a population of less than 10,000 people, with a sampling requirement of 40. You all put it off and put it off after several attempts to get the issue resolved.

Add a bit of heartbreak to that when the Laboratory and MDEQ Representative Jeni Bolt made over 70 lead and copper samples available to anyone who would like to see them and tear down the Benton Harbor's water system!

(Remember the chorus; "we don't want another Flint")

In what I thought would be the last correspondence email (but it was not) I asked if **I needed to submit a Formal Request to MDEQ to have the population adjusted to where it should be in terms of less than 10,000 people**.

You jumped on that then. And came back stating that our population jumped to 9,970 people and that you and the gang decided that you had the right to insist upon requiring 60 samples.

I closed by stating that what difference would it make if I end up collecting 40 or 60 lead results that if done right are guaranteed to be greater than the 15ppb Action level.
Which I am guessing will bring much much more grief for Benton Harbor.
You all can help me now in 1 way, admit that the Benton Harbor water system serves less than 10,000 customers and should begin again in the Lead and Copper Regulations by collecting 2 rounds of 40 samples in 2019.
You can do this from your desk, I do not need a visit as I have people working for me that are Benton Harbor or Benton Township people and have the best chance to communicate our needs in terms of sampling.
Thank you, (no actually, Sincerely Yours),
Mike O'Malley
Benton Harbor Water Superintendent
On Thu, Jun 13, 2019 at 9:22 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike – Sounds like the 60 lead/copper samples is the biggest challenge right now, in addition to staffing. We'd be willing to provide some assistance in any way possible. Just say the word, I could potentially be there first thing tomorrow morning for a few hours to help. We could make phone calls, organize records, whatever you think; anything in an effort to help the city complete this first round of sampling by June 30.
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> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
> **Cc:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Mike OMalley <momalley@cityofbentonharbormi.gov>
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On Thu, Jun 13, 2019 at 8:45 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

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> Feedback- There are some days when the dosed phosphate is much lower than the agreed upon target. Eventually, we are going to be setting ranges for acceptable levels, with only 9 excursions allowed in a 6 month period. This will likely include alkalinity, pH, and phosphate. We will be discussing with you in the near future.
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> **From:** Sarkipato, Ernest (EGLE)
> **Sent:** Monday, June 10, 2019 8:47 AM
> **To:** momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE) <OnanB@michigan.gov>
> **Cc:** Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov
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> Drinking Water and Environmental Health Division
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> 616-307-0261 mobile
> EGLE
> www.michigan.gov/drinkingwater
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> **Cc:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** MI 0600 Benton Harbor MOR May 2019
> Please see attached: *MI 0600 Benton Harbor MOR 2019.pdf*
> .
> Thank you,
> Mike O'Malley
> Benton Harbor Water Superintendent

From: Onan, Brandon (DEQ)
To: Bolf, Michael (DEQ); Sarkipato, Ernest (DEQ); Oswald, Eric (DEQ)
Cc: Thurston, Brian (DEQ); Lachance, Amy (DEQ)
Subject: RE: Benton Harbor Proposed PO4 feed
Date: Monday, December 3, 2018 4:21:56 PM
Attachments: image001.png

I completely understand what Mike is saying about the potential for hydraulic issues. Just as an FYI on that topic, this plant's suction header is designed such that there is a gate valve that can isolate between the two looped legs so that high service pumps 1, 2, and the two backwash pumps can run off from one side, while high service pumps 3, 4, and 5 can run off the other side. Currently, they are only using pumps 2 and 3 (I believe) and are WAY under utilizing the headers design potential, so there will be plenty of capacity after changing the header to have only one feed point. In the future they may need to change this proposed system setup based on either having a drastic increase in their demands or by utilizing more pumps once they are fixed and returned to service. This could be done by simply repeating the proposed design on the opposite leg and closing the crossover valve so each leg runs independently.

Mike is right, there is a chance that we are placing more liability on ourselves than we would normally, but this (I believe) is a pretty straight forward setup and with the state of affairs being what they are in Benton Harbor I'm personally comfortable with this proposal being functional and meeting the needed protection to public health.

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Bolf, Michael (DEQ)
Sent: Monday, December 3, 2018 3:15 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Subject: RE: Benton Harbor Proposed PO4 feed

Brandon's description is more detailed than we usually see in a permit application and sounds like a nice setup (he must have been a consultant at one time). However, given our role as the regulatory agency, I would caution getting too prescriptive on the design. One potential unintended consequence of cutting off one supply to a high service pump suction header is adversely impacting pumping hydraulics (suction pressure, velocity, turbulence). With the lead ALE, I agree prescribing a PO4 product, dose, and requiring a OCC study. However, I'd leave the design details to them and we can review what they propose in the permit app. Even with the best intentions, these things can come back and bite us if they don't work out.

Michael Bolf, P.E.
Water Treatment Specialist
Community Drinking Water - Engineering Unit
Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Monday, December 03, 2018 1:11 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor Proposed PO4 feed

Yep, that was a typo…30%/70% poly/ortho…Thanks Ernie

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ)
Sent: Monday, December 3, 2018 1:06 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor Proposed PO4 feed

I agree with Brandon's proposal. Note, I believe Carus 8600 is a 30% poly / 70% ortho blend (not 30/40 listed below).

Also, the 1.5 ppm ortho residual is higher than that proposed by Elhorn engineering, and I support the increased residual based on my reading of the draft 10 States standards section on corrosion treatment.

Other items for the city: obtain an orthophosphate test kit prior to adding the chemical, and contact an integrator to connect the new insertion meter to SCADA since the plant currently has no working finished water meter.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Monday, December 3, 2018 12:22 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Subject: Benton Harbor Proposed PO4 feed

Eric,

I propose having Benton Harbor execute the following plan for implementation of phosphate into their distribution system:

- Force the bifurcated suction line leaving the clear well, before the high service pumps, to be unidirectional (i.e. close one of the gate valves on the high service pump suction line so that all of the flow comes from one inlet).
- Install a hot tap insertion mag meter that has the ability to produce a 4 – 20 mA signal for chemical meter pump pacing at the suction inlet to the high service pumps
- Install a ¾" chemical injection quill into an existing corp stop at the suction inlet to the high service pumps
- Install a chemical metering pump that accepts a 4 – 20 mA signal for phosphate injection
- Install a floor scale with digital read out
- Procure 50 gallon drums of Carus 8600
- Begin injecting the Carus 8600 (30% poly/40% ortho blend) at a rate such that a minimum of 1.5 ppm of orthophosphate residual is found throughout the distribution system. This dose and chemical have been recommended to Benton Harbor by their chemical supplier based on water quality sample data they obtained.
- Install and perform a corrosion control study as follows:
    - Select lead service line sites for sequential sampling.
        - Should include an initial round either just before or very near when phosphate starts being injected
        - Do another round of sequential sampling at the same sites within 60 days of obtaining a stable orthophosphate residual in the system
    - After injection of phosphate commences, install coupon test racks on a side stream and perform a 90 day test to help identify the optimal dosage of the blended phosphate.

Please let me know if you have any questions or would like any further details.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality

525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736
onanb@michigan.gov

From:	Oswald, Eric (EGLE)
To:	Boeskool, Travis (EGLE)
Subject:	RE: Benton Harbor Water Department needs some help.
Date:	Friday, October 2, 2020 2:20:00 PM
Attachments:	Benton Harbor - Reduce Lead & Copper Sampling.pdf image003.png

Travis, we had a meeting this afternoon to discuss this further. Benton Harbor has asked several times to reduce their LCR sampling numbers and we have declined to do so because it is not in the interest of public health. We are firm in that position. A formal letter is attached.
We intend to assist the city with funding for a corrosion control study.
It is important to know that we have an ACO with the city that we are currently working through as well.
Hope this helps.
Eric

From: Oswald, Eric (EGLE)
Sent: Friday, 2 October, 2020 11:31
To: Boeskool, Travis (EGLE) <BoeskoolT@michigan.gov>; Bishop, Heather (EGLE) <BishopH@michigan.gov>
Cc: Krisztian, George (EGLE) <krisztiang@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; EGLE-Legislative-Contact <EGLE-Legislative-Contact@michigan.gov>; Howes, Sarah (EGLE) <HowesS1@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Strong, Regina (EGLE) <StrongR1@michigan.gov>; Ruch, Suzann (EGLE) <RuchS@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor Water Department needs some help.
We will definitely be reaching out to Benton Harbor to make sure they take advantage of the funding.
I think Ernie and Brandon can provide some feedback on Mike's email with respect to the second question. I will say we decided not to reduce the LCR sampling numbers as the city slipped just under the 10,000 population mark and it didn't make sense to reduce the number of samples during a time when they were having issues with the ALE simply because they dropped slightly below the population number.
Others please chime in here.
Eric

From: Boeskool, Travis (EGLE) <BoeskoolT@michigan.gov>
Sent: Friday, 2 October, 2020 11:22
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Bishop, Heather (EGLE) <BishopH@michigan.gov>
Cc: Krisztian, George (EGLE) <krisztiang@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; EGLE-Legislative-Contact <EGLE-Legislative-Contact@michigan.gov>; Howes, Sarah (EGLE) <HowesS1@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Strong, Regina (EGLE) <StrongR1@michigan.gov>; Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Subject: FW: Benton Harbor Water Department needs some help.
DWEHD folks –
Can I get some feedback on the questions below regarding Benton Harbor, system size, and LCR sample collection requirements? Is this just a case of them having required increased sampling

because of the ALE? Or is it more complicated than that? CC'ing others since I know there's been a lot of folks involved with this community.
I've already responded on how they can get more information about the MI Clean Water plan.
Thanks,
Travis

Travis Boeskool
Legislative Analyst | Office of Legislative Affairs
Department of Environment, Great Lakes, and Energy
C 517 512 5992 | boeskoolt@michigan.gov
Follow Us | Michigan.gov/EGLE

From: Daniel Carrick <DCarrick@senate.michigan.gov>
Sent: Friday, October 2, 2020 9:49 AM
To: Boeskool, Travis (EGLE) <BoeskoolT@michigan.gov>
Subject: FW: Benton Harbor Water Department needs some help.

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Morning Travis,
Two quick questions regarding the email below:

1. I fully imagine Benton Harbor applies to at least the Lead Service Line Replacement in Disadvantaged Communities Program ($102 million) and many other of the $500 million grant dollars Governor Whitmer announced for clean water initiatives. How can we get him connected to some of these funds?
2. Is there merit to what he is saying? I do not know the history well enough to know if he has a point about "re-designating" Benton harbor and that would alleviate issues, so that they would not have to do as much testing.

Thanks!

Dan Carrick
District Director
State Senator Kim LaSata
Cell: 269-252-6987
Email: DCarrick@senate.michigan.gov

From: Mike O'Malley <momalley@bhcity.us>
Sent: Thursday, October 1, 2020 4:00 PM
To: Daniel Carrick <DCarrick@senate.michigan.gov>
Cc: Mike O'Malley <momalley@bhcity.us>
Subject: Re: Benton Harbor Water Department needs some help.
I recognize the name but I do not remember why.
Well I just saw the new funding program that may help the city remove lead service lines, which as

you may know is a substantial issue in Benton Harbor.
That is the 1st I've heard about helping get the lead out of MI since the Lead law changed 2 years ago.
The 1st thing for now is this.
In 1991 the Federal and State Drinking water acts implemented a Lead and Copper Rule.
Benton Harbor's sampling protocol was based upon a population of more than 25,000 people (A Large System, requiring 60 Samples, initially and 30 samples in Reduced Monitoring.)
In about 2011, Benton Charter Township left the City's water system, nearly 60% customer base.
In 2014, St. Joe Charter Township (Fairplain) left the City's water system.
In 2015, the MDEQ Kalamazoo DW MAD representative adjusted the Water Population to 9,670 people
At that time, all but the Lead and Copper sampling rules were adjusted to that population.
The size of the required Water System Operations Chief dropped from S-1 to S-2.
Then the Flint Crisis came. Gov Snyder demanded that MI change the Lead Rules to be what they are now.
Benton Harbor exceeded the Lead Action Level in September 2018.
Of course the City had to return to the original Lead Monitoring (not reduced)
That is the rule and it is still the exact way it was originally written!
Since that day, The State's New EGLE DWMAD has demanded that the City still collect samples and abide by all the new lead laws based upon the Large System
Benton Harbor has argued that the City has a population of less than 10,000 people and should be treated as a Medium Sized system in the Lead Rules.
A medium sized system only has to collect 40 original samples for consecutive bi-annual monitoring and much lesser additional work.
This argument has been sent to EGLE DW MAD many times, and rejected every time based upon the idea that LEAD IS FAR TOO IMPORTANT TO ALLOW THE BENTON HARBOR SYSTEM THE RELAXED RULE CHANGE!!!
When Gov Whitmer created an EAGLE Names Regina Strong as Environmental Justice Public Advocate. I called her for help.
We went all the way through the 2 sets required by the EGLE, and were not successful at collecting 60 samples both times.
Which resulted in 2 Notices of Violation (NOV) and 2 Fines in 2019.
Which helped greatly the degradation of our consumer's confidence in their public drinking water!!
A group was formed by Nina Sassy, the Environmental Justice Public Advocate; MI DHHS director and staff; EGLE DW MAD; Fresh Water Futures and The New Benton Harbor Water Quality Committee, headed up by Rev Pinkney.
That is a person you, your boss, and your boss's husband should know quite a bit about.
To me, now it appears that Rev Pinkney is using his skills for the better and helped Benton Harbor collect 63 Samples for Lead and Copper, for the 1st half of 2020.
And is ready to go at it again for Benton Harbor's 2 half 2020 requirement of 60 samples.
I said a lot. But hopefully, I have painted a picture easy enough to see that Imposing the Large System requirements on Benton Harbor and the something Like 28 State, and Local representatives services to help.
If the Actual Lead and Copper Rules were followed, Benton Harbor as a Medium System, could have met it's responsibility without all the additional fuss and headaches.

And, I am not stating that we will NOT exceed the Lead Action Level, because we follow the requirements to the letter, by using those labeled as *"homes to be known to have a Lead portion in their service line."*

Benton Harbor could use a little break.

And don't you know we intend to get that Water Grant Money from the state, for sure, and somewhat specifically to remove all the Lead Service Lines that we can!

Sincerely,

Your friend, electorate, and

The Benton Harbor Community Water Supply Operator IN Charge.

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 17, 2020

Mr. Mike O'Malley, Water Superintendent
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: **00600**

Dear Mr. O'Malley:

SUBJECT: Response to Request to Reduce Number of Lead and Copper Sampling Sites

The City of Benton Harbor (City) wrote the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on May 27, 2020, regarding the City's population as it relates to required monitoring under the Michigan Lead and Copper Rule. EGLE sent the City an annual monitoring schedule in February of 2020, outlining the requirement to sample once per six month period in 2020 for lead and copper in the amount of sixty (60) samples, according to Rule 710a of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Previously, the City fell inside the population bracket of 10,001 – 100,000 and therefore was placed on triennial monitoring of lead and copper in the amount of thirty (30) samples. In Fall 2018, an action level exceedance was triggered for lead, doubling the required number of samples per Rule 710a.

The purpose of tap monitoring for lead and copper is to get a sense of corrosion rates throughout the system. It is important to obtain enough samples to adequately assess any trends across the system as significant funds are being spent for the sake of public health protection. For these reasons, EGLE has required the higher number of samples to remain protective of public health and obtain the most reliable dataset for making decisions. The authority for this determination is Rule 732 from Act 399.

Please be reminded, according to R 325.10710a(a), the City is required to submit a Lead and Copper Sampling Pool/Plan (LCSP). EGLE recently notified the City of the need to submit a LCSP by June 17, 2020 and has not received.

We applaud the efforts by the City and local volunteers to obtain 60 samples during the current sampling round. We continue to offer our assistance to help the City obtain the necessary number of compliance samples. If you have any questions regarding this letter, please contact me below, or in writing at EGLE-Drinking Water and

Environmental Health Division, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato
Surface Water Treatment Specialist
Drinking Water and Environmental
Health Division
616-307-0261
sarkipatoe@michigan.gov

cc/via email: Mr. Ellis Mitchell, City Manager, City of Benton Harbor
Mr. Brandon Onan, Lead and Copper Unit Supervisor, EGLE
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE

From: Sarkipato, Ernest (DEQ)
To: Mike O"Malley
Cc: Darwin Watson; Bolf, Michael (DEQ)
Subject: RE: Benton Harbor Water Plant New Alum Feed Location
Date: Friday, March 1, 2019 7:33:37 AM

Reminder…. We are still looking for a permit application submittal for the alum project. The previous submittal is a good start, and we need a revised design with two correctly sized pumps (see below), and a diagram of the piping. I strongly encourage you to lean on your new secretary Toni as much as possible to get over this paperwork hurdle.
Other items coming up due on the ACO are operations for distribution, chlorine analyzer, meter installation, as well as the SCADA system upgrades. Again, this is a lot especially when you are doing 4 jobs Mike. Please let Darwin know what resources you may need to get these things done by April 1, 2019. That's 1 month from today.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Tuesday, February 12, 2019 11:19 AM
To: 'Mike O'Malley' <momalley@cityofbentonharbormi.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor Water Plant New Alum Feed Location
Mike, thanks for sending "your version", this is a nice spreadsheet. By the way, you're right on the head calculation. 30 feet should equal 13 psi, which is within the allowable range of 25 psi of the pump. Another sign I'm moving too fast doing these calcs!
Column F, Pounds of Aluminum Sulfate, looks like it's "as product". It matches the MOR numbers, but that column is labeled as "dry" Al2(SO3)4 Pounds" (should be changed). Assuming the product, liquid alum, contains 4.4% Al ion, the dosage I calculate for 1/1/2019 is
Ppm = lbs Chem / Mlbs H20 = [289 lbs liquid alum * 0.044 = 12.716 lbs Al ion] / [0.8675 mgal x 8.34 = 7.235 mLbs h2o] = 1.758 mg/L
This is the same as yours, perfect. It also lines up with the pump sizing spreadsheet I had sent earlier. If I plug in the data for 1/1/2019 (.8675 mgd, 1.75 mg/L as Al3+, 11.11 lbs/gal) the spreadsheet comes up with 288.14 lbs for the day.
Your plan to propose different pumps that will easily handle the max flow and max coagulant dose is a good one.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>

Sent: Tuesday, February 12, 2019 8:53 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Darwin Watson <dwatson@cityofbentonharbormi.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Water Plant New Alum Feed Location

No problem, thanks!
I do not understand what you are talking about.
Your calculations make no sense to me, after all I am only a water guy. Not a Choo Choo Charlie.
Go with what I know and you see every month in the MORs
for an example see attached: *Jan 2019 LS Sample flows.xlsx*
1st, Alum weighs 11.11 pounds per gallon
The Stenner pump is rated at 25 psi TDH which is 57+ft
The elevation of rapid mix 0.0 pump level 30' top of water in Plate Settlers
You are right, in the sense that 1 stenner pump is borderline for required Alum treatment.
Of course we are talking 2 pumps
And very likely that is not recommended in some 10-States Standards.
Of course we are only talking about Benton Harbor WTP
Doesn't matter anyway.
I originally bought the 2 stenner pumps to replace the 1 Watson Marlow pump that failed last year.
Another failed a few months ago and a 3rd one failed over the past weekend..
So, I will be using the 2 Stenner pumps for Sodium Hypochlorite feed very soon.
Mike O'Malley
Benton Harbor Water Superintendent.
Hey, we got freezing rain, what did you all get?
On Mon, Feb 11, 2019 at 1:01 PM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Well this is embarrassing – I needed to re-do the alum pump calculator spreadsheet due to incorrect conversions, and came up with the attached. In short, the Stenner pump you are proposing probably isn't able to be permitted due to limitations on the flow, and likely limitations on the head.
>
> ---
>
> **From:** Sarkipato, Ernest (DEQ)
> **Sent:** Tuesday, February 5, 2019 12:21 PM
> **To:** 'Mike O'Malley' <momalley@cityofbentonharbormi.gov>
> **Cc:** Darwin Watson <dwatson@cityofbentonharbormi.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>
> **Subject:** RE: Benton Harbor Water Plant New Alum Feed Location
>
> Back to the Alum project (too busy focusing on other things like phosphate!). We are fully supportive of getting this project permitted and completed, and appreciate you've already started the legwork of getting the alum lines planned out and also the electrical line for the dead-man switch.
>
> **Transfer Pumps**
>
> The attached information from the Wightman engineer is helpful to assess the ability of the existing transfer pumps to move alum a further distance. Based on the calculations, I'm concerned the alum transfer pumps will be running way off the curve with smaller pipe sizing. This might result in wear and tear on the pumps, as well as slower fill times. Whatever diameter you propose, it would be good to have a backup plan if the transfer pumps either quit or can't keep up.

Dosing Pumps

Existing pumps are Omni Pulsafeeder, with 11.6 gph against 150 psi. You're proposing a Stenner pump that is 80 gpd at 25 psi(photo attached). I've done some calculations for dosing 1.5 ppm as Al^{3+}, and at 3 MGD flow rate the pump will barely keep up. Also, the 25 psi rating probably won't be sufficient. The plans I've got show water level in the mixer of 617 feet, and floor of 602 feet, which is 15 feet of head or 35 psi. One option is to get stenner pumps that are double-headed, which would increase their ability to pump against pressure.

I'd be more comfortable knowing there were two pumps installed, one per treatment train. If you just want to keep a backup on the shelf and have a single pump installed to feed chemical, we would like to see a larger pump design. Either way, we need to have feeder redundancy for alum.

Day Tank

The existing polymer day tanks are designed to be corrosion resistant, and are sized at 120 gallons (see attached specs from original permit). The size is a little large, as the 30-hour 10 states gallonage would be more in the 75 gallon range. However, I think with alum this is less of a concern than with something like fluoride.

Moving Forward

we still need to see:

-permit application (https://www.michigan.gov/deq/0,4561,7-135-3313_3675_3691---,00.html)

-verification of the pipe diameter for bulk chemical transfer

-diagram of the alum day tank and feed pump w/ piping (this could be in the form of a photograph markup)

-verification the materials used (piping) will be chemically resistant.

-description of chemical use measurement (scale w/ readout? Level indicators?)

-verify redundancy of feed pump, two in parallel, ability to pump against head pressure

-outline a backup plan for transfer pump failure

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, January 3, 2019 9:51 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Benton Harbor Water Plant New Alum Feed Location

As you know, I've been working on relocating the Alum Supply to the Polymer Room.

In order to recitify the mistake made during the DWRLF project at the Water Plant in 2010.

You and I both know that proper flash mixing of Alum as it is 1st injected into a raw water if done correctly will result in Zero Net Charge in the water. Which will lend itself to more potential collissions in the flocculation stage of alum treatment.

It is generally accepted that this flash mix and subsequent collisions can remove even large Organic Particles (TOC hopfully) from the water and build a larger and stronger and heavier floc.

We have talked about doing this for a year now and it was added as a significant defenciency in

the Sanitary Survey. The idea is to pump an alum supply to the un-used Polymer room and take advantage of the day tank by adding pumps to inject the Alum into the existing polymer feed lines directly ahead of the raw water line entering each basin's rapid mix.
I have shown you the 2 pumps that I intend to use for the injection into the existing lines, as the polymer pumps will not work in an Alum situation.
Now, it is preferred to inject into the rapid mix right at the impeller's highest velocity stirring, but for now, let us try it in the incoming water line.
I have already begun with the electrician to run a conduit and wire and dead man switch to the polymer room and he is partially done: Mead and White Electric.
I got side tracked but I now have the engineering needed to give to the Plumbers to quote and install the actual Alum Supply Piping from the existing day tank to the Polymer Day Tank: DA Dodd Mechanical on Pawpaw Ave in Benton Harbor.
See Attached: ***Benton Harbor Water Plant New Alum feed Location Packet 2018 11 28.pdf***
We have talked some about a Permit to Construct being requested from your office. I hope that I can complete this Permit to Construct without any additional Engineer's input.
Will this still be the case? Even with Darwin's request to have this project funded with the MDEQ Pilot Grant? If not, I will need to hire an Engineer to complete the process.
Please advise at your earliest,
Thank You,
Mike O'Malley
Benton Harbor Water Superintendent.

From: David A. Cornwell
To: Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject: RE: Benton Harbor Water Quality
Date: Monday, March 2, 2020 10:51:45 AM

Any TCR chlorine data? especially looking for seasonal lows.
Its interesting (but not surprising) how similar to GR this is, but GR lead is very low.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, March 2, 2020 10:02 AM
To: David A. Cornwell <DCornwell@cornwellinc.com>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: Benton Harbor Water Quality
Hi Dave,
Here is the 2019 *Average* Water Quality Data for Benton Harbor:

Parameter	*Location*	*Average*
Turbidity	Raw Water	6.19 NTU Avg, Max 33 NTU
Sulfate	Plant Tap	32 mg/L as SO4-
Chloride	Plant Tap	24 mg/L as Cl-
TDS	Distribution	300 mg/L
Calcium	Plant Tap	45 mg/L as Ca++
Magnesium	Plant Tap	12 mg/L as Mg++
Iron	Plant Tap	Non Detect
Sodium	Plant Tap	15 mg/L
Alkalinity	Raw	120 mg/L as CaCO3
Total Hardness	Raw	160 mg/L as CaCO3
pH	Raw Plant Tap	8 7.9
Free Chlorine	Plant Tap Distribution	1.7 mg/L 0.9 mg/L
Aluminum Sulfate *Dosed*	Rapid mix	1.65 mg/L as Al+++

Ernie

From: David A. Cornwell <DCornwell@cornwellinc.com>
Sent: Friday, February 28, 2020 3:18 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: Meeting to discuss corrosion treatment
Just making sure Eric is ok with me getting involved. It was he and I and Brandon that first discussed switching Benton Harbor. Its important to keep in mind I haven't seen any of their water chemistry.
I could do 9 am the 5th or later but not 10 am.
I can do 2:30 the 6th
Dave

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>

Sent: Friday, February 28, 2020 3:05 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; David A. Cornwell <DCornwell@cornwellinc.com>
Subject: RE: Meeting to discuss corrosion treatment

Good afternoon Mr. Cornwell,

I wanted to reach out to you to inquire about scheduling a phone conversation with you and the City of Benton Harbor officials regarding their corrosion control treatment. They have been struggling to reduce lead numbers using a 70/30 poly/ortho blend, and we recently designated a chemical composition and treatment target for them. They would like some more discussion regarding that decision, and your name was brought up as an expert in the field. I know you have talked with Brandon Onan in the past, so he will reach out to you to fill you in.

Would you be available either of the following for a phone call with the city officials?

3/5/2020-10:00AM

3/6/2020-02:30PM

Thank you in advance,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Friday, February 28, 2020 2:20 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Meeting to discuss corrosion treatment

Hey,

Just call me Monday. Not sure if this is an action item for me or the city…If you are speaking of Cornwell as the "national expert" I have to know ASAP so that I can get his availability.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, February 28, 2020 1:56 PM
To: rrice@cityofbentonharbormi.gov
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Meeting to discuss corrosion treatment

Good afternoon Ms. Rice,

Please consider the following appointments for a phone conversation with City Manager Mitchell regarding the new corrosion treatment in Benton Harbor. We will be looking to invite a national expert in corrosion control treatment, so please indicate which options are available and we will try to coordinate schedules.

3/3/2020 11:00AM

1:30PM

3:00PM
3/5/2020 10:00AM
1:30PM
3:00PM
3/6/2020 2:30PM
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Crider, Steven (DHHS); Nicki Britten
Subject:	RE: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring
Date:	Thursday, June 13, 2019 9:29:29 AM

Thanks for clueing us in here Steve. If you would like to discuss any of this and get a more articulate/direct answer, please don't hesitate to reach out.
One clarification, not that you much care, the target dosing is 1.5 mg/L as total phosphate (PO4), Mike has an incorrect statement below about that aspect.
Ernie

From: Crider, Steven (DHHS) <CriderS1@michigan.gov>
Sent: Wednesday, June 12, 2019 7:49 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: FW: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring
Steve Crider
D: 517-284-9012
M: 517-230-2166
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, June 11, 2019 5:33 PM
To: Nicki Britten <nbritten@bchdmi.org>
Cc: Nick Margaritis <nmargaritis@bchdmi.org>; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Courtney Davis <cdavis@bchdmi.org>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring
Nicki,
Thank you for your response and the graphic. I will make a few copies and put them up at City Facilities.
You have all been great help, even if Berrien County has not done any testing, the MI DHHS has and has already given me some help.
So your question; with my reply in RED:

- Who is the main point of contact for compliance testing at the City? Mike O'Malley (269) 363-0575 momalley@cityofbentonharbormi.gov and Toni Wade desk phone (269) 447-1945 8:30 am to 4:00 pm. awade@cityofbentonharbormi.gov

Water Plant operator desk phone: (269) 204-2201 7:00 am to 2:00pm only.

- What is the process for collecting the water samples? EGLE has a new requirement: Homeowner receives 5 sample bottles; fills 1 after another starting with 1st draw then 2,3, 4 & 5.

- Who is providing the education to the resident on how to collect the sample? When? Where? On the instructions we will provide with the bottles.

- Where do residents get the water bottles? We will bring them, with instructions and a form to fill

out including **the code** I will supply.

- When does the testing need to be done (date)? June 30, 2019 (yes I am late) then if possible, again in September 2019.

- How will filled water bottles be collected/returned to the city? I will ask them to leave them on their porch, and we will pick them up.

- How will residents learn about their test results? How will residents know if there was a problem testing their samples? I will send a follow up letter with **their code** and their results.

- How will water sample results be shared with other entities? Same as last year. The home owner will get their results. The community and EGLE will get the necessary form with **the code only**, as required by rule.

I have done this same procedure each time since 1993. Including sharing only **the code** with results to anyone other than the residents.
The rules have changed. The original rule required Tier 1 sites and including known Lead service line locations.
The new rule has changed the Tier 1 sites to any lead components known and the original Tier 1 sites are now Tier 3 and will be un-acceptable to EGLE.
Since we dug up and investigated service line materials I have 40 some known lead sites.
They have already received a request to be a sampling site. We have about 4 volunteers from that group.
To fill in the gap, I chose to send letters to 50 or so sites that tested ≥ 15ppb for Lead in the Free Sampling pool of 350 locations.
We seem to still be at about 4 volunteers.
Every site that was above the action level in 2018 has been replaced with Copper all the way, so, I cannot use them any more.
I have received some help from MI DHHS and I think that brings me to 8 possible volunteers.
I will go deeper this week.
The State has demanded we go back to the original 1991 sampling of 60 locations. based on serving approximately 25,000 customers.
They refuse to change our status as a Medium system >3300 and < 10,000 people; that would require only 4 sample locations.
Keep in mind:

1. If I cannot get 60 people to volunteer; we will receive a violation notice from EGLE.
2. And, regardless of how many samples we take and the volunteers are diligent; The City will exceed the Action Level at probably 100% of samples taken.
3. Resulting in another EGLE Violation Notice.
4. Unless of course the Corrosion control treatment has an impact. However, I've been told it take months of treatment to have that kind of protection results.
5. We did start treatment March 26, 2019 and we are approaching the optimum level, but not there yet.

Wish us luck,
Sincerely,

Mike O'Malley
Benton Harbor Water Superintendent
On Tue, Jun 11, 2019 at 12:36 PM Nicki Britten <nbritten@bchdmi.org> wrote:

> Hi Mike,
> Nice to hear from you and have a bit of an update on what is going on in your world as it pertains to the Lead Action Level Exceedance.
> In terms of your request for assistance in seeking additional sampling locations to get to the required 60, I think we may be limited on what we can provide. First of all, the county has done absolutely no water testing in the city of Benton Harbor. This is not part of our role in the response. Even if EGLE allowed for other samples to count toward compliance, we would have nothing to offer in that regard.
> Second, we do have many residents that we have had continued contact with for water filter distribution. The Health Department would be willing to make some phone calls to residents that have remained engaged in that process to see if they would be willing to participate in your sampling pool, but we must have very clear guidance from the city about the process before we engage in that activity. If you can give clear responses and direction to the questions below so that we can effectively communicate and direct residents as to how to engage in compliance sampling, we can try to help.
>
> - Who is the main point of contact for compliance testing at the City?
> - What is the process for collecting the water samples?
> - Who is providing the education to the resident on how to collect the sample? When? Where?
> - Where do residents get the water bottles?
> - When does the testing need to be done (date)?
> - How will filled water bottles be collected/returned to the city?
> - How will residents learn about their test results? How will residents know if there was a problem testing their samples?
> - How will water sample results be shared with other entities?
>
> As you may be aware, we do water filter distribution on the first Monday of the month and the third Thursday of the month within the city (see attached flyer). The next one is June 20. You or another city staff member are welcome to be present at any of those to try to recruit people for compliance samples. This offer was made to Mr. Watson in late April so that we would not find ourselves scrambling for people to provide samples in June. Please consider utilizing this option moving forward.
> Look forward to hearing from you.
> Nicki
> **From:** Mike O'Malley [mailto:momalley@cityofbentonharbormi.gov]
> **Sent:** Friday, June 07, 2019 8:33 AM
> **To:** Nick Margaritis; Nicki Britten; Steven Crider
> **Cc:** Mike OMalley

Subject: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring

Nick and Nicki,

You know, I get a kick out of seeing friends of mine being quoted in the local paper.

It makes you celebrities for my day!

I am hopeful the 3 of you might be able to help me.

Let me preface: with my insistence of protecting privacy of residents; and then finding out DHHS has HIPPA protection.

It occurs to me that the protection comes back on me at the Benton Harbor Water Department (even if the list originated from Benton Harbor).

So here goes;

I believe that both the State and County have conducted some testing in the Benton Harbor Water System.

But, I have only heard of 1 location and I have no documentation of what was being done.

I have sent out nearly 100 letters in the past 2 days to addresses that either:

- Tested high ≥ 15ppb for Lead in the free sampling pool. This was about 51 places. I could drop the number and increase the number of locations.
- Those home where we did a dig up inspection of service line materials and found a Lead Service on the Public side of the Curb Stop Valve. This was around 40+ locations.

Now, I expect it will take days for return calls, but I am nerveos that because I am way too late, I may not meet the 60 sample pool that EGLE has insisted upon.

I have attached a sample letter of one of the free testing locations.

attached: *BH Letter sample for 955 Ogden Mattie Johnson sent 06 04 2019.doc*

If you have a mind to assist, I was hoping for just that:

1. A pipe dream is that EGELE would accept results from samples taken in 2019 by DHHS State and County.
2. Or more realistically, you could contact those sites you have tested and asked them if they would be interested in helping Benton Harbor fill the 60 location pool for sampling this June and again for September and beyond.

So you know and you can tell the residents:

We started feeding a 70/30 Orthopolyphosphate (OPP) March 26, 2019.

Recent results have shown that sites in the system have results between 1.0 to 1.4 ppm as P.

The suggested target dose by the MDEQ and Contractor was 1.5 ppm as P.

So, 1 part of the testing I propose is to test each of the 60 locations for OPP in addition to Lead and Copper. We only need 10 ml for this test.

Please help me, if you can. Reply either way.

Thank You,

Mike O'Malley
Benton Harbor Water Superintendent
(269) 363-0575

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE)
Cc:	Bolt, Jennifer (EGLE); Oswald, Eric (EGLE); Thurston, Brian (EGLE); Ruch, Suzann (EGLE); Krisztian, George (EGLE)
Subject:	RE: Benton Harbor Weekly Check-in
Date:	Thursday, February 25, 2021 8:44:00 AM

In lieu of a meeting this week (scheduling conflicts), please note the following updates in writing:

-PE mailing deadline is 3/1, will include a PN for failure to distribute previous rounds correctly.
-City manager takes issue with PE format, wishes to change the order of information to be less 'alarmist'
-financial update, FY 2020 revenue is down but only 3%, this is due to the 10% rate increase and grants for "no shut-off" order
-financial impacts of 'emergency projects' are being assessed (floc/sed, roof leaks)
-waiting to hear on the TMF grant application
-reiterated the need to flow-pace phosphate pump during water tower project
-need to prioritize the floc/sed work prior to water tower project, eliminate risk if possible
-Blue Conduit has been engaged for work on the DSMI, via the EPA grant.
-Rob requested a meeting w/ EGLE regarding the Lagoon functionality
-DHHS has done 3/10 investigative sampling so far.
-Draft RFP for corrosion study language was sent to the City/Abonmarche.

Ernie

-----Original Appointment-----
From: Sarkipato, Ernest (EGLE)
Sent: Thursday, January 7, 2021 8:47 AM
To: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE)
Cc: Bolt, Jennifer (EGLE); Oswald, Eric (EGLE); Thurston, Brian (EGLE); Ruch, Suzann (EGLE); Krisztian, George (EGLE)
Subject: Benton Harbor Weekly Check-in
When: Thursday, February 25, 2021 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Topics for weekly discussion:

1. Summary of external weekly meeting
2. ACO Progress
3. Corrosion Treatment
4. LCR Compliance
5. Financial

Microsoft Teams meeting

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From:	Bolt, Jennifer (DEQ)
To:	Sarkipato, Ernest (DEQ)
Cc:	Bolf, Michael (DEQ)
Subject:	RE: Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor
Date:	Thursday, April 11, 2019 10:57:55 AM

Hi Ernie and Mike,
We should have a conversation regarding 60 vs 40 just to make sure everyone is in agreement.
Jeni

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Thursday, April 11, 2019 10:34 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor
As far as Benton Harbor's population is concerned, that is a topic for Ernie to take on.
In regards to which sites to sample…The sites that you previously used that have had their service line replaced are no longer valid sites. The expectation from the DEQ is that you choose residential homes with lead service lines that are:

- occupied,
- the drinking water is utilized normally, and
- there are no treatment devices in the home, or in place on the tap and not bypassed, at the time of sampling.

You should prioritize full lead service lines, over partial lead service lines, over lead goosenecks. This means that if you have to sample from 40 locations, and you know there are 40 full lead service lines, then you should sample the 40 full lead services. Otherwise, you should exhaust your full lead services before going to partials, and so on.
Galvanized lines (if not connected to lead) should not be sampled for compliance, but must be replaced if they were downstream of lead.
This is all the criteria required in selecting the homes you must sample. If you have more questions let us know and if I missed something, Jeni will let us know.
Thanks,
Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, April 11, 2019 10:17 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor
So, you are back from vacation, and right back in the saddle.

We basically are doing remote sampling at the new Coupon Rack at City Hall.
I have to improve the sampling system. There was a serious mix up.
HACH quit making DR200 portable kits, but yesterday I found out they have DR 300 kits. I am thinking it best to purchase one of those.
The sampling equipment I bought is a color comparator and it is REAL HARD for our old eyes to see that shade of blue.
I did another WQP set, since I was not crazy about the 1st ones.
I would attaché the results to this email, if I had them cleaned up, so soon.
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BCT and SJCT were both required to collect Lead/Copper based on the change, but Benton Harbor was never granted any kind of change.
Time for it now, don't you think? We talked about it before, but now I have to go out and find new samples (next issue). I would propose 40 of them.
2nd thing 2nd: What sites shall Benton Harbor use? Keep in mind:

1. The City replaced ALL of those 2018 AL exceeded sites with the Pilot Grant.
2. The City also has done service line material assessments, with the Pilot Grant and (probably) identifying several Lead/Galvanized services and even Lead/Lead services.
3. The City did extensive Free Water Lead/Copper sampling and the most recent count for high lead (≥16 ppbs, there were no 15 ppbs) is 54 homes.

And, I received some information via a letter but I cannot find the actual documentation on the MDEQ Web Site.
So, stew over thing 1 and thing 2 and let me know.
Thanks,
Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Apr 11, 2019 at 9:32 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

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> Also, please remember to conduct monitoring of ortho phosphate in the distribution system to study the coating. Residuals may be low at first as the coating builds, but should stabilize close to the calculated dose over time.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> DEQ-Drinking Water and Municipal Assistance Division
> 616-307-0261

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Elhorn Engineering is our go-to Contractor for Corrosion Control. They will continue to work with us to evaluate the treatment and make adjustments as needed.

Berrien County has been a REAL PARTNER in this whole lead thing. I do not remember all the names so if you 2, Nicki and Nick can let the others that helped know, that would be great.

Thank you all for all the hard work you put into this whole lead exceedence issue in Benton Harbor.

Some time (hopefully near future) the pipes serving all the residents and business in the City of Benton Harbor's water system will have this protection.

Love (actually, just like) you all,

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To:	Mike O"Malley
Cc:	Bolf, Michael (EGLE); Onan, Brandon (EGLE); Bolt, Jennifer (EGLE); Darwin Watson; Thurston, Brian (EGLE)
Subject:	RE: Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor
Date:	Tuesday, April 30, 2019 9:15:55 AM

Mike – we received your request to review our population determination, as well as the number of samples required for lead and copper in 2019 for BH. Below are some notes but I'll cut to the chase. We are keeping the previously determined population for now (9,970), *AND* will *not* be reducing the number to 40 this year as you requested. Since I know you appreciate legal references, the authority to designate sampling outside the population windows in the law comes from Rule 732 of the Safe Drinking Water Act administrative rules.

Further notes:

-The DEQ's previous population determination from 2011 followed our policy, by relying upon the most recent census count with a known adjustments. It will remain at 9,970, likely until the 2020 census data becomes available or some other reliable method of counting residents.

-This population is very close to the 10,000 breakpoint for sampling, which affects the number of lead and copper samples required among other things.

-This number is an *estimate* of the number of residents of Benton Harbor. There is practically speaking no way to know the exact number of residents in Benton Harbor without a real-time head count. We have to be realistic about the error involved in *estimating* population.

-Since the population was established in 2011, the city has remained on a sample schedule for lead and copper for systems in the 10,000-100,000 population bracket.

-The actual size of the distribution system has not changed. The nature of the population of Benton Harbor is somewhat unique, consisting of a number of rentals and multi-family units. In addition, there are certainly a number of vacant or abandoned houses.

-The city is currently working on addressing lead in the drinking water and has identified this as a major issue presently affecting public health.

For the above reasons the EGLE has asked the city to conduct "full monitoring" for lead and copper, being two 6-month rounds of 60 samples in 2019. This is technically above the designated population of 9970, and allowed by Rule 732 of the Safe Drinking Water Act. This monitoring is most protective of public health. Future changes in population estimates may result in a reduction of this requirement.

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www.michigan.gov/drinkingwater

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Ernie and Brandon did tons of work to help us get this going.
Elhorn Engineering is our go-to Contractor for Corrosion Control. They will continue to work with us to evaluate the treatment and make adjustments as needed.

Berrien County has been a REAL PARTNER in this whole lead thing. I do not remember all the names so if you 2, Nicki and Nick can let the others that helped know, that would be great.

Thank you all for all the hard work you put into this whole lead exceedence issue in Benton Harbor.

Some time (hopefully near future) the pipes serving all the residents and business in the City of Benton Harbor's water system will have this protection.

Love (actually, just like) you all,

Mike O'Malley
Benton Harbor Water Superintendent
(269) 363-0575

From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski
Subject: RE: Benton Harbor job
Date: Monday, February 4, 2019 2:01:17 PM

Thanks. Just wanted to be sure (again) the converter would be included, that's all.

From: Curtis Brzyski <cbrzyskimmi@msn.com>

Sent: Monday, February 4, 2019 1:57 PM

To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>

Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com

Subject: Re: Benton Harbor job

Standard output is 4-20mA signal
Two digital outputs to pace chemical feed pumps
see highlighted data sheet for more information
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** Sarkipato, Ernest (DEQ)
> **To:** Curtis Brzyski ; jmommersmmiinc@gmail.com
> **Cc:** momalley@cityofbentonharbormi.gov ; roudbier@fnwusers.com ; ron@oudbierinst.com
> **Sent:** Monday, February 4, 2019 1:44 PM
> **Subject:** RE: Benton Harbor job
>
> I see a line item for "NEMA 4X Transmitter with 6 Digit totalizer as Specified"
>
> Can you confirm this is the M-Series flow converter which will allow integration with a flow-paced chemical feed pump?
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> ---
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> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
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> **Sent:** Monday, February 4, 2019 12:46 PM
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> **Cc:** momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
>
> **Subject:** Re: Benton Harbor job
>
> Mr. Sarkipato,
> Enclosed is the quotation you requested.
> The quotation has been addressed to Mr. O'Malley.
> Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
> If available please send drawings so we can assist with the ideal meter location before tapping the line.
> Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
> Once the attached order form is filled out a custom 395L will be built to your specifications.
> Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
> Thank you,
> Curtis Brzyski
> Midwest Municipal Instrumentation Inc.
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> (C) 517 250 3063

www.midwestmunicipalinc.com

----- Original Message -----
From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski ; James Mommers
Cc: momalley@cityofbentonharbormi.gov
Sent: Monday, February 4, 2019 10:29 AM
Subject: RE: Benton Harbor job

City is going to have a local contractor tap the main and install the meter.
Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
We probably need 40' of cable.
Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Tuesday, January 29, 2019 9:36 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job

Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job

Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job

Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.

Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job

Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.
Ernie

From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job

Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell

On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
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> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile

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To:	James Mommers; Oudbier Inst
Cc:	curtis brzyski
Subject:	RE: Benton Harbor job
Date:	Friday, January 25, 2019 2:01:12 PM

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Subject:	RE: Benton Harbor job
Date:	Monday, February 4, 2019 1:44:06 PM
Attachments:	0219bentonharboroud.doc

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Midwest
Municipal
Instrumentation Inc.

McCROMETER
The Flow Measurement Specialists

Customer: City of Benton Harbor Water Treatment Plant

Reference: Insertion Meters
Date: 02/4/19

Attention: Mr. Mike O'Malley

We are pleased to offer our proposal for furnishing and delivering McCrometer Inc. equipment for the above referenced project. Equipment is specifically listed in the attached "Proposed Equipment List." Items required, but not listed, are to be furnished by others. **Make all Purchase Orders out to McCrometer, Inc.; c/o: Midwest Municipal Instrumentation**

PROPOSED EQUIPMENT LIST

Freight Included
Does not include taxes

30 Inch INSERTION Meters with AC Power

Quantity	Model	Unit Cost
1	FPI MAG 395L McCrometer, FPI Flow Meter. Multi-Mag Insertion Type Multiple sets of 316 Stainless Steel Electrodes as Specified **Forward Flow ONLY** **Probe Insertion: 30 Inches in Length** 2 Inch Stainless Steel Diameter Probe as Specified NSF Fusion Bonded liner Sliding Joint: (Hot Tap) 2 Inch NPT 1% Accuracy from 0.3 Feet/second to 20 Feet/second (0 to 33,000 GPM) 110 VAC Power / Dual 4-20mA output for flow / Low Flow Contact NEMA 4X Transmitter with 6 Digit totalizer as Specified **40 Feet of cable of dual submersible cable** 2 Inch Stainless Steel Valve and 316 Stainless Steel Nipple P#43059-1 Included / Saddle not included Tag FE/FIT Advise	$13,995.00.
1	Ship Insertion measuring Tool	Included
	Startup by Oudbier Instruments NOT INCUDED	

Curtis Brzyski
MMI Inc.

Prepared by: Richard W Mommers
4391 Bonnymede Court
Jackson, MI 49201
Per McCrometer Terms & Conditions

Telephone: 419-936-4369
Fax: 419-754-2100
Cell: 419-419-9733
E-mail: rmommersmmi@msn.com

Validity of Proposal: 90 Days FOB: Factory
Payment Terms: 100% Net 30 Days from shipment
Taxes: Excluded and are the responsibility of the Buyer
Installation and all on-site services: Not Included

McCrometer, INC. - PROVISIONS & CONDITIONS

Acceptance: All orders subject to acceptance by Marsh-McBirney, Inc., hereinafter "Seller". Seller sells only pursuant to the provisions and conditions in this Order Acknowledgment. If Buyer's order contains written, printed, or stamped conditions inconsistent with the written, printed, or stamped provisions contained in this Order Acknowledgment, then the provisions of this Order Acknowledgment shall prevail.

Payment Terms: Invoices for material delivered under this order are payable only in United States dollars. All payments are due from date of invoice or shipment, whichever is sooner. These terms of payment are subject, nevertheless, at all times to the approval of Seller's Credit Department and in case of doubt arising as to Buyer's financial responsibility, shipment may be suspended until satisfactory assurances of Buyer's responsibility is received. **In the event that payment is received in excess of thirty (30) days from date of invoice, a Service Fee of 1.5% per month (18% per annum) shall be assessed. In the event that collection procedures are required by reasonable attorney fees, court costs, other litigation-related expenses, and interest at 1.5% per month from thirty days after date of invoice until receipt of payment.** Each shipment shall be considered a separate and independent transaction, and payment therefore shall be made accordingly. In the event the Buyer delays shipments, payments shall become due on the date when the Seller is prepared to make shipment. In the event the Buyer delays the work covered by the purchase order, payments shall be based on the purchase price and the percentage of completion. Products held for the Buyer shall be at the risk of the Buyer. The Seller reserves the right to ship to its order and make collection by sight draft with bill of lading attached.

Assignment: All accounts receivable balances due are assignable at the discretion of the Seller.

Delivery Dates: The estimated shipping capability stated on this order acknowledgment is given solely for the Buyer's information and does not constitute a commitment to deliver products in accordance herewith. Buyer may request a specific shipping date or shipping schedule; however, Buyer may not request that a shipment be scheduled beyond one year from the issuance of its purchase order. Seller will schedule shipments based upon Buyer's request and Seller's shipping capabilities at the time Buyer's purchase order is processed, at which time Seller will issue to Buyer a formal acknowledgment that will indicate the estimated shipping date(s). After the shipments have been scheduled, Buyer may not cancel or postpone a scheduled shipment unless Buyer submits its request in writing and Seller consents by issuing a new acknowledgment. Any request to reschedule the shipment that is received less than thirty (30) days from the date scheduled for the shipment of the products covered by the request may be rejected as untimely, or may be accepted upon payment of a rescheduling charge of 10% of the sales price shown on this acknowledgment, at Seller's option. Seller will use its best efforts to ship on or before the estimated shipping dates indicated, but will not be liable for any delay or failure to deliver resulting from circumstances which are beyond the reasonable control of the Seller or which would cause Seller to incur unreasonable expense in order to effect such delivery. Seller shall not be liable for any special incidental or consequential damages resulting from delivery delays or inability to deliver.

Cancellations: In the event Buyer cancels the contract embodied in Buyer's order and this acceptance thereof in whole or in part, or such contract is canceled by Seller because of default by the Buyer, then Buyer shall pay Seller by reason of such cancellation or default for all damages sustained, and shall pay for units in process and completed units, shipped or unshipped, at current price applicable to the total quantity completed at time of default.

Shipping: All items are shipped FOB Frederick, Maryland with freight charges prepaid and added to the invoice. Title and risk of loss shall pass to Buyer upon tender of the products by Seller to a common carrier. In absence of specific written instruction from Buyer, Seller will select the common carrier, but Seller shall not thereby incur any liability in connection with shipment. Buyer

shall be responsible for any freight charge.

Returns/Exchanges: Only instrumentation manufactured by Marsh-McBirney, Inc. will be accepted for return/exchange. An instrument can only be returned or exchanged after first; notifying the factory of the reason for return/exchange, and secondly, receiving authorization from a Marsh-McBirney, Inc. factory representative. Computers and other peripheral devices supplied by Marsh-McBirney, Inc. with a customer's order will not be exchanged or accepted for return after shipment. For all returns of instrumentation and accessories, there is a 25% restocking charge.

Start-up Service: It is the customer's responsibility to notify Marsh-McBirney, Inc. to schedule on-site start-up service. Marsh-McBirney, Inc. will make every effort to schedule the start-up service as soon as possible after receipt of notification.

Warranty: The one-year warranty period starts from date of shipment from the factory. This warranty covers only instrumentation manufactured by Marsh-McBirney, Inc. See complete warranty statement enclosed. For extended maintenance agreements, please contact our Customer Service Department.

Seller and Buyer agree that the laws of Maryland shall govern their agreement.

ABB INC.
GENERAL TERMS AND CONDITIONS OF SALE

1. General. The terms and conditions contained herein, together with any additional or different terms contained in ABB's Proposal, if any, submitted to Purchaser (which Proposal shall control over any conflicting terms), constitute the entire agreement (the "Agreement") between the parties with respect to the order and supersede all prior communications and agreements regarding the order. Acceptance by ABB of the order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. These terms and conditions may not be changed or superseded by any different or additional terms and conditions proposed by Purchaser to which terms ABB hereby objects. Unless the context otherwise requires, the term "Equipment" as used herein means all of the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the order. Unless the context otherwise requires, the term "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the order. As used herein, the term "Purchaser" shall include the initial end use of the Equipment and/or services; provided, however, that Paragraph 13(a) shall apply exclusively to the initial end user.

2. Prices.
(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof.
(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.
(c) The price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, or other like taxes which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such taxes which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any tax or holds a direct payment permit, Purchaser shall, upon order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.
(d) The price includes customs duties and other importation or exportation fees, if any, at the rates in effect on the date of ABB's Proposal. Any change after that date in such duties, fees, or rates, shall increase the price by ABB's additional cost.

3. Payment.
(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal.
(b) If in the judgment of ABB the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB, or may terminate the order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.
(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection.

4. Changes.
(a) Any changes requested by Purchaser affecting the ordered scope of work must be accepted by ABB and resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.
(b) ABB may, at its expense, make such changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications. If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection.

5. Delivery.
(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered F.O.B. point of shipment. Equipment shipped from outside the continental United States is delivered F.O.B. United States port of entry. Purchaser shall be responsible for any and all demurrage or detention charges.
(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.
(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.
(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier

6. Title & Risk of Loss. Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall remain in ABB until fully paid for. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage shall pass to Purchaser upon delivery.

7. Inspection, Testing and Acceptance.
(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours.
(b) If the order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.
(c) If the order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.
(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software, Spare Parts and Refurbished or Repaired Parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. The Warranty Remedy Period for refurbished or repaired parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.
(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or 30 days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.
(c) Exceptions. ABB shall not be responsible for providing working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.
(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".
(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Patent Indemnity.
(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB (a "Process") directly infringes any claim of a patent of the United States

of America and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.
(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any patent issued after the date hereof; or (v) any action settled or otherwise terminated without the prior written consent of ABB.
(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY PATENT INFRINGEMENT.
(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Patent Indemnity" provision.

10. Limitation of Liability.
(a) In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages. ABB's liability for any claim whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Patent Indemnity") exceed one-half (1/2) of the purchase price allocable to the Equipment or part thereof or Services which gives rise to the claim.
(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.
(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

11. Laws and Regulations. ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth herein, and compliance with any laws and regulations relating to the operation or use of the Equipment or Software is the sole responsibility of the Purchaser. All laws and regulations referenced herein shall be those in effect as of the Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall be governed by the laws of the State of New York, but excluding the provisions of the United Nations Convention on Contracts for the International Sale of Goods and excluding New York law with respect to conflicts of law. Purchaser agrees that all causes of action against ABB under this Agreement shall be brought in the State Courts of the State of New York, or the U.S. District Court for the Southern District of New York. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

12. OSHA. ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

13. Software License.
(a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) The Software may be used only in conjunction with equipment specified by ABB; (ii) The Software shall be kept strictly confidential; (iii) The Software shall not be copied, reverse engineered, or modified; (iv) The Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.
(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine readable Software from all of Purchaser's storage media.

14. Inventions and Information. Unless otherwise agreed in writing by ABB and Purchaser, all right, title and interest in any inventions, developments, improvements or modifications of or for Equipment and Services shall remain with ABB. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

15. Force Majeure. ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

16. Cancellation. Any order may be cancelled by Purchaser only upon prior written notice and payment of termination charges, including but not limited to, all costs identified to the order incurred prior to the effective date of notice of termination and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

17. Termination. No termination by Purchaser for default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

18. Export Control.
(a) Purchaser represents and warrants that the Equipment and Services provided hereunder and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use. Purchaser agrees not to disclose, use, export or re-export, directly or indirectly, any information provided by ABB or the "direct product" thereof as defined in the Export Control Regulations of the United States Department of Commerce, except in compliance with such Regulations.
(b) If applicable, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

19. Assignment. Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

20. Nuclear Insurance – Indemnity. For applications in nuclear projects, the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage resulting from a nuclear incident to and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident.

21. Resale. If Purchaser resells any of the Equipment, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder.

22. Entire Agreement. This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided.

From:	Sarkipato, Ernest (DEQ)
To:	Curtis Brzyski; jmommersmmiinc@gmail.com
Cc:	momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject:	RE: Benton Harbor job
Date:	Monday, February 4, 2019 1:21:33 PM
Attachments:	lower level drawing.pdf InkedIMG_2536_LI.jpg InkedIMG_2537_LI.jpg

Thank you very much!

Hopefully this drawing and photos help with the lay of the land.

Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>

Sent: Monday, February 4, 2019 12:46 PM

To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>

Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com

Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come
Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** Sarkipato, Ernest (DEQ)
> **To:** Curtis Brzyski ; James Mommers
> **Cc:** momalley@cityofbentonharbormi.gov
> **Sent:** Monday, February 4, 2019 10:29 AM
> **Subject:** RE: Benton Harbor job
>
> City is going to have a local contractor tap the main and install the meter.
>
> Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
>
> We probably need 40' of cable.
>
> Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
>
> Ernie
>
> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
>
> **Sent:** Tuesday, January 29, 2019 9:36 AM
>
> **To:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
>
> **Subject:** RE: Benton Harbor job

Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.
Ernie
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Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
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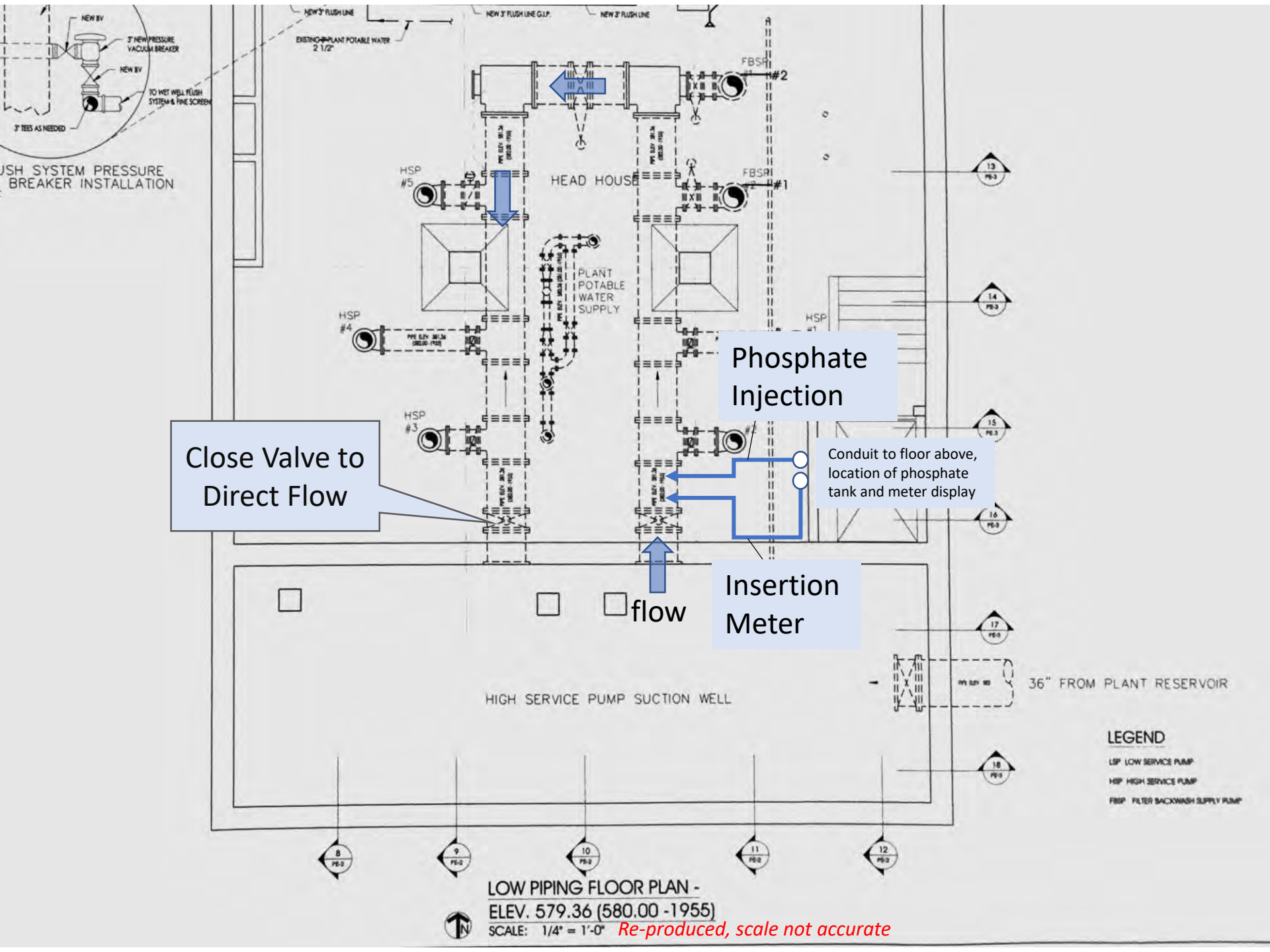
> Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

POTABLE WATER
FINISHED WATER

POTABLE WATER

From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski; James Mommers
Cc: momalley@cityofbentonharbormi.gov
Subject: RE: Benton Harbor job
Date: Monday, February 4, 2019 10:28:15 AM
Attachments: RE Benton Harbor job.msg

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McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

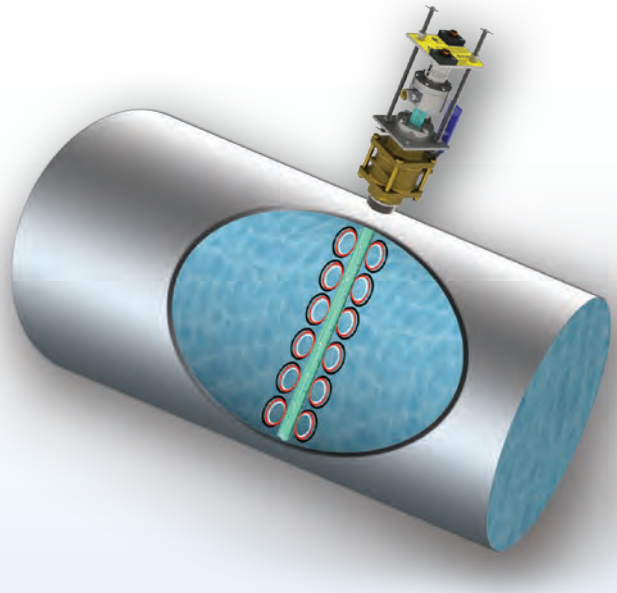
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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U.S. Patent 8,136,410. Foreign Patents Pending.

Printed in USA

Lit Number 30120-45 Rev 1.3 / 05-13

Represented by:

From: Curtis Brzyski [cbrzyskimmi@msn.com]
To: Sarkipato, Ernest (DEQ) [SARKIPATOE@michigan.gov]; James Mommers [jmommersmmiinc@gmail.com]
CC:
Subject: RE: Benton Harbor job
Sent: Friday, January 25, 2019 16:30:23
Attachment 1: SPI_Mag_Municipal_Sales_PresentationMM2015I.ppt
Attachment 2: FPIbrochure201330120-45.pdf
Attachment 3: SPIbrochure.pdf

Ernie

Enclosed Powerpoint on insertion meter accuracy

This just goes over what I discussed

The single point meter costs about 4K but it can be profiled

The SPI or single point does not have a NSF liner

The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup

This should be your most stable signal from this flowmeter.

Curtis Brzyski

MMI Inc.

517 764 4736

www.midwestmunicipalinc.com <https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.midwestmunicipalinc.com&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C6ec0742132864721489f08d68303f576%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636840451711919886&sdata=g%2FDF1RxL%2FD1RCgx8Fc%2B0pITX1AutxPYrrhnuJC%2BOFGs%3D&reserved=0>

Sent from <https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgo.microsoft.com%2Ffwlink%2F%3FLinkId%3D550986&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C6ec0742132864721489f08d68303f576%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636840451711929888&sdata=L0OWeXokAZnvKH%2F3a%2BbzJyA2GDKym9g%2FnKjDsOCdY6o%3D&reserved=0> Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <mailto:SARKIPATOE@michigan.gov>
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job

Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost...

Ernie

From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job

Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers

Midwest Municipal Instrumentation, Inc.

517-764-4736 - Office

517-250-1650 - Cell

On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov <mailto:SARKIPATOE@michigan.gov> > wrote:

Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.

Here's the situation – we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a <https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.seametrics.com%2Fproduct-category%2Fflow-meters%2Findustrial-magmeters%2Fex-series%2F&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C6ec074213286472148 9f08d68303f576%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636840451711939896&sdata=zef9hdcz6yOxo5sO3U8ma7hb34lmqj5mpbuQMU3U78M%3D&reserved=0> Seametrics EX250-S-08-15 insertion meter paired with a <https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.seametrics.com%2Fproduct%2Frate-total-indicator-ft400-series%2F&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C6ec074213286472148 9f08d68303f576%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636840451711949903&sdata=%2FdlVYQyB93%2Fvlf9aUipHkNA531QKmduB4PwMj8mJzVo%3D&reserved=0> Seametrics FT440W-139, through MMI. This

flow meter can be inserted into a 2” tap in the 30” water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it’s a nice and simple install. What we’d like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump. I attached a couple photos of the area the tap can be made.

Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O’Malley and possibly even Elhorn.

Thanks for the consideration – we have high hopes this project can go smoothly and as quickly as possible.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C6ec0742132864721489f08d68303f576%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636840451711959911&sdata=1KaSuSa9F6uprHHbt0V5u%2FF1ZMzZ7irgGoof6xmjwwc%3D&reserved=0>
www.michigan.gov/drinkingwater

McCROMETER

SPI Mag™

Single Profile Insertion Flow Meter

Ideal for Clean or Dirty Water Flow Measurement

Highly Cost-Effective Flow Solution

SPI Mag™

SPI Mag™

Key SPI Mag Specs in Brief *

The SPI Mag Insertion Flow Meter provides a highly cost-effective solution for the accurate measurement of liquid flow in closed conduit, pressurized pipe applications. The SPI measures forward flow only and is suitable for line sizes from 2 to 96 inches. The SPI can be easily re-located to various line sizes.

- **Proven electromagnetic technology based on Faraday's Law**
- **Debris shedding, self-cleaning sensor eliminates costly maintenance**
- **Cost is independent of line size**
- **Easy Hot Tap Installation - no interruption of flow process**

The SPI Mag is suitable for municipal water and wastewater applications including:

- **Wastewater:** Effluent, Waste Activated Sludge (WAS), Return Activated Sludge (RAS), Reclaim / Recycle
- **Clean Water:** Raw Water Intake, Clear Wells

The SPI Mag also reliably measures flow in many types of industrial flow processes involving conductive fluids such as potable water, slurries, sludge, cooling water, and pulp stock.

M-SERIES CONVERTER

The SPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The SPI Mag is available with the following specs:

- **Range:** Nominal pipe size availability
- **Accuracy:** ±2% of reading ± 0.03 ft/s (± 0.009 m/s) zero stability from 0.3 to 32 ft/s velocity range (0.09 to 10m/s)
- **Pipe Sizes:** 2 - 96 inches (50 mm - 2,400 mm)
- Reverse flow indication

** See data sheet for complete specs and order information*

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, CA 92545 USA
Phone 800 220-2279 | 951 652-6811 | Fax 951 652-3078

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McCROMETER

Insertion Flow Meters

FPI Mag™ SPI Mag™

Municipal Market Customer Presentation

Insertion Type Magnetic Flowmeter

- Insertion probes have many uses in the Flow industry
- They give good accuracy in any number of difficult applications.
- They are used in a number of differing circumstances.
  - Where temporary measurement only is required.

  - **Where it is not possible to install a more conventional 'full bore' meter**
  - **Where it is necessary to check the performance of an installed full bore meter.**

- **Suitable for both temporary and permanent applications**
- **Hot-Tap capabilities allows installation while pipe is under full working conditions**

McCROMETER

Product Description

SPI Mag™

The SPI Mag™ is a single point insertable electromagnetic closed conduit/full pipe flow meter.

FPI Mag™

The FPI Mag™ is the successor of the Multi Mag. A Full Profile Insertion electromagnetic flow meter that has a fully submersed sensor with multiple electrode points to measure flow across the entire cross-section of flow.

Now Available
394L Bi-Directional Configuration

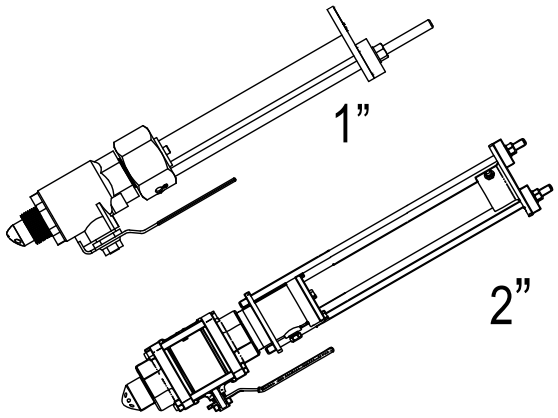
McCROMETER

Product Offering

SPI Mag™

Single Point Model

Model 282L



1” for pipe sizes 2” to 30”
2” for pipe sizes 6” to 96”
Forward flow only

FPI Mag™

Multi-Point Models

395L – Forward Flow
394L – Bi-Directional Flow

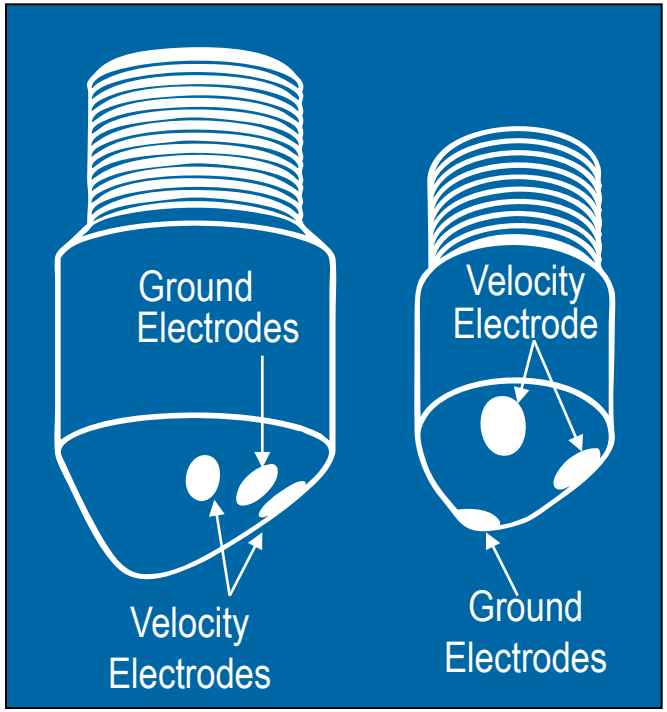
Small Diameter Sensor
For 4” to 24”

Large Diameter Sensor
For 24” to 138”

Principle of Operation

SPI Mag:

- **Sensor generates an electromagnetic field, creating a voltage in the water.**
- **Two velocity electrodes along with the ground electrodes measure this voltage.**
- **A faster water velocity produces a higher voltage. By accurately measuring this voltage, a velocity is determined.**



2” sensor **1” sensor**

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Flow Profiling Theory and Practice

What is flow profiling?

- A number of point velocity measurements are made across a diameter, and data integrated to establish the mean flow velocity.
  - The comparison of this value with the value generated by the meter being verified, gives an indication of how accurately the flowmeter is measuring the true flow.
- Terminology
  - Mean Velocity – the average of all the velocities across the flow.
  - Sensed Velocity – the velocity that is measured by the sensor

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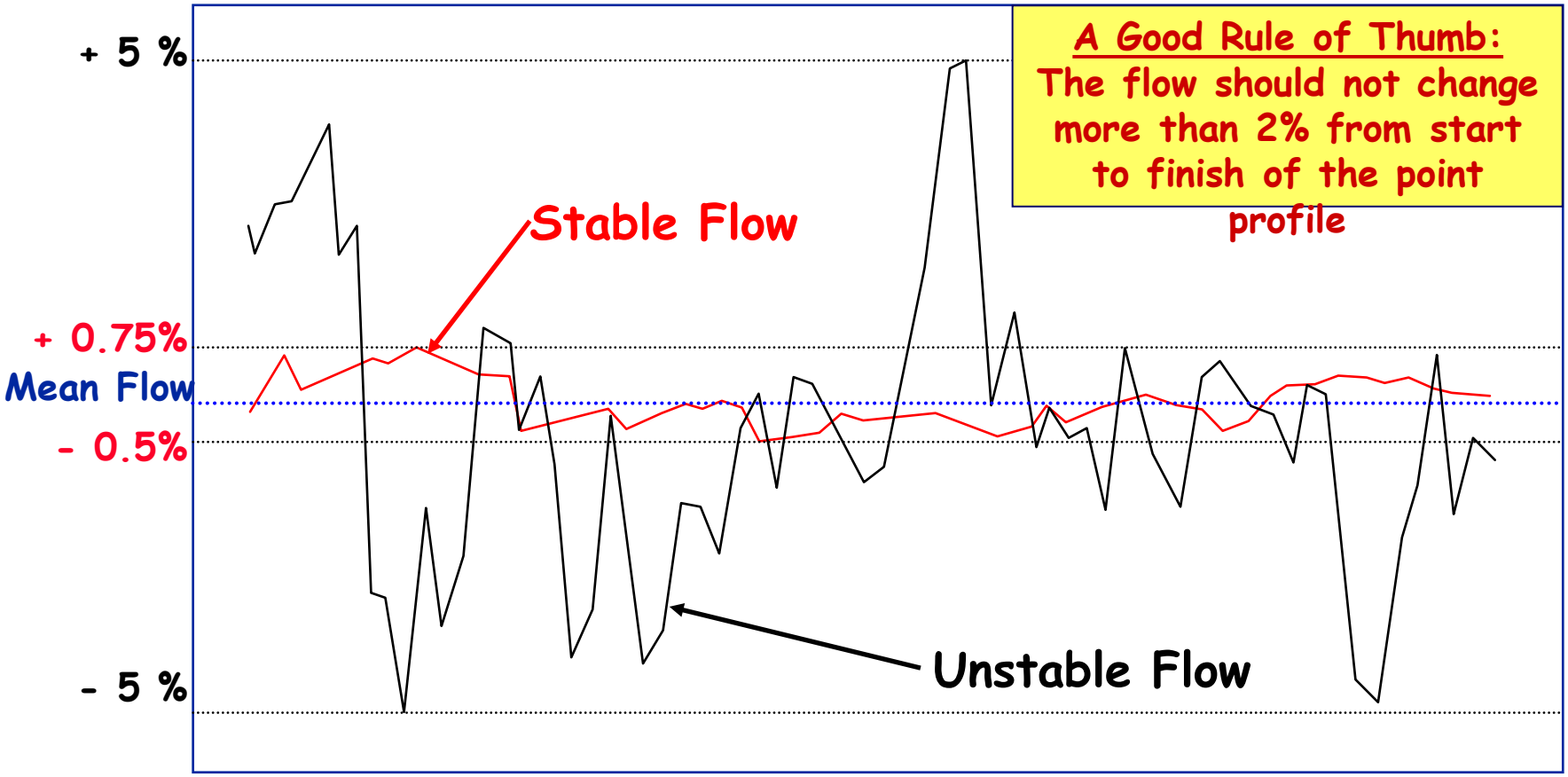
Flow Profiling Theory and Practice

Flow Profiling Considerations

- Flow Profile
- Velocity
- Size of pipe
- Number of points
- Time at each point
- Stability of Flow
- Upstream pipe Configuration

Flow Profiling Theory and Practice

It is important to have stable flow when profiling



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  - **Where it is necessary to check the performance of an installed full bore meter.**

- **Suitable for both temporary and permanent applications**
- **Hot-Tap capabilities allows installation while pipe is under full working conditions**

Flow Profiling Theory and Practice

Installation Considerations

- **The best results are obtained from a sensor that is as far as possible away from elbows, junctions, and obstructions**.

- Insertion Point
  - **Preferred – Centerline of Pipe (1/2 of the Pipe Diameter)**
  - Alternative – Mean Point Velocity (1/8 of the Pipe Diameter)
    - Used At High Velocities (prevents damage to probe)
    - Reduces Unit Cost

- Upstream pipe conditions need to be good
  - 25 diameters - 50 Diameters (ISO 7145)

- Flow Profile must be known
  - Known by proper straight run or profiling

- **Poor conditions can be tolerated by use of profiling**

- Measurement of pipe diameter is essential

- Location and alignment of probe is important

Flow Profiling Theory and Practice

Profiling Procedures

- Under most circumstances you will carry out a full traverse
  - For larger pipes you will not be able to profile the whole pipe and can do a half profile
  - **Half profile is only really valid when the flow is evenly distributed over the whole pipe, since you are trying to measure the profile, presumably you do not know whether or not it is symmetrical….This is therefore a dubious procedure**.

- Insert the to the far wall

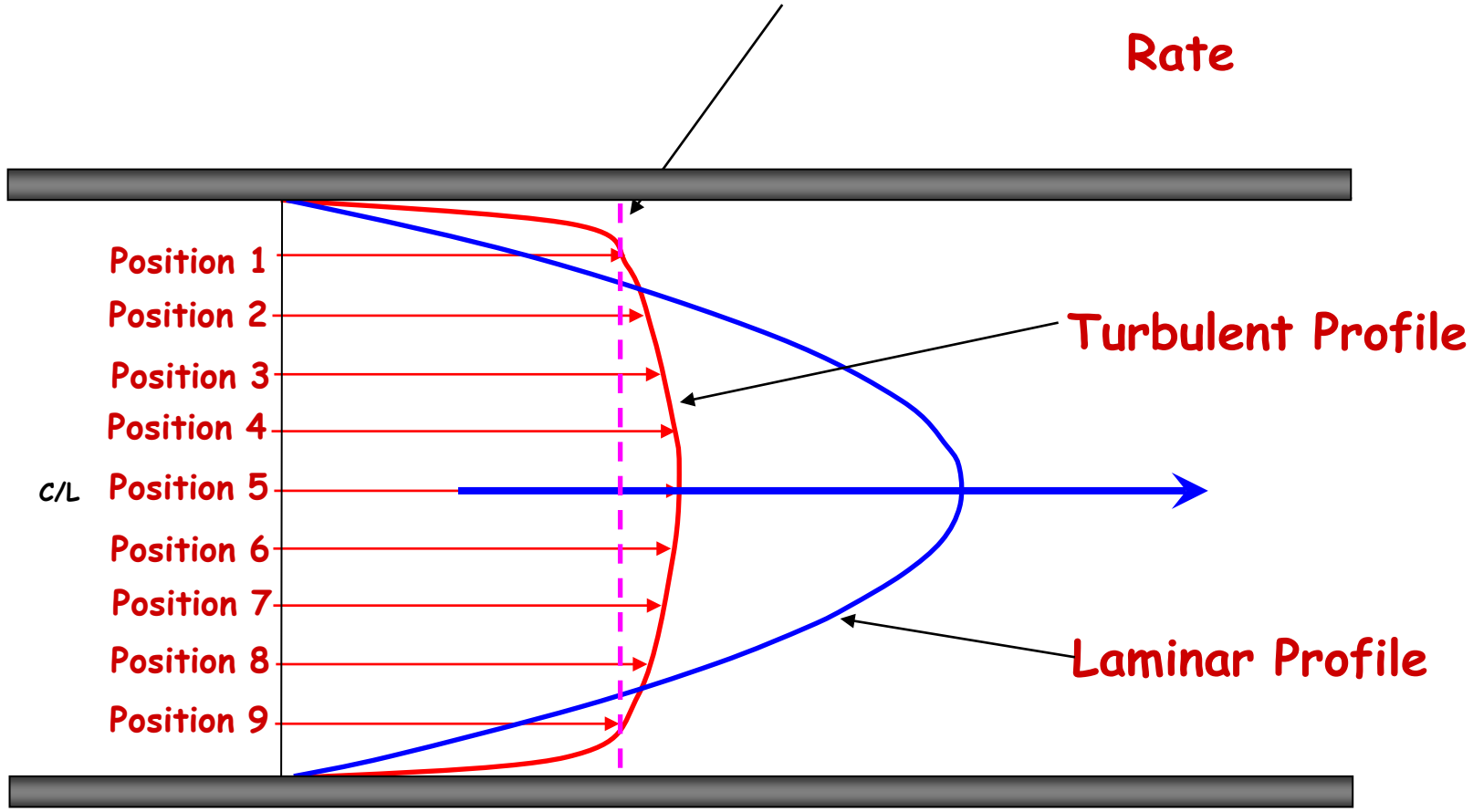
- Take measurement

- Move probe to next point

- Continue until you have traversed the whole pipe

- Automated software is available, or it can be done manually.
- If operating manually, point measurement should be logged and should be enough to give a good average.
  - Logged data should be examined to establish the overall stability of the flow during the profile
  - From this an estimate of the validity of the profile can be made.

Flow Profile Diagram



From:	Sarkipato, Ernest (DEQ)
To:	ron@oudbierinst.com; tim@oudbierinst.com; James Mommers; cbrzyskimmi@msn.com
Cc:	Onan, Brandon (DEQ); momalley@cityofbentonharbormi.gov; "Todd Luks"
Subject:	RE: Benton Harbor job
Date:	Friday, February 1, 2019 1:58:49 PM

I have verbal indication from Benton Harbor they will be contacting MMI soon to order the McCrometer multi-mag insertion meter with the M Series Converter. This is a change from the previously spec'd Seametrics single-mag meter, due to increased accuracy and NSF certified coating.
Oudbier: hoping you can contact Mike O'Malley to visit the plant to see the layout of the project.
Mike: After contacting MMI, please remember to make contact to a contractor to do the tapping.
Thanks all,
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 10:40 AM
To: ron@oudbierinst.com; tim@oudbierinst.com
Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov; James Mommers <jmommersmmiinc@gmail.com>; 'Todd Luks' <elhorneng@aol.com>
Subject: Benton Harbor job
Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
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Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
Thanks for the consideration – we have high hopes this project can go smoothly and as quickly as possible.
Ernie Sarkipato, P.E.
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Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (DEQ)
To:	Mike O"Malley; Darwin Watson
Subject:	RE: Benton Harbor job
Date:	Friday, February 1, 2019 11:42:49 AM
Attachments:	Re Flow Meter Quote.msg

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, February 1, 2019 11:38 AM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: Fwd: Benton Harbor job
Ernie,
I actually do not recall this email. And I do not see Darwin on the copy line.
I only saw the link to McCrommeter, so I used their web system to request a quote.
This is better, I presume James Mommers is waiting for me to call.
As well as the fact the price is much higher than originally intended, but I think, you have already revised it with MDEQ Pilot Grant.
Please advise.
Mike O'Malley
Benton Harbor Water Superintendent

---------- Forwarded message ---------
From: **Sarkipato, Ernest (DEQ)** <SARKIPATOE@michigan.gov>
Date: Fri, Feb 1, 2019 at 8:56 AM
Subject: Fwd: Benton Harbor job
To: MICHAEL O'MALLEY <momalley@cityofbentonharbormi.gov>

See below - cheaper through MMI!!

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

Begin forwarded message:

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Date: January 29, 2019 at 9:35:46 AM EST
To: "Sarkipato, Ernest (DEQ)" <SARKIPATOE@michigan.gov>, James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job

Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00

Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here…how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost…
Ernie
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To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell

On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

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> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
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> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ) []
To: Mike O'Malley [momalley@cityofbentonharbormi.gov]; DARWIN WATSON [dwatson@cityofbentonharbormi.gov]
CC: Onan, Brandon (DEQ) [OnanB@michigan.gov]
Subject: Re: Flow Meter Quote
Sent: Saturday, January 26, 2019 09:58:38
Attachment 1: image001.png

I checked into the proposed insertion meter a bit more yesterday. I'm on the fence with the proposed seametrics single-electrode mag meter for two reasons. First, it's not very accurate unless it's in a long straight run of pipe (10% error is possible, or more according to Curtis at MMI). It's also not NSF certified for drinking water use. There are more expensive insertion mags that have multiple electrodes and epoxy coatings with NSF approval. Trouble is, MMI quotes those closer to $14,000! I know this shoots the cost up, but I wanted to check with Darwin on the grant availability. Are you able to expand the chemical feed project portion of the grant to $30,000?

If so, I suggest we move forward and send an updated cost estimation to Karol Patton.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist

DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Jan 25, 2019, at 4:55 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov <mailto:momalley@cityofbentonharbormi.gov> > wrote:

Received, thank you.

On Thu, Jan 24, 2019 at 3:25 PM Onan, Brandon (DEQ) <OnanB@michigan.gov <mailto:OnanB@michigan.gov> > wrote:

Attached is the flow meter quote.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

525 West Allegan St.

P.O. Box 30817

Lansing, MI 48909

(p) 616.307.6736

<mailto:onanb@michigan.gov> onanb@michigan.gov

<image001.png>

From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Date: Tuesday, January 29, 2019 9:43:15 AM

Thanks. Benton Harbor is going to work on a tapping contractor for the install. FYI, 20 feet of cable is too short, probably need more like 40 if possible. Oudbier is definitely willing to do the startup/integration work.

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Tuesday, January 29, 2019 9:36 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??
Curtis
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job
Something I missed here…how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job
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Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
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The SPI or single point does not have a NSF liner
The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.
Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com
Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job
Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost…
Ernie
From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell
On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
> Here's the situation – we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.
> Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.
> Thanks for the consideration – we have high hopes this project can go smoothly and as quickly as possible.
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Municipal Assistance Division
> Department of Environmental Quality
> 616-307-0261 mobile
> www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
To: ron@oudbierinst.com; tim@oudbierinst.com
Subject: RE: Benton Harbor job
Date: Tuesday, January 29, 2019 9:13:21 AM

Hi guys, just checking to see if you were able to find a time to stop by the Benton Harbor water plant in the next couple weeks?

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 10:40 AM
To: ron@oudbierinst.com; tim@oudbierinst.com
Cc: Onan, Brandon (DEQ) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov; James Mommers <jmommersmmiinc@gmail.com>; 'Todd Luks' <elhorneng@aol.com>
Subject: Benton Harbor job

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From:	Sarkipato, Ernest (DEQ)
To:	Curtis Brzyski; James Mommers
Subject:	RE: Benton Harbor job
Date:	Tuesday, January 29, 2019 9:09:41 AM

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Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
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Sent: Friday, January 25, 2019 2:01 PM
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Sent: Friday, January 25, 2019 11:00 AM
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Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job
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517-764-4736 - Office
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Thanks for the consideration – we have high hopes this project can go smoothly and as quickly as possible.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
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From:	Sarkipato, Ernest (DEQ)
To:	Ron Oudbier; "Curtis Brzyski"; jmommersmmiinc@gmail.com
Subject:	RE: Benton Harbor job
Date:	Tuesday, February 5, 2019 10:14:54 AM

Curtis and I discussed error at length, and the physical location here is somewhat non-negotiable. The error with a single-point mag would be unacceptable due to the lack of straight run … hopefully the multi-mag will get us below 5% error.

From: Ron Oudbier <ron@oudbierinst.com>
Sent: Monday, February 4, 2019 1:56 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; 'Curtis Brzyski' <cbrzyskimmi@msn.com>; jmommersmmiinc@gmail.com
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com
Subject: RE: Benton Harbor job

It does not look like it will give the proper up and down stream straight line pipe length.
Page 6 of attached document.
However, given the application I don't know what else would work better.
Curtis, do you know what kind of error this will cause?

Ron Oudbier
Oudbier Instrument Co.
4064 S Rolling Ridge
Wayland, MI 49348
Office: 269 792-4404
Cell: 616 893-2343

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Monday, February 4, 2019 1:22 PM
To: Curtis Brzyski <cbrzyskimmi@msn.com>; jmommersmmiinc@gmail.com
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: RE: Benton Harbor job

Thank you very much!
Hopefully this drawing and photos help with the lay of the land.
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
Subject: Re: Benton Harbor job

Mr. Sarkipato,
Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.
If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come

Thank you,
Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

----- Original Message -----
From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski ; James Mommers
Cc: momalley@cityofbentonharbormi.gov
Sent: Monday, February 4, 2019 10:29 AM
Subject: RE: Benton Harbor job

City is going to have a local contractor tap the main and install the meter.
Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.
We probably need 40' of cable.
Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?
Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Tuesday, January 29, 2019 9:36 AM
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> Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

Virus-free. www.avast.com

From:	Draheim, Andy (EGLE)
To:	Bolf, Michael (EGLE)
Cc:	Epkey, Amy (EGLE); Thelen, Mary Beth (EGLE)
Subject:	RE: Benton Harbor letter -- just making sure
Date:	Wednesday, June 17, 2020 2:27:30 PM

Thanks and no worries. It was a matter of me losing track of things. Appreciate your quick response. Best, Andy

---

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Wednesday, June 17, 2020 2:26 PM
To: Draheim, Andy (EGLE) <DraheimA@michigan.gov>
Cc: Epkey, Amy (EGLE) <epkeya@michigan.gov>; Thelen, Mary Beth (EGLE) <THELENM2@michigan.gov>
Subject: RE: Benton Harbor letter -- just making sure

Andy,
Sorry if that was not clear. Yes, the italicized wording below is accurate as is.
Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Draheim, Andy (EGLE) <DraheimA@michigan.gov>
Sent: Wednesday, June 17, 2020 12:59 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Epkey, Amy (EGLE) <epkeya@michigan.gov>; Thelen, Mary Beth (EGLE) <THELENM2@michigan.gov>
Subject: Benton Harbor letter -- just making sure

Mike: per your comment in the draft letter, is the following sentence accurate as it is? I can't remember if you changed the sentence to reflect your comment or if you comment suggested we needed to change the sentence. If it needs to be changed, please suggest the changes. Thanks! Andy

The system has consistently exceeded the Michigan action level since the fall of 2018 despite implementing corrosion control measures in conjunction with our department.

*****

Andy Draheim
Chief of Staff
Michigan Department of Environment, Great Lakes, and Energy
517-614-0240 | draheima@michigan.gov
Follow Us | **Michigan.gov/EGLE**

From:	Mike O"Malley
To:	Sarkipato, Ernest (DEQ)
Cc:	Darwin Watson; momalley@cityofbentonharbormi.gov; Bolf, Michael (DEQ); Bolt, Jennifer (DEQ); Onan, Brandon (DEQ); Thurston, Brian (DEQ)
Subject:	Re: BH ACO and Lead and Copper Compliance Status
Date:	Friday, April 12, 2019 1:01:30 PM
Attachments:	MO Response to Compliance from ES.xlsx

Ernie,

This is the 1st time I have ever seen this email. So, as you might have guessed, I jumped on it in lieu of anything else to do.

As for the Lead and Copper sampling plan.
I was here, Mentoring Greg Alimenti under a BH/ MDEQ Order Agreement; and actually managed Benton Harbor's 1st Tri-annual Reduced Monitoring Plan.
And, under that same Order Agreement Benton Harbor installed their 1st continuous Chlorine Analyzer on the wall in the laboratory, where I just had a new one installed. And, it was still there in December of 2008 when I came back.

I was gone under the State of MI Appointed Emergency Manager when the Benton Charter went on line as their own water system.
But ZERO experiences as to what BH Water would do with their new found *Medium Distrbution System*.
When I come back in 2016; I find that there are only 2 Stage 2 DBP sites; I had to ask *Why the City was only collecting 1 TOC sample per quarter;*
And the Coliform Collection dropped to 10 samples a month.
And, the Distribution System Certified Operator Oversite Requirement dropped from S1 to S2.
I understand that the plant remained a F1 plant, not on residents served but on size and complexity.

So, I ask you; *Why wasn't the Sampling Requirement for Lead and Copper not adjusted to reflect the "Medium Size' S2 system versus Large Size S1.*
Since the onset of the *ALE;* and the Benton Harbor Water System required to return to a original Lead and Copper Sampling Protocal.
And, the City's decimated financial condition brought on by 2 Sate Appointed Emergency Managers.

I have to insist, that the Benton Harbor water distribution system is required to return to 1991 initial Lead and Copper program as a **Medium Sized system** as defined in the Lead & Copper rules.
I will work very hard to continue with the lead and copper monitoring by collecting 40 samples before June 30, 2019 and 40 more by 12/31/2019.
And, please revise the ACO to reflect this and return it at your earliest convenience.
I left the attachment as an Excel spreadsheet to make it convenient for the changes.

Attached: *MO Response to Compliance from ES.xlsx*

Thank you and have a blessed Easter Season,

Mike O'Malley

Benton Harbor Water Superintendent

On Fri, Apr 12, 2019 at 9:53 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Good morning Darwin,
>
> Thank you for submitting the rate study and a request to extend a few ACO deadlines. In the future, please note Section 4.14 of the ACO requires these requests 10 days prior to the deadline.
>
> I see the requested extensions to the ACO deadlines were granted, and as such I've attached a revised timeline for ACO compliance. The timeline also includes some of the lead and copper Action Level Exceedance dates. Please note: two items remain with a response needed that is now past the due date:
>
> -Corrosion Plan. Based on my recollection of conversations, this proposal from the City was going to rely on Elhorn's plan to conduct a coupon study or set of studies to ensure the treatment rate and chemical selection are optimized to reduce lead release.
>
> -Rates. The ACO requires the city to submit an implementation plan to ensure rates are sufficient to cover costs, per the recent rate study by a qualified consultant.
>
> Please respond as soon as you can on these items, as they are now past due.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Municipal Assistance Division
>
> Department of Environmental Quality
>
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater
>
> **From:** Darwin Watson <dwatson@cityofbentonharbormi.gov>
> **Sent:** Tuesday, March 26, 2019 10:39 AM
> **To:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> **Cc:** momalley@cityofbentonharbormi.gov
> **Subject:** Re: REMINDER
>
> Good Morning Ernie,
>
> Please find attached to this email a copy of the rate studies for water and sewer for the City of Benton Harbor.
>
> Also, please accept this email as a formal request for extensions on the following items

outlined in the Administrative Consent Order ("ACO"):

- **Finish upgrades to the SCADA system to store/access regulatory data, and ensure alarms and callouts for high turbidity and low chlorine** - the City requests that this due date be adjusted to **May 15, 2019**. This request is a result of scheduling issues with the vendor needed to install the necessary hardware and software.
- **Install metering capability on finished water**- the City is requesting that the deadline for this be adjusted to **June 15, 2019**. This request is based on challenges with getting equipment from the vendor and also the lead time needed to construct the meter for the application.
- **Have working chlorine analyzer on finished water tap** - the City is requesting that the deadline for this be adjusted to **May 15, 2019**. This request is based on challenges with getting equipment from the vendor and installation of the equipment.
- **Hire licensed operator for distribution system** - the City is requesting that the deadline for this be adjusted to **May 1, 2019**. This request is based on negotiations with the contractor.

If you have any questions, feel free to contact me.

Thanks

On Tue, Mar 26, 2019 at 7:45 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Hi Darwin,
>
> Please submit a request for extension by 11AM today, as I'm off for two weeks which will span the first ACO deadline.
>
> Also please submit an update on pumping of phosphate, and any initial residual monitoring data if available.
>
> Ernie

Completed?	Project Details	Due By
	Propose optimal corrosion control treatment, or a corrosion study	**3/31/19**
	Submit rate study to DEQ with implementation plan	4/1/19
	Obtain licensed operator in charge of water distribution system	5/1/19
	Submit plan to streamline the rate collection process	5/1/19
	Upgrade existing SCADA system to have historian and alarm capabilities	5/15/19
	Fix continuous chlorine analyzer	5/15/19
	Data store continuous chlorine analyzer Mike Adds to line 7	5/15/19
	Submit updated cross connection control program, staffing support	6/1/19
	Submit plan to inventory valves, and plan for ongoing maintenance	6/1/19
	Install coagulant feed to rapid mix	6/1/19
	Install metering capabilities	6/15/19
	Collect 60 samples for lead and copper, remembering 1st/5th liter	6/30/19
	Collect WQP as required by ALE letter	6/30/19
	Conduct professional inspection of water tower	6/30/19

	Install working mussel feed control system at the raw water intake	6/30/19
	Report 2018 ALE in the consumer confidence Report	7/1/19
	For first round of 2019, this is the due date for reporting to DEQ	9/28/19
	Collect 60 samples for lead and copper, remembering 1st/5th liter	12/31/19
	Collect WQP as required by ALE letter	12/31/19
	Repair filter to waste valves	1/1/20
	For second round of 2019, this is the due date for reporting to DEQ	3/31/20
	Collect one LCR sample from entry point to distribution	3/31/2022

Notes	MO date
Action Level Exceedance (ALE) Requirement	3/25/2019
Still need a plan to implement rate increases as recommended by the study	
	4/4/2019
	3/29/2019
	4/18/2019
	3/9/2019
	as of 3/25/2019

Action Level Exceedance (ALE) Requirement

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Action Level Exceedance (ALE) Requirement

MO Notes 04 12 2019
Not in ACO completed in fast rated even without meter but added HS Pump On control as requested by MDEQ.
Darwin told me this week it will be on the CC Agenda.
Historian Computer and software arrive mid March. Technician in and set up 4/1/2019 & 4/2/2019
Up and Running, still working on data collection.
Partially done needs tech to tag it to SCADA, he already has the cable installed by his electrician; and he has promised me it be hooked up by next week after he returns from trainning.
I've started and I sent the necessary report on time for last year.
This item was never part of the Sanitary Survey. I had advised you long ago that there are many records, both paper and digital. The digital was done by Abonmarche. The paper was done eon's ago. I have updated those paper and some digital records extensivly in 2008 to 2012 and again in 2016 to on-going.
Alum supply to repurposed Polymer Day tank completed with pump control, piping and check for proper operation.
2" meter tap going in today, 4/12/2019 as you know the meter is 8+ weeks out from that. We were thinkng that this flow meter can be used for Distrbution flow. And, as you know, I have already begun calculatculating flow as of 1/1/2019. Please note I have never had a MOR that includes Dist flow, do you have any templates?
Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened as did every other requirement was reduced in 2012 (Stage 2; DMR). All of my requests to MDEQ are going un-answered. This needs to be rectified by the MDEQ without question.
Not in ACO. BHWW has collected 2 sets now. The recent set was done in the late February 2019. Results coming soon as I can. I was unsure of the requirement timing, but now that I have the regs, I can look them up and I will abide by those results.
Working on that with contractor. Please note, that the Benton Harbor Water Distribution System CANNOT function with direct pressure. I am looking for ways to take the water tower out of service and not run the system without it (direct pressure). 6/30/2019 deadline; may not be easily met.

Trying my best. Even you told me to hold off as other more pressing needs required my attention.
NO brainer. If you could, please provide the language required for Lead, before I write it and print it. 2-years in a row you changed your mind and sent BH a violation notice.
I do not know what your are talking about. If it is for the 1st round of 40 lead & Copper sampling, it makes sense. Remember without you having FOIA protection, you will see only codes and not addresses or names. Benton Harbor will provide all information to MI DHHS as I did late last year.
Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened as did every other requirement was reduced in 2012 (Stage 2; DMR). All of my requests to MDEQ are going un-answered. This needs to be rectified by the MDEQ without question.
Is this all the more often you want WQP samples taken? I have long since forgotten that letter.
I do not know what your are talking about. If it is for the 2nd round of 40 lead & Copper sampling, it makes sense. Remember without you having FOIA protection, you will see only codes and not addresses or names. Benton Harbor will provide all information to MI DHHS as I did late last year.
Can't I just tell you the results: 0 for lead very small # for copper. There is a relativly short piece of copper from the WW Service tap on the house main to the Sample Sink.

From:	London, Bob (EGLE)
To:	Bolf, Michael (EGLE)
Cc:	Onan, Brandon (EGLE); Thurston, Brian (EGLE); Philip, Kris (EGLE); Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Krisztian, George (EGLE); Nelson, Maureen (EGLE)
Subject:	Re: Benton Harbor CCT
Date:	Friday, February 7, 2020 12:46:04 PM

Mike's proposed revision addresses my concerns.

Sent from my iPhone

On Feb 7, 2020, at 12:18 PM, Bolf, Michael (EGLE) <BOLFM@michigan.gov> wrote:

> All,
> A higher ortho dose will likely prove to be the optimum treatment strategy, but I think Bob is concerned that the state is being too prescriptive and as a result the city may not consider all options in the CC study. There is merit in having a comprehensive study by a third party that evaluates the alternatives and provides justification why the selected alternative is the best. The evaluation of alternatives may be as simple as a few statements why many of the other strategies will not be effective in this situation. The focus may still be on the type and dose of phosphate product, but will include an evaluation of other treatments. In the unlikely event they propose an exotic treatment strategy we disagree with, we still don't have to approve it. You might consider a slight change to the following paragraph:
> *The above phosphate treatment strategy is intended to provide immediate improvement of corrosion protection in the distribution system, but without further study it is not certain to be the optimum treatment strategy. Therefore, the City is directed to have a third party consultant submit to the department a corrosion control study proposal following the requirements of Rule 325.10604f(3)(c). This study proposal must be submitted to the department within six months following the date that the directed treatment change is completed. The study plan must focus on ~~a range of phosphate chemicals and dosages to optimize~~ identifying optimum corrosion control treatment for the city of Benton Harbor's water system. Reference to analogous water systems alone will not suffice to meet this requirement.*
> Michael Bolf, P.E.
> Engineering Unit Supervisor
> Drinking Water and Environmental Health Division
> Michigan Department of Environment, Great Lakes, and Energy
> 906-630-4107 (mobile) | bolfm@michigan.gov
>
> **From:** London, Bob (EGLE) <LONDONR@michigan.gov>
> **Sent:** Friday, February 07, 2020 10:31 AM
> **To:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE)

<krisztiang@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: Re: Benton Harbor CCT

After discussing the letter further with Brandon, my revised comment #2 is as follows:

2. We are designating treatment initially to attempt to make a quick and meaningful improvement to Benton Harbor's treated water as it relates to corrosivity. I concur with the treatment designation. We are also requiring an optimization study. The study should follow the requirements of Rule 604 f(3), meaning that other treatment alternatives (in addition to a phosphate-based inhibitor) should be considered in the study. The wording of the letter appears to direct them toward selecting orthophosphate addition. Orthophosphate addition may very well be the recommended treatment for OCCT, but I don't believe there's a reason to word the letter to diminish the other possible options. The City will have an orthophosphate feed system in place to protect the water system while they work on the study, so the study should be comprehensive. I don't support the wording related to the direction of the study as it is currently written.

From: London, Bob (EGLE)
Sent: Monday, February 3, 2020 11:23 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: RE: Benton Harbor CCT

Here are my comments:

<!--[if !supportLists]-->1. <!--[endif]-->In 2017 when we designated treatment for the Genesee County water plant, we assigned interim WQPs for the plant tap. We assigned a “target residual,” a “90 percent range,” and “100 percent range.” Of the three, only the “100 percent range” was regulatory (100 percent of their residuals had to fall within the range, except they were allowed 9 excursion days in any 6-month monitoring period per our rules). Here is a screen shot from the letter we sent them:

<image003.jpg>

We did this so they would practice controlling their residuals within a reasonable range – to get them ready for the future when they would have actual enforceable WQP ranges. They also needed to start preparing for distribution system WQPs, which aren’t nearly as easy to control as point-of-entry WQPs. My recommendation is to assign interim WQPs for both the plant tap and the distribution system…even if you don’t make any of them enforceable yet, I think

it's a valuable operational tool for them to have a target and range.

<!--[if !supportLists]-->2. <!--[endif]-->The letter directs the City to undertake a corrosion control study per 604f(3)(c). That sub-rule states that several treatment options (pH/alkalinity adjustment, calcium hardness adjustment, and the use of corrosion inhibitors) must be evaluated. The system must also evaluate constraints that might make a particular treatment option unfeasible. Basically, the sub-rule places the burden of eliminating possible treatment options on the water system. The draft letter appears to steer the City toward the use of phosphate-based inhibitors. My opinion is that we should not bias the direction of the study in the letter. Discussions about the likely direction can certainly take place, but the City does need to follow the requirements of the rule.

Bob London
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
989-450-7834
londonr@michigan.gov
michigan.gov/EGLE

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Monday, February 03, 2020 9:54 AM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; London, Bob (EGLE) <LONDONR@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: Benton Harbor CCT

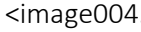
All,

Ernie and I have drafted a letter to Benton Harbor mandating a change in treatment. Please review the letter and provide comment. Currently this letter has my signature block on it but I am open to suggestions on who this letter should come from. We want to get this letter to the supply ASAP.

Letter is at the following link: T:\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\District 93\Benton Harbor\Communication\Draft_Benton Harbor OCCT update_20200203.docx

Thanks for your timely response,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan St.
P.O. Box 30817
Lansing, MI 48909
(p) 616.307.6736

onanb@michigan.gov


From:	Mike O"Malley
To:	Sarkipato, Ernest (DEQ)
Cc:	Onan, Brandon (DEQ); mike@michonline.net; Darwin Watson; Lachance, Amy (DEQ); Oswald, Eric (DEQ); Thurston, Brian (DEQ); Mike OMalley
Subject:	Re: Benton Harbor Corrosion Control Treatment
Date:	Monday, November 26, 2018 1:27:11 PM

See you Thursday morning.

Sorry, I thought he said 10:00 am Thursday. I am good at 9:00am on Thursday.

We will meet at the plant.

Thanks for letting me know.

Mike O'Malley
Benton Harbor Water Superintendent

On Mon, Nov 26, 2018 at 1:24 PM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Mike – four attendees is plenty, I agree, and they are listed below. The rest of the DEQ folks are only copied as an fyi. Mike E responded and said he could make 9am work on Thursday. Darwin is welcome/encouraged to attend if he's around.
>
> We do have a peer review team, which is probably what you're referring to. They will need to review this permit application as well when the time comes, and Brandon is involved but not on the team specifically.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Municipal Assistance Division
>
> Department of Environmental Quality
>
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Monday, November 26, 2018 1:10 PM
> **To:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> **Cc:** Onan, Brandon (DEQ) <OnanB@michigan.gov>; mike@michonline.net; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
> **Subject:** Re: Benton Harbor Corrosion Control Treatment
>
> Ernie and all the rest of you.

Mike Elhorn is out of state until Wed. He proposes Thursday at 10:00 am.

If you intend for all these people to come, where will I have room?

Let's just have Brandon and Ernie, bring some literature and support to Benton Harbor, the rest can stay home.

Unless, Amy; Eric; and Brian are 3 members of the 4-man Corrosion Team you do not seem to want me to know about. Is Brandon the 4th?

This to me, is simple enough. I just propose to set up some metering equipment on top of a barrel of Carus 8600 and pump discharge into a convenient tap to the finished water line or the 20-inch headers.

I am looking forward to the Sanitary Survey meeting. Pushed out until December 4.

Thanks,

Mike O'Malley

Benton Harbor Water Superintendent

On Mon, Nov 26, 2018 at 8:59 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> I'd like to propose a meeting at the Benton Harbor WTP to discuss Elhorn's preliminary work to determine a recommended corrosion control chemical (see attached). Part of the discussion will also be the logistics of installing and feeding the chemical at the plant.
>
> Who: Mike O'Malley, Brandon Onan, Mike Enlow, Ernie Sarkipato
>
> Date: Thursday, 11/29/18
>
> Time: 9:00 AM
>
> Where: 601 Ridgeway St, St Joseph, MI 49085
>
> *This is all preliminary at this point, and a permit application will need to be submitted prior to installation.*
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Municipal Assistance Division
>
> Department of Environmental Quality
>
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski
Cc: ron
Subject: Re: Benton Harbor FPI application
Date: Tuesday, February 5, 2019 5:04:09 PM

Great!!

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 5, 2019, at 5:00 PM, Curtis Brzyski <cbrzyskimmi@msn.com> wrote:

Good application per factory

Get Outlook for Android<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Faka.ms%2Fghei36&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C1%7C636850008049202329&sdata=xd5Tc1whEY50noqAD%2FcA5lqriV0lg6NRUjKbwScQyhI%3D&reserved=0>

From: Clements, Joe <JoeC@mccrometer.com>
Sent: Tuesday, February 5, 2019 1:42:43 PM
To: 'Curtis Brzyski (cbrzyskimmi@msn.com)'
Cc: Spiegel, Barry S; James; Colon, Jose M
Subject: Benton Harbor FPI application

Curtis,

Feeding from a tank is like having an unlimited straight run. The gate valve should be 100% open. I would mount the FPI sensor in the 12:00 position close to the gate valve. The Phosphate Injection should be as far downstream of the sensor as posable which will still be pretty close.
Looks like a good application.
Thanks for getting the details worked out up front.

Joe Clements | Application Engineer – Water Market
cell 717-372-4095 | joec@mccrometer.com<mailto:joec@mccrometer.com>
McCrometer, Inc. | www.mccrometer.com<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.mccrometer.com%2F&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049212338&sdata=B4uUX5HDFCh%2BGl%2FuyNzgajYol%2Bu6UqmujRZGqmPDBjs%3D&reserved=0>

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 04, 2019 1:43 PM
To: Clements, Joe <JoeC@mccrometer.com>; Spiegel, Barry S <barrys@mccrometer.com>
Cc: jmommersmmi@msn.com
Subject: Fw: Benton Harbor job

Joe
recommendations
flow in 1 direction 30 inch line
Thank you,

Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttp-3A__www.midwestmunicipalinc.com%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3D3x4Mhd0-osumhx2zx-EPI8HLFJOaC-HoMkZXnpWmAW8%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049232354&sdata=JDrfusP07oXSNTX%2BVxBduHscnXsxBwBw4jWt3UeQDn8%3D&reserved=0>

----- Original Message -----
From: Sarkipato, Ernest (DEQ)<mailto:SARKIPATOE@michigan.gov>
To: Curtis Brzyski<mailto:cbrzyskimmi@msn.com> ; jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>
Cc: momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov> ; roudbier@fnwusers.com<mailto:roudbier@fnwusers.com> ; ron@oudbierinst.com<mailto:ron@oudbierinst.com>
Sent: Monday, February 4, 2019 1:22 PM
Subject: RE: Benton Harbor job

Thank you very much!

Hopefully this drawing and photos help with the lay of the land.

Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Cc: momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov>; roudbier@fnwusers.com<mailto:roudbier@fnwusers.com>; ron@oudbierinst.com<mailto:ron@oudbierinst.com>
Subject: Re: Benton Harbor job

Mr. Sarkipato,

Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.

If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come

Thank you,

Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttp-253A-252F-252Fwww.midwestmunicipalinc.com-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893360230-26sdata-3DK8dQUf76mo8DqC6EvZsIv44h5KspIF5-252B7l5wV7ovYUU-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DzoH9xXYOfaL5rt7CC9OsZCz7ne1JaO6Trs7zm-n0lj4%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049242368&sdata=1vo6mu7iFihgPeNsZQrThGOBmhkx2v1IPhqK6OAUWsA%3D&reserved=0>

----- Original Message -----
From: Sarkipato, Ernest (DEQ)<mailto:SARKIPATOE@michigan.gov>
To: Curtis Brzyski<mailto:cbrzyskimmi@msn.com> ; James Mommers<mailto:jmommersmmiinc@gmail.com>
Cc: momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov>
Sent: Monday, February 4, 2019 10:29 AM
Subject: RE: Benton Harbor job

City is going to have a local contractor tap the main and install the meter.

Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.

We probably need 40' of cable.

Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?

Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Sent: Tuesday, January 29, 2019 9:36 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>; James Mommers <jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>>
Subject: RE: Benton Harbor job

Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??

Curtis

Sent from Mail<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fgo.microsoft.com-252Ffwlink-252F-253FLinkId-253D550986-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893380240-26sdata-3D9-252Fh-252BdootKxXEo2QdnKLUoPhWON-252Bo5GYhWsIjCRoM3gE-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DWVpMbZD4zFjJ4ZXFNGSuVhDwBW4feQYVHDwNaU9XkBg%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049262384&sdata=dZYLac69HFi2gfZvHdEb3S46YmexVJx4DQhe7KYPF%2Fg%3D&reserved=0>
for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job

Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>; James Mommers <jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>>
Subject: RE: Benton Harbor job

Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner

The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.

Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttp-253A-252F-252Fwww.midwestmunicipalinc.com-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893390245-26sdata-3D6qOQHwViCbT3SxFdm4LETCReVSuViHw55HfOnWxdaxc-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DT2axrmIh9Pc19fp2UGrCq1Oy8vkgpAbCZRfllFfmvhw%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049272387&sdata=5XVjv%2FL0qwCf3DzhmaBM53UxvTEipXWhd8RDKdcqLWQ%3D&reserved=0>

Sent from Mail<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fgo.microsoft.com-252Ffwlink-252F-253FLinkId-253D550986-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893400256-26sdata-3DVlXLGiovrsDqq6ccEels8fV7cJwankSuRpYVNJB-252BbL8-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DCgTipYUFB2sq6Sz3RqI4GDtW9swyHqtVYc64lUrQlXQ%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049292403&sdata=DwPe%2Faz2eSM2olJO%2BhcJP7rDoVex65UtCkiEoQGUTfE%3D&reserved=0> for Windows 10

From: Sarkipato, Ernest (DEQ)<mailto:SARKIPATOE@michigan.gov>
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job

Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.

Ernie

From: James Mommers <jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>; Oudbier Inst <ron@oudbierinst.com<mailto:ron@oudbierinst.com>>
Cc: curtis brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Subject: Re: Benton Harbor job

Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell

On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>> wrote:
Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.

Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fwww.seametrics.com-252Fproduct-2Dcategory-252Fflow-2Dmeters-252Findustrial-2Dmagmeters-252Fex-2Dseries-252F-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893410261-26sdata-3DfGpqoxpDCXcGZQP6vC03pLWouDi0d4A6LLlM23BGUDE-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DrD_82P3FCw0Y2GJsmWnTHaaf3GMP_TmsacUaZOrmZKU%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049302412&sdata=s0lRCrUbbLuX9o%2FF9NMSIVzDbufkwpSn%2B%2F95Vi2b07Y%3D&reserved=0> paired with a Seametrics FT440W-139<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fwww.seametrics.com-252Fproduct-252Frate-2Dtotal-2Dindicator-2Dft400-2Dseries-252F-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893420279-26sdata-3DVgktYBSGoJ2FfFoVhH-252BbkohiQUOmkfmE8Vbx6RkF9Dg-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DXFKJPqJOjiZ3aPclWkVvgupMOStZYdu-RXOXoUljIUI%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049322428&sdata=NjDLg%2B2zYXWQfWbQUcQIfJrkeXiR3jilPLjAEQlP5lk%3D&reserved=0>, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump. I attached a couple photos of the area the tap can be made.

Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.

Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttp-253A-252F-252Fwww.michigan.gov-252Fdrinkingwater-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893430284-26sdata-3DPp6g1AKUGGfZkr3RXXOz0FaIs3DNCK4-252Bh7Vf8keQnZk-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3Dqcfx4ZJ6SQ7IhjkJlaG5YX5C6zzsKWZf3jKAZlE_N2k%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049332436&sdata=JID9zpDedYxZYmAr2ayq4Qv%2Bnn4i92sj4yTKu2A2diU%3D&reserved=0>

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<lower level drawing.pdf>
<InkedIMG_2536_LI.jpg>
<InkedIMG_2537_LI.jpg>

From: Sarkipato, Ernest (DEQ)
To: Curtis Brzyski
Cc: ron
Subject: Re: Benton Harbor FPI application
Date: Tuesday, February 5, 2019 5:04:09 PM

Great!!

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 5, 2019, at 5:00 PM, Curtis Brzyski <cbrzyskimmi@msn.com> wrote:

Good application per factory

Get Outlook for Android<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Faka.ms%2Fghei36&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C1%7C636850008049202329&sdata=xd5Tc1whEY50noqAD%2FcA5lqriV0lg6NRUjKbwScQyhI%3D&reserved=0>

____
From: Clements, Joe <JoeC@mccrometer.com>
Sent: Tuesday, February 5, 2019 1:42:43 PM
To: 'Curtis Brzyski (cbrzyskimmi@msn.com)'
Cc: Spiegel, Barry S; James; Colon, Jose M
Subject: Benton Harbor FPI application

Curtis,

Feeding from a tank is like having an unlimited straight run. The gate valve should be 100% open. I would mount the FPI sensor in the 12:00 position close to the gate valve. The Phosphate Injection should be as far downstream of the sensor as posable which will still be pretty close.
Looks like a good application.
Thanks for getting the details worked out up front.

Joe Clements | Application Engineer – Water Market
cell 717-372-4095 | joec@mccrometer.com<mailto:joec@mccrometer.com>
McCrometer, Inc. | www.mccrometer.com<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.mccrometer.com%2F&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049212338&sdata=B4uUX5HDFCh%2BGl%2FuyNzgajYol%2Bu6UqmujRZGqmPDBjs%3D&reserved=0>

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Monday, February 04, 2019 1:43 PM
To: Clements, Joe <JoeC@mccrometer.com>; Spiegel, Barry S <barrys@mccrometer.com>
Cc: jmommersmmi@msn.com
Subject: Fw: Benton Harbor job

Joe
recommendations
flow in 1 direction 30 inch line
Thank you,

Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttp-3A__www.midwestmunicipalinc.com%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3D3x4Mhd0-osumhx2zx-EPI8HLFJOaC-HoMkZXnpWmAW8%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049232354&sdata=JDrfusP07oXSNTX%2BVxBduHscnXsxBwBw4jWt3UeQDn8%3D&reserved=0>

----- Original Message -----
From: Sarkipato, Ernest (DEQ)<mailto:SARKIPATOE@michigan.gov>
To: Curtis Brzyski<mailto:cbrzyskimmi@msn.com> ; jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>
Cc: momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov> ; roudbier@fnwusers.com<mailto:roudbier@fnwusers.com> ; ron@oudbierinst.com<mailto:ron@oudbierinst.com>
Sent: Monday, February 4, 2019 1:22 PM
Subject: RE: Benton Harbor job

Thank you very much!

Hopefully this drawing and photos help with the lay of the land.

Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Sent: Monday, February 4, 2019 12:46 PM
To: jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Cc: momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov>; roudbier@fnwusers.com<mailto:roudbier@fnwusers.com>; ron@oudbierinst.com<mailto:ron@oudbierinst.com>
Subject: Re: Benton Harbor job

Mr. Sarkipato,

Enclosed is the quotation you requested.
The quotation has been addressed to Mr. O'Malley.
Enclosed is an order entry form that will need to be filled out prior to flowmeter production.

If available please send drawings so we can assist with the ideal meter location before tapping the line.
Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.
Once the attached order form is filled out a custom 395L will be built to your specifications.
Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come

Thank you,

Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttp-253A-252F-252Fwww.midwestmunicipalinc.com-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893360230-26sdata-3DK8dQUf76mo8DqC6EvZsIv44h5KspIF5-252B7l5wV7ovYUU-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DzoH9xXYOfaL5rt7CC9OsZCz7ne1JaO6Trs7zm-n0lj4%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049242368&sdata=1vo6mu7iFihgPeNsZQrThGOBmhkx2v1IPhqK6OAUWsA%3D&reserved=0>

----- Original Message -----
From: Sarkipato, Ernest (DEQ)<mailto:SARKIPATOE@michigan.gov>
To: Curtis Brzyski<mailto:cbrzyskimmi@msn.com> ; James Mommers<mailto:jmommersmmiinc@gmail.com>
Cc: momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov>
Sent: Monday, February 4, 2019 10:29 AM
Subject: RE: Benton Harbor job

City is going to have a local contractor tap the main and install the meter.

Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.

We probably need 40' of cable.

Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?

Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Sent: Tuesday, January 29, 2019 9:36 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>; James Mommers <jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>>
Subject: RE: Benton Harbor job

Its included in the cost of the flowmeter
$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.
Freight , installation and startup are not included
Freight around $300.00
Installation ??
Startup by Oudbier ??

Curtis

Sent from Mail<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fgo.microsoft.com-252Ffwlink-252F-253FLinkId-253D550986-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893380240-26sdata-3D9-252Fh-252BdootKxXEo2QdnKLUoPhWON-252Bo5GYhWsIjCRoM3gE-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DWVpMbZD4zFjJ4ZXFNGSuVhDwBW4feQYVHDwNaU9XkBg%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049262384&sdata=dZYLac69HFi2gfZvHdEb3S46YmexVJx4DQhe7KYPF%2Fg%3D&reserved=0>
for Windows 10

____
From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job

Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>; James Mommers <jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>>
Subject: RE: Benton Harbor job

Ernie
Enclosed Powerpoint on insertion meter accuracy
This just goes over what I discussed
The single point meter costs about 4K but it can be profiled
The SPI or single point does not have a NSF liner

The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup
This should be your most stable signal from this flowmeter.

Curtis Brzyski
MMI Inc.
517 764 4736
www.midwestmunicipalinc.com<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttp-253A-252F-252Fwww.midwestmunicipalinc.com-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893390245-26sdata-3D6qOQHwViCbT3SxFdm4LETCReVSuViHw55HfOnWxdaxc-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DT2axrmIh9Pc19fp2UGrCq1Oy8vkgpAbCZRfllFfmvhw%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049272387&sdata=5XVjv%2FL0qwCf3DzhmaBM53UxvTEipXWhd8RDKdcqLWQ%3D&reserved=0>

Sent from Mail<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fgo.microsoft.com-252Ffwlink-252F-253FLinkId-253D550986-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893400256-26sdata-3DVlXLGiovrsDqq6ccEels8fV7eJwankSuRpYVNJB-252BbL8-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DCgTipYUFB2sq6Sz3RqI4GDtW9swyHqtVYc64lUrQlXQ%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049292403&sdata=DwPe%2Faz2eSM2olJO%2BhcJP7rDoVex65UtCkiEoQGUTfE%3D&reserved=0> for Windows 10

From: Sarkipato, Ernest (DEQ)<mailto:SARKIPATOE@michigan.gov>
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job

Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.

Ernie

From: James Mommers <jmommersmmiinc@gmail.com<mailto:jmommersmmiinc@gmail.com>>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>; Oudbier Inst <ron@oudbierinst.com<mailto:ron@oudbierinst.com>>
Cc: curtis brzyski <cbrzyskimmi@msn.com<mailto:cbrzyskimmi@msn.com>>
Subject: Re: Benton Harbor job

Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell

On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>> wrote:
Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.

Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fwww.seametrics.com-252Fproduct-2Dcategory-252Fflow-2Dmeters-252Findustrial-2Dmagmeters-252Fex-2Dseries-252F-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893410261-26sdata-3DfGpqoxpDCXcGZQP6vC03pLWouDi0d4A6LLlM23BGUDE-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DrD_82P3FCw0Y2GJsmWnTHaaf3GMP_TmsacUaZOrmZKU%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049302412&sdata=s0lRCrUbbLuX9o%2FF9NMSIVzDbufkwpSn%2B%2F95Vi2b07Y%3D&reserved=0> paired with a Seametrics FT440W-139<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fwww.seametrics.com-252Fproduct-252Frate-2Dtotal-2Dindicator-2Dft400-2Dseries-252F-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893420279-26sdata-3DVgktYBSGoJ2FfFoVhH-252BbkohiQUOmkfmE8Vbx6RkF9Dg-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3DXFKJPqJOjiZ3aPclWkVvgupMOStZYdu-RXOXoUljIUI%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049322428&sdata=NjDLg%2B2zYXWQfWbQUcQIfJrkeXiR3jilPLjAEQlP5lk%3D&reserved=0>, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate feed system would be stand-alone from the SCADA, so it's a nice and simple install. What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump. I attached a couple photos of the area the tap can be made.

Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.

Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater<https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Furldefense.proofpoint.com%2Fv2%2Furl%3Fu%3Dhttps-3A__eur03.safelinks.protection.outlook.com_-3Furl-3Dhttp-253A-252F-252Fwww.michigan.gov-252Fdrinkingwater-26data-3D02-257C01-257C-257Cbbb1c05892d34798991508d68acdd9b5-257C84df9e7fe9f640afb435aaaaaaaaaaaa-257C1-257C0-257C636849014893430284-26sdata-3DPp6g1AKUGGfZkr3RXXOz0FaIs3DNCK4-252Bh7Vf8keQnZk-253D-26reserved-3D0%26d%3DDwMFAw%26c%3D9mghv0deYPYDGP-W745IEdQLV1kHpn4XJRvR6xMRXtA%26r%3DXewZpP1HR7YV3H7lyM-mxMLjm561EmuZSNKQmYyhqD4%26m%3DBzOcFUUpl49NF4CQCdjRUvKNauUu6VUeYsY9p4HiH6k%26s%3Dqcfx4ZJ6SQ7IhjkJlaG5YX5C6zzsKWZf3jKAZlE_N2k%26e%3D&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C81cf23c3ec254aaad76308d68bb4e156%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636850008049332436&sdata=JID9zpDedYxZYmAr2ayq4Qv%2Bnn4i92sj4yTKu2A2diU%3D&reserved=0>

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<lower level drawing.pdf>
<InkedIMG_2536_LI.jpg>
<InkedIMG_2537_LI.jpg>

From:	Nicki Britten
To:	Sarkipato, Ernest (DEQ); Oswald, Eric (DEQ); Krisztian, George (DEQ); Crider, Steven (DHHS)
Cc:	Lachance, Amy (DEQ); Onan, Brandon (DEQ); Bolf, Michael (DEQ); Thurston, Brian (DEQ)
Subject:	Re: Benton Harbor Follow up call.
Date:	Wednesday, January 9, 2019 1:21:34 PM

I'm quite troubled by this information and will be working with our legal counsel to see how we can ratchet up a response and try to get more information about what the city is or is not providing to residences with a known level 15 or above. I was under the impression that the city was mitigating this public health hazard by providing water or filters like they said they would.

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Sarkipato, Ernest (DEQ)" <SARKIPATOE@michigan.gov>
Date: 1/9/19 1:02 PM (GMT-05:00)
To: "Oswald, Eric (DEQ)" <OswaldE1@michigan.gov>, "Krisztian, George (DEQ)" <krisztiang@michigan.gov>, "Crider, Steven (DHHS)" <CriderS1@michigan.gov>
Cc: "Lachance, Amy (DEQ)" <LACHANCEA1@michigan.gov>, "Onan, Brandon (DEQ)" <OnanB@michigan.gov>, "Bolf, Michael (DEQ)" <BOLFM@michigan.gov>, nbritten@bchdmi.org, "Thurston, Brian (DEQ)" <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor Follow up call.

I just received a call from a local resident who had made the initial contact to the non-profit below. She had received a letter from the city that the water is safe to drink after a first flush (I think this accompanied her results?). She called the number and spoke with Mike O'Malley, who somewhat rudely advised her the city is delivering "clean water right to the tap and you should have no trouble drinking it".

We talked about some ways residents can reduce their risk, and also talked about our difficulty in going door to door to educate and do sequential sampling at this time. I also mentioned we are striving to install corrosion treatment system at the city's water plant. She offered to talk with her HOA about possibly offering cooperation with us in that effort. I made sure to explain the nature of FOIA'ble information and PII. She took my email address in case there is a need for more communication.

I've also asked Mike O'Malley to send a copy of the letter the city is distributing.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Sent: Wednesday, January 9, 2019 12:30 PM
To: Krisztian, George (DEQ) <krisztiang@michigan.gov>; Crider, Steven (DHHS) <CriderS1@michigan.gov>
Cc: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: FW: Benton Harbor Follow up call.

FYI – I spoke with her this morning and gave her an update on the situation in Benton Harbor. They plan to reach out to residents and offer alternate water.

Eric

From: Izzy Marrah <izzy@freshwaterfuture.org>
Sent: Wednesday, January 9, 2019 12:18 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Subject: Benton Harbor Follow up call.

Hello Mr. Oswald,

Thank you so much for taking my call this morning and getting back to me so quickly. I didn't want to keep your phone lines busy by calling back, but felt you should be updated about this.

I spoke with the Water Plant and Distribution Director Mick O'Malley just now and he told me that they are advising residents (even the 40+ homes that tested above 15 ppb) to continue to drink the water after letting it run for a few minuets. He sated that after first flush it's okay to drink and cook with. I wasn't sure if your office knew about this. He also said they are not proving filters or bottles for anyone (even homes over the action level) because they provide clean water "right to their spout".

I'll be working on providing filters for those who want it in Benton Harbor but thought your office should know what Public Works is telling residents.

Thank you,

Isabel Marrah

--

Image removed by sender.

From:	Sarkipato, Ernest (DEQ)
To:	Mike O"Malley
Cc:	DARWIN WATSON; Onan, Brandon (DEQ)
Subject:	Re: Benton Harbor MI water plant needs quote
Date:	Thursday, January 31, 2019 11:49:08 AM

Mike: MMI already gave a quote which was lower than the quote I got through McCrometer, and included the controller ($13,500). If the city has enough grant funding for this meter, we should contact MMI and get it ordered ASAP. I was waiting to hear from Darwin about designating $30k for the phosphate install...

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Jan 31, 2019, at 11:36 AM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:

Alicia,

My friend Ernie from the Michigan Dept of Environmental Quality sent me the attached McCrometer FPI-MAG meter.

See Attached: *BHWW Request for Quote Mike OMalley 01 31 19.pdf*

I need a quote, to move forward with our new chemical treatment project.

We need to use this to operate a corrosion treatment chemical pump.
Is that what is the AMI/AMR Smart Output feature is designed to do?
Our installation will be in the treatment plant and will need to be AC powered.
And, we would need only forward flow.
The pipe we need to put it in is 30" so, center of flow measurement needs to be around 15" to 20".

We are also interested in lead time.

Please email the quote and any necessary documentation.

The water plant is located at:
Benton Harbor Water Plant
601 Ridgeway, St. Joseph, MI. 49085

Our Accounts Payable is:
Attention Water Account Payable
200 East Wall Street, Benton Harbor, MI. 49022

Or, the invoice can be sent to my email.

Thank You,

Michael O'Malley
Benton Harbor Water Superintendent
cell: (269) 363-0575

<BHWW Request for Quote Mike OMalley 01 31 19.pdf>

From:	Sarkipato, Ernest (DEQ)
To:	Mike O"Malley
Cc:	DARWIN WATSON; Onan, Brandon (EGLE)
Subject:	Re: Benton Harbor MI water plant needs quote
Date:	Thursday, January 31, 2019 11:49:08 AM

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Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

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Or, the invoice can be sent to my email.

Thank You,

Michael O'Malley
Benton Harbor Water Superintendent
cell: (269) 363-0575

<BHWW Request for Quote Mike OMalley 01 31 19.pdf>

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Cc:	Ellis Mitchell; Mike OMalley; Oswald, Eric (EGLE)
Subject:	Re: Benton Harbor News Article
Date:	Monday, November 18, 2019 2:27:32 PM

Truth be told, I was a little bit ahead of the game.

I am assuming you saw the results as I used the MDEQ Laboratory which of course, you also probably noticed that the lab screwed up 1 sample for me.

What you do not know, is that I had the homeowners fill me an extra bottle.
So I could do some chemistry OPP residuals, Chloride and Sulphate.
And, I had 8 samples of those.

So, my enlightenment had more to do with those:
OPP Residuals were good, many at 1.5 mg/L
And your favored Chloride/Sulfate Ratio was less than 1.0 at All 8 sites.
And, all sites were from people 8 out of 30 some that agreed to be tested from the June sampling.

I liken that to success, even if only 1 or 2 sites had lower values for lead.
I needed Commissioners and the press to bolster my success rate for getting volunteers.

I have had 2 yes calls to sampling!
That article was not near as helpful. But maybe more will call.

I am soon going to send out 81 more requests, from sites that I have vetted for possible lead service lines.

Here is you chance!

The Benton Harbor Water System serves less than 10,000 people, regardless of what number you use.
As that; the MDEQ Sampling requirement states that a population less than 10,000 water consumers is required to take
40 Lead and Copper Samples and 4 Water Quality Parameters, (with only Chloride/Sulfate Ratio required).

Please return to us a statement authorizing the above request.

Thank you very much,

Mike O'Malley
Benton Harbor Water Superintendent
and Benton Harbor Water Operator IN Charge.

On Mon, Nov 18, 2019 at 10:23 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Good morning Mike / Ellis,
>
> I was interested to see the below article which covered some comments from Mr. O'Malley at a City committee meeting last week. His statements are somewhat encouraging (finding lower results from 7 samples), and I hope the article results in a lot more volunteers for sampling.
>
> However the statements are also a bit concerning. We have learned that we need to wait and see the whole picture before making any conjectures on treatment efficacy. It might be best to coordinate media releases like this with our department. You may not be aware, but there is some external scrutiny of the City's corrosion study right now. We need to be careful about how we interpret all lead test data, and about how we continue the corrosion control treatment study into the future.
>
> https://www.heraldpalladium.com/news/local/official-bh-making-inroads-with-lead-in-water/article_c0ae841d-9116-5ab8-9712-7e60ed18e3df.html
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Environmental Health Division
>
> MI Department of Environment, Great Lakes, and Energy
>
> 616-307-0261 mobile
>
> EGLE
>
> www.michigan.gov/drinkingwater

From: Sasy, Ninah (EGLE)
To: Sarkipato, Ernest (EGLE)
Subject: Re: Benton Harbor Partner Updates & Next Steps
Date: Saturday, February 29, 2020 1:52:59 PM

Sure that works

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Saturday, February 29, 2020 1:29:20 PM
To: Sasy, Ninah (EGLE) <SasyN@michigan.gov>
Subject: Re: Benton Harbor Partner Updates & Next Steps

Maybe instead of ALE, 'Public health and Outreach' or something?

From: Sasy, Ninah (EGLE) <SasyN@michigan.gov>
Sent: Saturday, February 29, 2020 1:24:15 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Re: Benton Harbor Partner Updates & Next Steps

Thanks for the info. If the categories that I created aren't helpful then I'm definitely open to suggestions...

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Saturday, February 29, 2020 1:08:27 PM
To: Sasy, Ninah (EGLE) <SasyN@michigan.gov>
Subject: Re: Benton Harbor Partner Updates & Next Steps

Here is a brain dump so to speak… If you would like this document to be more bullet point oriented, perhaps you could wordsmith that from my below comments? Also, I'd like to run this by my management before it's final.

LCR - Compliance with the lead and copper rule entails a number of items, especially for a water system which exceeds the action level for lead or copper:
Sampling-The new Michigan lead and copper rule requires any sample from a home suspected to have a lead service line must fill both a first and 5th L bottle. The CIty of Benton Harbor has been required to collect 60 samples every six months from homes with lead service lines to comply with the rule. In addition, the Michigan lead and copper rule requires water quality parameters to be monitored at the water treatment facility, and in the distribution system. These include things like pH, temperature, calcium, and chloride. Part of Egle's responsibility is to review these WQP data as indicators of water quality, relative to the release of metals in the system.

LCR Corrosion treatment-In response to the action level of students, Egle has worked closely with city officials to consult with water professionals to quickly install (and fund) corrosion treatment system at the water plant, consisting of a phosphate chemical. The level of corrosion chemical has been closely monitored for consistency since March of 2019, and results of lead sampling in the system have been scrutinized for any trends. Recently, upon reviewing the last round of sampling of lead samples from late 2019, Egle required the city to increase the amount of orthophosphate in the system, as well as change to a different chemical formula

containing more orthophosphate content. This ordered change is in the spirit of proactively taking every possible step to protect public health, and is based on consultation with experts, EPA, and observations of studies in a similar system.

In addition to the above sampling requirements of the LCR, Benton Harbor is facing regulatory requirements similar to other water systems in the state of Michigan. Th is includes identifying and inventorying any lead service lines, and also beginning in 2021 removal of 5% per year of those lead service lines. This represents a major financial hurdle for any system, especially one that is financially distressed. It also represents a significant challenge of administrative recordkeeping and paperwork, something that is also lacking in Benton Harbor. Egle has been in discussions with brigadier general Mike McDaniel with the potential for partnering to help the city upgrade it's records, who was helpful for this purpose in Flint.

ALE - General comment, we would view the action level exceedance (ALE) as a component of the LCR. I would suggest changing this heading to community out reach if that is the intention of the topic.

The ALE triggers a required public notification every six months if the 90th percentile of lead or copper exceeds the action level. There are both a public advisory document, as well as a public education document which is more thorough, every time this happens. Such a document was sent to the citizens of benton harbor Friday, February 28 for the third time since 2018.

Initial response to the ALE included a public meeting at the city commission chamber, to hear directly from residents. It was poorly attended, but it was very cold and snowy.

ACO - The administrative consent order with the CIty of Benton Harbor is to resolve deficiencies identified with the cities water system during a 2018 review. The ACO is a tool to help guide compliance related activities, through the implementation of a compliance schedule. The city has struggled to meet deadlines that were self identified in the ACO, not least of which is due to the distraction and extra work relative to the lead ALE. They have now completed about half of the required actions. The goal of this process is to ensure the city has adequate technical, managerial, and financial capacity to operate the water system within compliance of act 399.

Remaining/current priorities from the ACO include the following:
-submit a rate collections plan (the first submittal was not acceptable, comments and guidance have been offered).
-water tower upgrades (discussing with consultants, and working with EGLE-Finance section for the revolving loan financing).
-cross connection program - working with staff on generating this program, although a contract will almost certainly be necessary to implement the program due to staffing levels. This is expensive, but cross connection prevention directly impacts public health protection.

-Ernie

From: Sasy, Ninah (EGLE) <SasyN@michigan.gov>
Sent: Saturday, February 29, 2020 11:13:29 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>

Subject: Benton Harbor Partner Updates & Next Steps

Hi Ernie,

I'm preparing a document to summarize our current efforts; please see attachment. Would you help me complete EGLE's section? If you send me information to plug-in then I'll take care it. I'm also working on a timeline for next steps that will be incorporated within the document. I'd like to share this document before our conference call on Thursday. Thanks for your help.

Ninah

Ninah Sasy, MSA, BS
Clean Water Public Advocate
Executive Office
Michigan Department of Environment, Great Lakes, and Energy
Office: 517-284-6843
Cell: 517-881-5219
Email: SasyN@michigan.gov

From:	Sarkipato, Ernest (DEQ)
To:	Onan, Brandon (DEQ)
Cc:	Bolf, Michael (DEQ)
Subject:	Re: Benton Harbor Phosphate Addition
Date:	Wednesday, February 13, 2019 3:20:43 PM

Great. Bear in mind the water plant will likely never hit 5 mgd, let alone 8 mgd!

On Feb 13, 2019, at 2:00 PM, Onan, Brandon (DEQ) <OnanB@michigan.gov> wrote:

Ernie,
The attached email is what I sent back to Mike and Brian. I've also attached the spreadsheet I used to make the table. You can compare these with what you had done previously.

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Wednesday, February 13, 2019 12:45 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: Re: Benton Harbor Phosphate Addition
Maybe the error in the spreadsheet is in the 33% as P ... could be as PO4?

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 4, 2019, at 1:52 PM, Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: PRT: Benton Harbor Phosphate Addition
Per our discussion today, please find attached a permit application for corrosion inhibitor for review

and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
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616-307-0261 mobile
www.michigan.gov/drinkingwater

<bh phosphate application 1_24_19.pdf>
<mime-attachment>
<dose calc check.xlsx>

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

From: Sarkipato, Ernest (DEQ)
To: Onan, Brandon (DEQ)
Cc: Bolf, Michael (DEQ)
Subject: Re: Benton Harbor Phosphate Addition
Date: Wednesday, February 13, 2019 12:45:20 PM

Maybe the error in the spreadsheet is in the 33% as P ... could be as PO4?

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

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From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
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Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile
www.michigan.gov/drinkingwater
<bh phosphate application 1_24_19.pdf>

From: Sarkipato, Ernest (DEQ)
To: Thurston, Brian (DEQ)
Cc: Onan, Brandon (DEQ); Bolf, Michael (DEQ); London, Bob (DEQ)
Subject: Re: Benton Harbor Phosphate Addition
Date: Thursday, February 21, 2019 5:13:22 PM
Attachments: image003.png

I appreciate the PRT input and will continue to wait for consensus. FYI, the recommendation from Elhorn was for 1.5 mg/L as total PO4, which was discussed with them in a meeting. I recall their concerns being the poly portion of the blend may be too high and counterproductive above this amount. I wonder if Mike Enlow would provide supporting science for this??

Have other recent proposals been for 100% ortho, as opposed to a blended product? This could explain the different approach.

One more comment, I believe the coupon test to follow would then quantify lead release at different dosages, resulting in the optimal designation by DEQ.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 21, 2019, at 4:47 PM, Thurston, Brian (DEQ) <THURSTONB@michigan.gov> wrote:

As far as I can tell the proposal is for approximately 1.05 ppm PO4 as Orthophosphate to address a city with Pb service lines and known Pb ALE. We have seen through recent sequential service line sampling that the city has a significant Pb issue. In my opinion this proposed treatment is not in line with other recent OCCT proposals of 3.1 ppm as Orthophosphate for a community with known Pb service lines and Pb ALE.

The issue discussed below shows the proposed chemical feed cannot feed the proposed dose at all plant flow conditions. It appears the pump is undersized. This needs to be addressed in the permit. What about a two pump system?

The attached permit submittal does not show how the consultant is planning to reach OCCT. In my opinion, a higher initial dose of Orthophosphate is need to quickly establish a protective film in the Pb service lines. I do not support the proposal as submitted. Maybe additional documentation has been submitted and not included in this permit package that addresses my concerns.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E., Community Water Supply Section Manager (Acting)
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
E-mail: thurstonb@michigan.gov<mailto:thurstonb@michigan.gov>
Direct: (231) 590-3430
Fax (231) 775-4050

Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601
[DEQ] www.michigan.gov/deq<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdeq&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C990b78cb79d24b889af708d698461f2f%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636863824448482290&sdata=whi2XhsSftSkA73UCTrgN1AxN%2FMkfeuzXWnXFFV9ezI%3D&reserved=0>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Sent: Thursday, February 21, 2019 3:14 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I agree with your explanation and have no further concerns. As long as the permit or the AL exceedance communication spells out the WQP monitoring requirements, I think this permit can be issued. I suspect OCCT ranges will be set subsequently once we have monitoring data available after the phosphate has been in use for a while.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Thursday, February 14, 2019 2:20 PM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

Do either of you have any further comments or discussion points on this permit review? I would like to get back with Ernie on this as he is trying to move the project forward.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Onan, Brandon (DEQ)
Sent: Thursday, February 7, 2019 11:38 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

MGD

ppm PO4 total

2

3

5

8

1

4.4

6.7

11.1

17.7

2

8.9

13.3

22.2

35.5

3

13.3

20.0

33.3

53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>

Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.

Can you shine some light on this?

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Tuesday, February 05, 2019 8:34 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater<https://na01.safelinks.protection.outlook.com/?
url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C990b78cb79d24b889af708d698461f2f%7C4d5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636863824448492292&sdata=%2FO%2B1BzxUckJVAYQiCCmLWNDGYvvGNjBh5xPs2R6Ce1o%3D&reserved=0>

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater<https://na01.safelinks.protection.outlook.com/?
url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C990b78cb79d24b889af708d698461f2f%7C4d5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636863824448502306&sdata=DTeQOptUri5Bk%2BdZVD1wQN7kmCDRlyhD5exAgFvJlOk%3D&reserved=0>

<bh phosphate application 1_24_19.pdf>
<image003.png>

From: Mike Enlow
To: Sarkipato, Ernest (EGLE)
Subject: Re: Benton Harbor Phosphate Project Update
Date: Thursday, February 14, 2019 1:13:34 PM

Hi Ernie, Thanks much for the update. I'll make sure Todd coordinates that with you! Mike Enlow, Elhorn Eng Co.

Sent from my Verizon Motorola Smartphone
On Feb 14, 2019 1:01 PM, "Sarkipato, Ernest (DEQ)" <SARKIPATOE@michigan.gov> wrote:

> All – Quick update on things needing follow-up in Benton Harbor:
>
> - Submit order to MMI for meter, controller, and display (2 week lead time, O'Malley will do)
> - Oudbier Instruments Start up (Ron or his son need to come see the plant for a quote)
> - Tap the Suction line? (O'Malley was going to contact DA Dodd or someone local for the tap)
> - Pay Elhorn Engineering? (Mike was going to send you an invoice)
> - A digital read out for flow, pump variable, and scale? (Scale and pump are with Elhorn, Flow readout is with the MMI quoted McCrometer flow meter)
> - The Orthopolyphosphate injector? (comes with Elhorn's setup, dependent on contractor's tapping capabilities, i.e. thread type)
>
> It would be great to have Elhorn and Oudbier onsite at the same time, maybe even with the tapping contractor. Todd (Elhorn) said he might be going down next week. Any days work for everybody to meet? Thursday 2/21 looks good for me.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Municipal Assistance Division
>
> Department of Environmental Quality
>
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Thursday, February 14, 2019 11:47 AM
> **To:** Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** Re: FW: Benton Harbor job
>
> Ii will get Darwin a PR today.

Now, was there other things I need to arrange for a PO for.

- Oudbier Instruments Start up
- Tap the Suction line?
- Pay Elhorn Engineering?
- A digital read out for flow, pump variable, and scale?
- The Orthopolyphosphate injector?

Mike O'Malley

Benton Harbor Water Superintendent

On Thu, Feb 14, 2019 at 10:36 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Can you give me an update on where you are at with moving the phosphate project forward?
>
> ---
>
> **From:** Sarkipato, Ernest (DEQ)
> **Sent:** Tuesday, February 5, 2019 10:19 AM
> **To:** momalley@cityofbentonharbormi.gov; 'DARWIN WATSON' <dwatson@cityofbentonharbormi.gov>
> **Cc:** jmommersmmiinc@gmail.com; 'Ron Oudbier' <ron@oudbierinst.com>; 'Curtis Brzyski' <cbrzyskimmi@msn.com>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net
> **Subject:** FW: Benton Harbor job
>
> Mike: here's a bump on this email quote from Curtis at MMI. All they need is an indication from you to get the meter on order. I spoke with Darwin who understands the need for a more expensive model (accuracy, NSF approval).
>
> Also, they confirmed this would also include the processing unit to send the signal to the Stenner phosphate pump.
>
> Ernie
>
> ---
>
> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
> **Sent:** Monday, February 4, 2019 12:46 PM
> **To:** jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> **Cc:** momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
> **Subject:** Re: Benton Harbor job
>
> Mr. Sarkipato,
>
> Enclosed is the quotation you requested.
>
> The quotation has been addressed to Mr. O'Malley.

Enclosed is an order entry form that will need to be filled out prior to flowmeter production.

If available please send drawings so we can assist with the ideal meter location before tapping the line.

Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.

Once the attached order form is filled out a custom 395L will be built to your specifications.

Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov; Mike OMalley
Subject:	Re: Benton Harbor Phosphate Residuals
Date:	Thursday, June 13, 2019 11:31:01 AM

Ernie,

I have already asked you for help and been denied.

The 2015 Sanitary Survey, the last one to be done with detail. Put the Water Population for the City of Benton Harbor at 9,670 people. All MDEQ population based Monitoring requirements except for Lead and Copper were based upon this population figure! Gary Wozniak reviewed and submitted this complete document to Stewart Beach and Darwin Watson, some time in 2015. It was likely that Stewart had to collect 30 tri-annual samples by September 2015 and neither he or Gary even discussed it, what the heck 30 samples was easier to get than to go back and review the original 1991 Lead and copper legislation.

Jump forward, we collected 30 samples in 2018, best I could do, using more than 1/2 of Stewart's list, he did not do, but had Denny do. Thankfully, Denny knew where the records were and I worked off of them.
Then comes the action level! In the 1st few days of all the excitement with the City, MDEQ, Berrien County, etc.; I started bringing up the fact that starting over meant starting over but at a population of less than 10,000 people, with a sampling requirement of 40. You all put it off and put it off after several attempts to get the issue resolved.

Add a bit of heartbreak to that when the Laboratory and MDEQ Representative Jeni Bolt made over 70 lead and copper samples available to anyone who would like to see them and tear down the Benton Harbor's water system!
(Remember the chorus; "we don't want another Flint")

In what I thought would be the last correspondence email (but it was not) I asked if **I needed to submit a Formal Request to MDEQ to have the population adjusted to where it should be in terms of less than 10,000 people**.
You jumped on that then. And came back stating that our population jumped to 9,970 people and that you and the gang decided that you had the right to insist upon requiring 60 samples.

I closed by stating that what difference would it make if I end up collecting 40 or 60 lead results that if done right are guaranteed to be greater than the 15ppb Action level.
Which I am guessing will bring much much more grief for Benton Harbor.

You all can help me now in 1 way, admit that the Benton Harbor water system serves less than 10,000 customers and should begin again in the Lead and Copper Regulations by collecting 2 rounds of 40 samples in 2019.

You can do this from your desk, I do not need a visit as I have people working for me that are Benton Harbor or Benton Township people and have the best chance to communicate our needs in terms of sampling.

Thank you, (no actually, Sincerely Yours),

Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Jun 13, 2019 at 9:22 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike – Sounds like the 60 lead/copper samples is the biggest challenge right now, in addition to staffing. We'd be willing to provide some assistance in any way possible. Just say the word, I could potentially be there first thing tomorrow morning for a few hours to help. We could make phone calls, organize records, whatever you think; anything in an effort to help the city complete this first round of sampling by June 30.
>
> Ernie
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Thursday, June 13, 2019 9:11 AM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
> **Cc:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** Re: Benton Harbor Phosphate Residuals
>
> I have no time for this.
>
> I almost lost it Since this, the lead, The order. I put off the Lead sampling requirement until recently, now I have to go full speed ahead on finding 60 homes.
>
> I have 4 right now. 100 letters 4 responses. We are going to go door to door next and hope for the best!
>
> I have some help. But with the 3 of them 1 is new to Benton Harbor; and 2 are new to water.
>
> The feed rate and record keeping (I that I have spent 2 months writing).
>
> There was an issue in putting barrels on as the others went down to nothing. It got taken care of, when I got back on Monday.
>
> Heck, Abonmarche is chomping at the bit for ME to tell them what I spent against the Pilot Grant. I am going to use the extention to put that off.
>
> Heck, I haven't even looked back at the Asset Mgt requirements you and that woman have insisted on.
>
> So, you know: The background corrosion coupon rack will not function as you think it will. Like I said you should have thought of that before we started.
>
> If it is important, you will have to send another letter telling me "to get it in the right place,

even if none exists".

The Sheet I created you do not even like. It took me 3 days to re-configure the record keeping while having to write a MOR on time. Denny took a vacation, I really do not know what that is, but he was he was not here to help.

The Bacti page with METER and OPP is the same in May as it was in April. Residuals IN PLANT.

Mike O'Malley

Benton Harbor Water Superintendent.

On Thu, Jun 13, 2019 at 8:45 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mr. O'Malley – some feedback from EGLE folks and a question:
>
> Feedback- There are some days when the dosed phosphate is much lower than the agreed upon target. Eventually, we are going to be setting ranges for acceptable levels, with only 9 excursions allowed in a 6 month period. This will likely include alkalinity, pH, and phosphate. We will be discussing with you in the near future.
>
> Question- Is the last column a distribution sample site or at the water plant?
>
> Ernie
>
> ---
>
> **From:** Sarkipato, Ernest (EGLE)
> **Sent:** Monday, June 10, 2019 8:47 AM
> **To:** momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE) <OnanB@michigan.gov>
> **Cc:** Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov
> **Subject:** Benton Harbor Phosphate Residuals
>
> We are getting some good data from Mike O'Malley on the phosphate residuals in Benton Harbor. Please see Page 6 of the MOR attached. Great job Mike!
>
> For clarity, the last column on the phosphate page is ortho residual. The next-to-last column is the calculated dose, as total phosphate, assuming 33% product strength.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Environmental Health Division
>
> MI Department of Environment, Great Lakes, and Energy
>
> 616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, June 7, 2019 5:24 PM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR May 2019

Please see attached: *MI 0600 Benton Harbor MOR 2019.pdf*

.

Thank you,

Mike O'Malley

Benton Harbor Water Superintendent

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Bolt, Jennifer (EGLE); Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov; Mike OMalley
Subject:	Re: Benton Harbor Phosphate Residuals
Date:	Thursday, June 13, 2019 11:31:02 AM

Ernie,

I have already asked you for help and been denied.

The 2015 Sanitary Survey, the last one to be done with detail. Put the Water Population for the City of Benton Harbor at 9,670 people. All MDEQ population based Monitoring requirements except for Lead and Copper were based upon this population figure! Gary Wozniak reviewed and submitted this complete document to Stewart Beach and Darwin Watson, some time in 2015. It was likely that Stewart had to collect 30 tri-annual samples by September 2015 and neither he or Gary even discussed it, what the heck 30 samples was easier to get than to go back and review the original 1991 Lead and copper legislation.

Jump forward, we collected 30 samples in 2018, best I could do, using more than 1/2 of Stewart's list, he did not do, but had Denny do. Thankfully, Denny knew where the records were and I worked off of them.
Then comes the action level! In the 1st few days of all the excitement with the City, MDEQ, Berrien County, etc.; I started bringing up the fact that starting over meant starting over but at a population of less than 10,000 people, with a sampling requirement of 40. You all put it off and put it off after several attempts to get the issue resolved.

Add a bit of heartbreak to that when the Laboratory and MDEQ Representative Jeni Bolt made over 70 lead and copper samples available to anyone who would like to see them and tear down the Benton Harbor's water system!
(Remember the chorus; "we don't want another Flint")

In what I thought would be the last correspondence email (but it was not) I asked if **I needed to submit a Formal Request to MDEQ to have the population adjusted to where it should be in terms of less than 10,000 people**.
You jumped on that then. And came back stating that our population jumped to 9,970 people and that you and the gang decided that you had the right to insist upon requiring 60 samples.

I closed by stating that what difference would it make if I end up collecting 40 or 60 lead results that if done right are guaranteed to be greater than the 15ppb Action level.
Which I am guessing will bring much much more grief for Benton Harbor.

You all can help me now in 1 way, admit that the Benton Harbor water system serves less than 10,000 customers and should begin again in the Lead and Copper Regulations by collecting 2 rounds of 40 samples in 2019.

You can do this from your desk, I do not need a visit as I have people working for me that are Benton Harbor or Benton Township people and have the best chance to communicate our needs in terms of sampling.

Thank you, (no actually, Sincerely Yours),

Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Jun 13, 2019 at 9:22 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike – Sounds like the 60 lead/copper samples is the biggest challenge right now, in addition to staffing. We'd be willing to provide some assistance in any way possible. Just say the word, I could potentially be there first thing tomorrow morning for a few hours to help. We could make phone calls, organize records, whatever you think; anything in an effort to help the city complete this first round of sampling by June 30.
>
> Ernie
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Thursday, June 13, 2019 9:11 AM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
> **Cc:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** Re: Benton Harbor Phosphate Residuals
>
> I have no time for this.
>
> I almost lost it Since this, the lead, The order. I put off the Lead sampling requirement until recently, now I have to go full speed ahead on finding 60 homes.
>
> I have 4 right now. 100 letters 4 responses. We are going to go door to door next and hope for the best!
>
> I have some help. But with the 3 of them 1 is new to Benton Harbor; and 2 are new to water.
>
> The feed rate and record keeping (I that I have spent 2 months writing).
>
> There was an issue in putting barrels on as the others went down to nothing. It got taken care of, when I got back on Monday.
>
> Heck, Abonmarche is chomping at the bit for ME to tell them what I spent against the Pilot Grant. I am going to use the extention to put that off.
>
> Heck, I haven't even looked back at the Asset Mgt requirements you and that woman have insisted on.
>
> So, you know: The background corrosion coupon rack will not function as you think it will. Like I said you should have thought of that before we started.
>
> If it is important, you will have to send another letter telling me "to get it in the right place,

even if none exists".

The Sheet I created you do not even like. It took me 3 days to re-configure the record keeping while having to write a MOR on time. Denny took a vacation, I really do not know what that is, but he was he was not here to help.

The Bacti page with METER and OPP is the same in May as it was in April. Residuals IN PLANT.

Mike O'Malley

Benton Harbor Water Superintendent.

On Thu, Jun 13, 2019 at 8:45 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mr. O'Malley – some feedback from EGLE folks and a question:
>
> Feedback- There are some days when the dosed phosphate is much lower than the agreed upon target. Eventually, we are going to be setting ranges for acceptable levels, with only 9 excursions allowed in a 6 month period. This will likely include alkalinity, pH, and phosphate. We will be discussing with you in the near future.
>
> Question- Is the last column a distribution sample site or at the water plant?
>
> Ernie
>
> ---
>
> **From:** Sarkipato, Ernest (EGLE)
> **Sent:** Monday, June 10, 2019 8:47 AM
> **To:** momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE) <OnanB@michigan.gov>
> **Cc:** Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov
> **Subject:** Benton Harbor Phosphate Residuals
>
> We are getting some good data from Mike O'Malley on the phosphate residuals in Benton Harbor. Please see Page 6 of the MOR attached. Great job Mike!
>
> For clarity, the last column on the phosphate page is ortho residual. The next-to-last column is the calculated dose, as total phosphate, assuming 33% product strength.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Environmental Health Division
>
> MI Department of Environment, Great Lakes, and Energy
>
> 616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, June 7, 2019 5:24 PM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR May 2019

Please see attached: *MI 0600 Benton Harbor MOR 2019.pdf*

.

Thank you,

Mike O'Malley

Benton Harbor Water Superintendent

From: Laura Drayton
To: Bolt, Jennifer (EGLE)
Cc: Sarkipato, Ernest (EGLE); Sasy, Ninah (EGLE)
Subject: Re: Benton Harbor Update
Date: Thursday, February 4, 2021 4:08:11 PM
Attachments: BH Water Advisory 02.21.pdf

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Thank you, Ernie and Jennifer.

I am attaching the updated document. Please let me know if any additional changes are needed and I'm happy to take care of them.

Have a great evening,
Laura

On Thu, Feb 4, 2021 at 3:15 PM Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov> wrote:

> I can confirm those numbers. Letter will be going out in a few minutes.
>
> ---
>
> **From:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Sent:** Thursday, February 4, 2021 2:23 PM
> **To:** micleanwaterLD@gmail.com
> **Cc:** Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
> **Subject:** RE: Benton Harbor Update
>
> Thanks Laura. I still haven't seen the letter, but wrote these down at a meeting earlier today:
>
> Date: today
>
> 90th Percentile: 24 ppb
>
> Total Sample Sites: 66
>
> Sites above AL: 11
>
> ---
>
> **From:** Laura Drayton <micleanwaterld@gmail.com>
> **Sent:** Thursday, February 4, 2021 1:30 PM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Sasy, Ninah (EGLE) <SasyN@michigan.gov>
> **Subject:** Benton Harbor Update
>
> [redacted]

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Good afternoon Ernie,

Just sending a quick email to see if you received the final information to include for the Benton Harbor Public Advisory document. We still need:

1. The date
2. The final 90th percentile
3. The total number of sites samples and the number of sites with elevated results

I know you mentioned that you're unaware of a list serv - we can just pull that information out for now, unless there's someone else that might know.

Thank you!

Laura

--

Laura Drayton, MPH

Clean Water Project Coordinator

Office of the Clean Water Public Advocate

Cell: 989-708-1664

Michigan.gov/CleanWater

Public Advisory for Drinking Water Customers in the City of Benton Harbor

On February 4, 2021, Benton Harbor found that more than 10% of water samples recently gathered in 66 residencies exceeded the Action Level of 15 parts per billion (ppb) for lead, resulting in Benton Harbor's fifth Action Level Exceedance (ALE). The 90th percentile for these samples was 24 ppb for lead, with 11 of 66 samples having lead samples in excess of 15ppb. There are many homes in Benton Harbor that have lead service lines, the pipes that deliver water to your home; as a result, the ALE will continue until lead sampling shows less lead so that less than 10% of the samples are above the Action Level.

LOOKING TO THE FUTURE AND KEY NEXT STEPS

The **Benton Harbor Water Outreach Task Force** will provide regular updates about lead outreach efforts and lead service lines. Members of the Task Force will include a representative from the Benton Harbor Community Water Council, the City of Benton Harbor, Berrien County Health Department, Andrews University, Freshwater Future, and the Benton Spirit Community Newspaper, along with the Office of the Clean Water Public Advocate, Michigan Department of Environment, Great Lakes, and Energy, and the Michigan Department of Health and Human Services. Additional community partners will be added to help support the work of the Task Force.

In October 2020, the U.S. Environmental Protection Agency (EPA) awarded the City of Benton Harbor a **$5.6 million grant.** This funding along with additional state grants and loans will help remove lead service lines and support a study to improve the city's lead corrosion control treatment to protect public health in Benton Harbor. Residents will see this work take place throughout the City in the coming years, starting in 2021.

Looking for more information? Visit https://bhcity.us/water/ for an overview of the history of the City of Benton Harbor's water system and current efforts to reduce lead in drinking water. For more information about the risks of lead, visit Michigan.gov/MILeadSafe. These articles were published in the Benton Spirit Community Newspaper and also summarized below:

THE PROBLEM: Benton Harbor's water distribution system, which are the pipes that help deliver water to your home, is about 100 years old. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents.

HOW TO PROTECT YOUR FAMILY: Obtain a lead reducing filter and maintain it by regularly cleaning and changing the cartridge. Berrien County Health Department provides free water filters and replacement cartridges to City of Benton Harbor residents. For help with getting a free water filter, go to: ***berriencounty.org/1599/City-of-Benton-Harbor***

FIXING THE PROBLEM: The City has begun replacing lead service lines. Because removal of all lead service lines is going to take some time, the city has also installed corrosion control treatment to help reduce the amount of corrosivity of the water, which will reduce lead levels.

If you are interested in helping to support the Task Force, contact EGLE-CleanWater@Michigan.gov.
For more information about resources and upcoming events, visit https://bhcity.us/water/.

Last updated 02/04/2021

BENTON HARBOR
Port of Opportunities

From: Sarkipato, Ernest (EGLE)
To: Bolf, Michael (EGLE); Bolt, Jennifer (EGLE); Thurston, Brian (EGLE)
Subject: benton harbor verbiage
Date: Friday, April 26, 2019 7:47:59 AM

It helps me to put this stuff down in writing. Please add/comment per our discussion, so I can send these talking points to the City and document in the file.

_____

-The DEQ's previous population determination followed our policy, by relying upon the most recent census count with a known adjustments. It will remain at 9970, until the 2020 census data becomes available or some other reliable method of population counting.
-This population is very close to the 10,000 breakpoint for sampling, which affects the number of lead and copper samples required among other things.
-This number is an *estimate* of the number of residents of Benton Harbor. There is practically speaking no way to know the exact number of residents in Benton Harbor without a real-time head count, which is not possible. We have to be realistic about the error involved in *estimating* population.
-Since the population was established in 2011, the city has remained on a sample schedule for lead and copper for systems in the 10,000-100,000 population bracket.
-The actual size of the distribution system has not changed. The nature of the population of Benton Harbor is somewhat transient, and consists of a number of rentals and multi-family units. In addition, there are certainly a number of vacant or abandoned residences as well.
-The city is currently working on addressing lead in the drinking water and has identified this as a major issue in protecting public health.
For the above reasons the DEQ is asking the city to conduct "full monitoring" for lead and copper, being two 6-month rounds of 60 samples. This is technically above their designated population of 9970, and allowed by Rule 732 of the Safe Drinking Water Act. This monitoring is most protective of public health. Future changes in population estimates may result in a reduction of this requirement.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment Great Lakes and Energy
616-307-0261 mobile
www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Chris J Cook
Cc:	Bolf, Michael (EGLE); emitchell@bhcity.us; rjones@fv-operations.com; drice@bhcity.us; Lesia Osler
Subject:	corrosion plan requirements
Date:	Tuesday, February 23, 2021 4:39:00 PM
Attachments:	image001.png 00600_BH_OCCT RFP_DRAFT.docx

Hi Chris,

Attached is a draft language for an RFP for the corrosion study, which remains fairly non-prescriptive with respect to methods used to study the corrosion treatment.

Some detailed tools and methods for studying the corrosion are listed below, based on EGLE discussion. **If you think you'd like to add these in, please take a stab and circle back for a final approval from EGLE:**

- Verify the distribution system materials. Update if necessary, in order to accurately analyze existing lead data.
- Statistical analysis of historic Pb/Cu data (i.e. look at subsequent samples from the same sample sites).
- Analysis of distribution system pipe scales on various materials
- Gather a broad data set on distribution and plant tap WQPs
    - Focus on PO4 dose and distribution concentration variability
    - Focus on Cl dose and residual variability
    - Focus on pH
- Solubility tests
- Pipe loops
- Comparison of nearby water system water quality. What can we learn from neighboring conventional plants with similar source, treatment, and DSMs?
- Evaluate single family home water use trends. This is a bit out of the box, but could be a significant contributor to high lead numbers.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
616-307-0261
www.Michigan.gov/communitywater

ROUGH DRAFT RFP FOR CORROSION STUDY IN BENTON HARBOR

Background and Purpose

The city of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant, which was installed in March of 2019 in response to an Action Level Exceedance for lead the previous October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at EGLE concluded the treatment was not achieving desired results in an expeditious manner based on review of distribution sampling for lead. The City was directed to change corrosion inhibitor chemicals, to a blended phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place starting February 21, 2020.

The current treatment goal was set by the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) and is based on experience in analogous water systems. However, without further study it is not certain to be the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

Qualifications

The submitted proposal must demonstrate the contractor's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water.

Scope of Work

The selected proposal will focus on determining the optimum corrosion control treatment. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor.

Attachments

Submit supporting documentation with the proposal to demonstrate corrosion study experience as it relates to specifically to drinking water, including references from previous studies. In addition, submit a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

From:	Sarkipato, Ernest (EGLE)
To:	Chris J Cook
Cc:	Bolf, Michael (EGLE); emitchell@bhcity.us; rjones@fv-operations.com; drice@bhcity.us; Lesia Osler
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From: Sarkipato, Ernest (EGLE)
To: Chris J Cook
Subject: corrosion study
Date: Thursday, February 4, 2021 12:01:00 PM
Attachments: image001.png

Hi Chris – do you have a template or example document that we could use to work with the city to get a RFQ/RFP going for a new corrosion study? I think that is the best way to get a work plan going for you.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
616-307-0261
www.Michigan.gov/communitywater

From:	Sarkipato, Ernest (DEQ)
To:	momalley@cityofbentonharbormi.gov
Subject:	documents for permit application
Date:	Thursday, January 24, 2019 3:41:04 PM
Attachments:	Design Calcs.xlsx stenner s pump catalog.pdf Carus 8600 Data Sheet.pdf Carus 8600 SDS.pdf Benton Harbor MI Oct30.pdf benton harbor 11-18.doc XT400-600.pdf corpstopNEW.pdf S-Series-Sales-Brochure (2).pdf 1218DEQEX250.pdf

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Here's a list of all the documents we've generated through the last few months of talking about the phosphate project.

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4	lbs/gal
Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	6.33	9.50	15.84	25.34
	2 mg/L as PO4	12.67	19.00	31.67	50.67
	3 mg/L as PO4	19.00	28.50	47.51	76.01

Goal: 1.5 mg/L as PO4 throughout distribution system

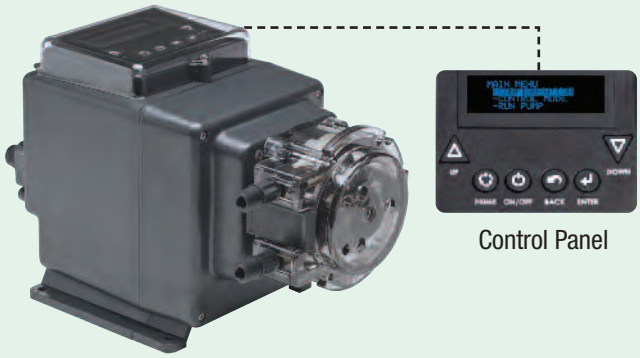
Low End: 9.3 gpd Assuming no demand, which is
High end: 37.5 gpd not realistic

Day Tank Use

Gal Chem per day	10	40
# days per tank	5.5	1.38

S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

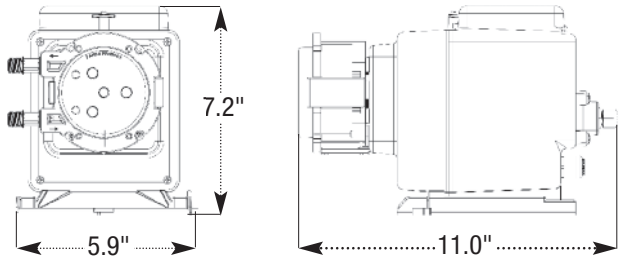
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

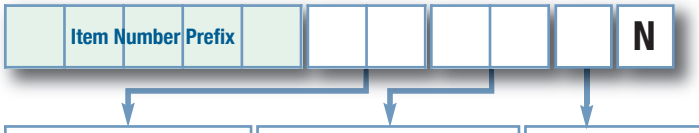
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

SAFETY DATA SHEET

1. Identification

Product identifier	**CARUS™ 8600 Water Treatment Chemical**
Other means of identification	
SDS number	-
Recommended use	CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company name	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixtures	
Composition comments	The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling	Avoid inhalation and contact with skin and eyes. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate.
Individual protection measures, such as personal protective equipment	
Eye/face protection	If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.

Form	Liquid.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	5.8±0.5
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1.37±0.03 at 25°C
Solubility(ies)	
Solubility (water)	Completely soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization will not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	May cause discomfort if swallowed.
Inhalation	In high concentrations, vapors may be irritating to the respiratory system.
Skin contact	Prolonged or repeated skin contact may cause irritation.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	May cause discomfort if swallowed.
Skin corrosion/irritation	Prolonged contact may cause dryness of the skin.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization No data available.

Skin sensitization Not a skin sensitizer.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity No data available.

Specific target organ toxicity - single exposure No data available.

Specific target organ toxicity - repeated exposure No data available.

Aspiration hazard Not classified.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability The product is not expected to be readily biodegradable.

Bioaccumulative potential No data available for this product.

Mobility in soil Not available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This substance/mixture is not intended to be transported in bulk.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 24-July-2014

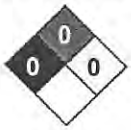
Revision date -

Version # 01

HMIS® ratings

Health: 0
Flammability: 0
Physical hazard: 0

NFPA ratings



References

HSDB® - Hazardous Substances Data Bank

Disclaimer

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CORPORATION DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CORPORATION MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTIABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Corporation, and shall be the sole responsibility of the holder or user of the product.

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

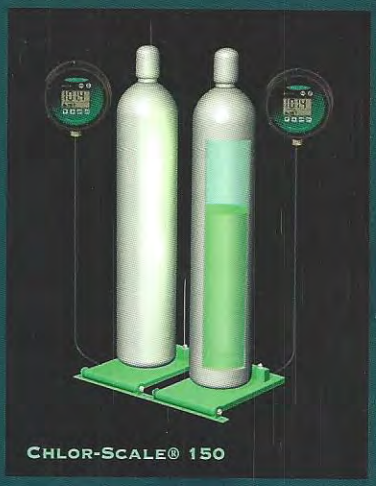
Sincerely,

Mike Enlow
Elhorn Engineering Company

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

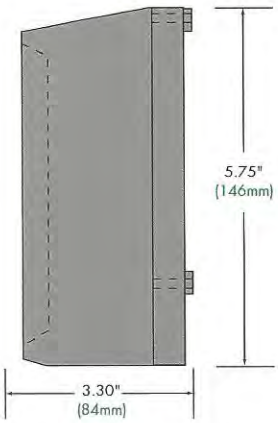
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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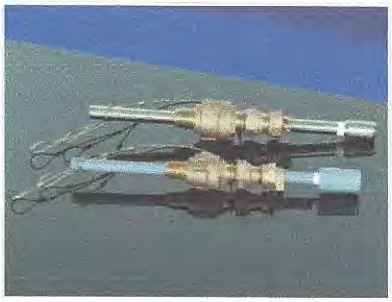
Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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PROPOSAL

FOR: DEQ
onanb@mich.gov

ATTN: Brandon Onan - 616-307-6736
REF:

Please make Purchase Orders out to the below, thank you.
MMI, INC.

QUOTE NO: 1118DEQEQ250
REGION: B.R. - .6X
DATE: 12/3/2018
TERMS: 100% Net 30 Days
F.O.B.: Factory
VALIDITY: 90 Days
DELIVERY: 5 Weeks ARO
2592.838/2058

ITEM	MODEL	DESCRIPTION	QTY	UNIT PRICE	TOTAL COST
1.1	EX250-S-08-15	**Hot Tap - Adjustable Dept. Insertion Mag Meter - 36"**	1	$ 2,675.00	$ 2,675.00
		316 SSTL, 10"-48", (**Sensor Only**)			
		Valve Assembly, 316 SS	1		
		Reverse Flow			
1.2	FT440W-139	**WALL DISPLAY**	1		$ -
		12-24 Vdc, Loop Power, Dual Scaled Pulse Output			
		& 4-20 mA Outputs			
		120 VAC - Built in Dual Power	1		
		Tags: FE/FIT: **Advise**			
		TOTAL			$ 2,675.00

We are pleased to offer this proposal for furnishing and delivering the above referenced product. Equipment is specifically listed, items required but not listed are to be furnished by others.

Freight and Handling Charges and Taxes
o Prepay and add freight charges - the amount charged will include all freight and handling expenses
o Taxes Excluded and are the responsibility of the buyer

James L. Mommers Midwest Municipal Instrumentation, Inc.

Midwest Municipal Instrumentation Inc.
4391 Bonnymede Ct
Jackson, MI 49201

Providing: Seametrics
Your helping hand in all your Municipal Water & Wastewater Needs

Telephone: 517-764-4736
Fax: 517-764-4739
Cell: 517-250-1650
E-mail: jmommersmmi@msn.com
http://www.midwestmunicipalinstr.com

Per Factory Terms & Conditions - see website
http://www2.emersonprocess.com;

From:	Onan, Brandon (EGLE)
To:	Jason Marquardt
Cc:	Sarkipato, Ernest (EGLE)
Subject:	RE: BH Corrosion Study Proposals
Date:	Tuesday, June 8, 2021 7:41:04 AM
Attachments:	Benton Harbor 2021-06-01 CCT_RFP_Score Sheet.xlsx image001.png image002.png image003.png image004.png image005.png

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Here is my scoring sheet. Sorry for the delay in getting it back to you.

Thanks!

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Friday, May 14, 2021 8:59 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Robert Jones (rjones@fv-operations.com) <rjones@fv-operations.com>; Darold L. Harlan (dharlan@fv-operations.com) <dharlan@fv-operations.com>; Darel Rice (drice@bhcity.us) <drice@bhcity.us>
Cc: Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>; Roena Rice (rrice@bhcity.us) <rrice@bhcity.us>; dmeeks@bhcity.us; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: BH Corrosion Study Proposals

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Ernie/All,

For now, here are the scanned proposals for future discussion.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, May 14, 2021 8:02 AM

To: Jason Marquardt <jmarquardt@abonmarche.com>; Robert Jones (rjones@fv-operations.com) <rjones@fv-operations.com>; Darold L. Harlan (dharlan@fv-operations.com) <dharlan@fv-operations.com>; Darel Rice (drice@bhcity.us) <drice@bhcity.us>
Cc: Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>; Roena Rice (rrice@bhcity.us) <rrice@bhcity.us>; dmeeks@bhcity.us; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: BH Corrosion Study Proposals

Thanks Jason! Looking forward to the discussion. So far, here are times that appear good on our end. Having the proposals ahead of the meeting would definitely be helpful.

Wed 5/19, 1PM or 2PM
Fri 5/21, 10AM or 11AM

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Thursday, May 13, 2021 3:08 PM
To: Robert Jones (rjones@fv-operations.com) <rjones@fv-operations.com>; Darold L. Harlan (dharlan@fv-operations.com) <dharlan@fv-operations.com>; Darel Rice (drice@bhcity.us) <drice@bhcity.us>
Cc: Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>; Roena Rice (rrice@bhcity.us) <rrice@bhcity.us>; dmeeks@bhcity.us; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: BH Corrosion Study Proposals

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All,

Letting everyone know that the City received three (3) proposals for the corrosion study. There have been received from:

1. Cornwell Engineering
2. Metro Consulting Associates
3. Black & Veatch

We'll need to formulate a group to review them and was thinking discussing next week. If you have any thoughts, or want a copy of the proposal immediately, I will scan and provide.

Also – My email account has was hacked earlier today. Please double check emails from me as they may have a different email associated on and SPAM. I've changed my email password, so I'm hoping it is limited.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager

D 269.926.4565
O 269.927.2295 ext. 171
C 269.876.9304
abonmarche.com

ABONMARCHE

ACEC
American Council of Engineering Companies of Michigan

"2021 Firm of the Year"

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SCORE SHEET

This score sheet will be used to score proposals. This is not to be used for low bid.

SELECTION CRITERIA	VENDOR NAME: **Metro Consulting Associates** ☐ Vendor does not appear to have any conflicts of interest concerning this service.	SCORING TOTAL POSSIBLE	 SCORE
Qualifications of Firm. Provide organization chart, if required. Provide description of Firm's history with similar clients/municipalities. For each sub vendor, describe role in service and include what percent of the named role that the sub vendor is expected to provide.	COMMENTS: MCA has done some very good work with other communities that have similar issues to Benton Harbor. The proposal however does not fully articulate a reasonable corrosion control study, in terms of treatment, in order to produce findings that can directly correlate with plant operation. Some of MCAs suggestions for geospatial data mapping are good suggestions and can target problematic areas but do not lead to data that directly informs the current treatment strategy. As a whole, the industry knowledge and research is trending away from the use of CaCO3 as a viable corrosion control treatment strategy.	40	20
Qualifications of Staff. Describe the structure of the project team including the roles of all key personnel. Provide resumes for each of the key staff of the prime and sub vendors.	COMMENTS: MCA has very accomplished technical staff but has not demonstrated their qualifications align with the needs of this project.	10	5
Project Understanding. Describe understanding of the service, innovations, and/or safety program intended to be proposed. This information is to be based on the scope of services.	COMMENTS: MCA seems to have a very good understanding of the community and I believe understands the state of the city and some of the items that they could bring to the table to help the city immensely. However, the majority of their experience listed and what they could help the city with is not the primary focus of this RFP.	50	40
	COMMENTS:	100	65
REVIEWER:	Brandon Onan, EGLE	**DATE:**	6/2/2021

From:	Sarkipato, Ernest (EGLE)
To:	Jason Marquardt
Cc:	Chris Cook; Ellis Mitchell (emitchell@bhcity.us)
Subject:	RE: BH Corrosion Study
Date:	Thursday, March 11, 2021 1:53:00 PM
Attachments:	image001.png image002.png image003.png image004.png 2021-03-09 BH Corrosion RFP_onan comments_sark response.docx

Please see attached. I realize it's been over a week, so we can discuss our proposed changes to the RFP.

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 3, 2021 3:47 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

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Ernie,

Please find attached, a draft version of the Corrosion Study RFP. I had a few additional comments listed below.

1. I see that "Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended" is referenced. Are there any other guidelines that you know of from EPA or EGLE that provides any further guidance on the study format or project deliverables? The study requirements are detailed the scope of work, but was curious if we should specially list what the expectation of the report deliverable should be. I found an older recommendation from the EPA (attached) , but am not certain if it should be referenced and required to be in full compliance with the consultant, or if it contradicts EGLE requirements.
2. Can you think of anything to include with the RFP to potential consultants as an attachment that may be useful?

Any other comments you may have, please let me know. I'll continue on it, so if I make any revisions, I'll highlight them for your review. I'll start to also work to get final bid opening dates, etc. with the City.

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565

C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, February 25, 2021 10:36 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: RE: BH Corrosion Study

Jason,

Our approach would probably be to allow the qualified consultant to propose the timeline, as it will depend on what methodologies they are proposing. If we give a bookend of 12 months, that will likely constrain their options. Can we extend that out to at least 18 months, but also indicate periodic check-ins?

Ernie

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, February 24, 2021 1:27 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>
Subject: BH Corrosion Study

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Ernie,

What would be a realistic timeframe to expect this type of corrosion study to be completed? Does it tie into any requirements from EGLE to the city in terms of hard deadlines? We had mentioned 12 months on the EPA application (expected to be completed by March 2022), which was on our EPA application from the fall.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager

D 269.926.4565
O 269.927.2295 ext. 171
C 269.876.9304
abonmarche.com

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City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

DRAFT
City of Benton Harbor
Request for Proposal

Project Name: Benton Harbor Corrosion Optimization Study

Date: March 3, 2021

Proposals Due: March TBD

The City of Benton Harbor (the "City") is accepting engineering proposals for a corrosion study to determine the optimum corrosion control treatment. This study is expected to be substantially completed within 18 months upon City award. The successful consultant will be required to provide study updates every two (2) months during the duration of the project.

Project Background and Purpose:

The City of Benton Harbor currently employs a corrosion inhibitor chemical at the water treatment plant. The chemical addition commenced in March of 2019 in response to an Action Level Exceedance for lead reported in October of 2018. Initially, the City elected to utilize a blended phosphate chemical treatment, comprised of 70% orthophosphate and 30% polyphosphate, citing 'nuisance metals' in the water supply such as iron, manganese, calcium, and magnesium. The initial target application rate was agreed to be 1.5 mg/L orthophosphate.

During January of 2020, staff at the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) concluded that the treatment process was not achieving desired results in an expeditious manner based on review of distribution system sampling for lead. The City was directed to change corrosion inhibitor chemicals to a phosphate comprised of 90% orthophosphate / 10% polyphosphate blend, with a treatment goal of 3 mg/L orthophosphate (as phosphate) in the distribution system. This treatment change was promptly made and has been in place since February 21, 2020.

The current treatment goal was set by EGLE and is based on experience in analogous water systems. However, further study is required to identify the optimum treatment strategy. The City has therefore been directed by EGLE to contract with a third-party consultant to conduct a corrosion control study following the requirements of Rule 325.10604f(3)(c) of the Michigan Safe Drinking Water Act, 1994 PA 399, as amended.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

Qualifications:

The submitted proposal must demonstrate the consultant's experience in completing a variety of corrosion optimization studies, referenced below in the scope of work. The contractor must demonstrate a familiarity with guidance from the US Environmental Protection Agency, as well as knowledge of the currently acceptable practices for studying corrosion rates in drinking water. The proposal shall include supporting documentation to demonstrate corrosion study experience as it relates specifically to drinking water, including references from previous studies. In addition, include a proposed timeline for the study scope, and a list of personnel involved with relevant experience.

Scope of Work:

The selected proposal will focus on determining the optimum corrosion control treatment process. This will be accomplished through demonstrative studies. Demonstrative studies for the purposes of this RFP are defined as physical activities such as solubility tests, scale analyses, pipe loops, etc. While the demonstrative studies may include some desktop study work, the primary focus is on field analysis of various corrosion control treatments, to include a study of optimum dose rate. The methods proposed will be commensurate with the particulars of the water system in Benton Harbor. In addition, the following items shall be described and addressed in the Corrosion Study report to be provided to the City upon completion.

1. Confirm and reference distribution system materials that impact the Corrosion Study findings in order to analyze existing lead data. The City has completed a partial distribution system materials inventory (DSMI) and will be completing further investigations concurrently during this study. The selected consultant will be provided updates to the DSMI for reference in the final study.
2. Statistical analysis of historic Lead/Copper (Pb/Cu) data (this will require an assessment of previous sample site codes to allow for data comparison)
3. Analyze key water quality parameters (WQPs):
    a. Phosphate (PO_4) dose and distribution concentration variability
    b. Chlorine (Cl) dose and residual variability
    c. pH and impacts on corrosion indices
4. Analysis of distribution system pipe scales on various materials
5. Solubility tests for a comparative study of treatment methods
6. Pipe loop testing and the effectiveness of corrosion treatment
7. Comparison with analogous water system water quality and corrosion control strategies
8. Evaluate single family home water use trends

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Anticipated Schedule:

The City anticipates the project proceeding according to the schedule below:

Engineering Proposals due – March TBD
Consultant Award – April 2021
Kickoff with City and EGLE staff – April 2021
Bi-monthly progress updates – June 2021 through December 2022
Corrosion Study and Recommendations Due – December 31, 2022

Note: some study components, such as a pipe loop if included, will likely remain in place for the city's use and continue to provide useful optimization data after this due date. In this case, the report should include recommendations on continued utilization of these components.

Terms and Conditions of this RFP:

1. Proposals must be submitted by 10:00 am on March TBD. Proposals received after that time will not be opened or considered. This is not a sealed bid public opening.

2. Proposals must be mailed or emailed to:

   Kimberly Thompson
   City of Benton Harbor
   200 E. Wall Street
   Benton Harbor, MI 49022
   Email: kthompson@bhcity.us

3. The City Reserves the Right to accept or reject any or all proposals and award the contract in the best interest of the City.

4. Proposals, once opened, become public documents and may be subject to disclosure under the Freedom of Information Act.

5. If the Firm is not proposing exactly to the specifications, terms and conditions of this RFP, the Firm shall supply a separate page labeled, "Exceptions, Omissions and/or Recommendations with information describing the non-compliant items.

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

6. Rates quoted must remain open to acceptance by the City for 90 days after the due date of the proposals.

Proposal Form

I/we offer professional consulting services in accordance with the specifications, terms and conditions of the City of Benton Harbor for the Corrosion Optimization Study on a lump sum basis:

Corrosion Optimization Study Lump Sum Fee $_____

Submitted by:

Firm: _____

Address: _____

Telephone: _____ Email: _____

Signed by: _____
Printed Name

Title: _____

Signature: _____ Date: _____

Accepted by the City of Benton Harbor:

Name: _____
Printed Name

Title: City Clerk

Signature: _____ Date: _____

City of Benton Harbor
200 E Wall Street
Benton Harbor, MI 49022
Phone: (269) 927-8400

City Commission Approval Date: _____

The City of Benton Harbor is an equal opportunity provider.

From:	Onan, Brandon (EGLE)
To:	Bolt, Jennifer (EGLE); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE)
Subject:	RE: BH Q&A
Date:	Tuesday, May 26, 2020 10:55:24 AM
Attachments:	Suggested Ed Topics Benton Harbor-MBJB_BMO comments.docx

I added on to Mike's and Jeni's with my edits/comments tracked.

Let me know if you have questions.

Thanks,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Sent: Thursday, May 21, 2020 5:00 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: BH Q&A

I worked off of Mike's copy.

Jeni Bolt
Environmental Quality Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
517-331-5161 | boltj@Michigan.gov
Michigan.gov/LCR | **Michigan.gov/drinkingwater**

Follow Us | **Michigan.gov/EGLE**

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Thursday, May 21, 2020 2:24 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>

Subject: RE: BH Q&A

Ernie,

A few suggestions…

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, May 21, 2020 12:24 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: BH Q&A

Attached is a draft Q&A. The questions were submitted by freshwater future, and DHHS will be providing input initially.

Suggested Topics Benton Harbor
Question and Answer Educational Info Regarding Lead

- When was it discovered that there ~~is~~ was a problem with high lead levels in tap water in Benton Harbor?
  In 2018 *the city performed routine monitoring for lead and copper by sampling at homes connected to the Benton Harbor Water Supply. These samples were analyzed and the 90th percentile exceeded the Action Level for lead. The samples collected in previous rounds did not have the same elevated results.* ~~*, a regular sampling for lead showed higher levels of lead than in previous sampling events. This caused an action level exceedance of Michigan's Lead and Copper Rule.*~~

- What actions have been taken since the city learned of the lead issue in tap water?
  Many efforts are underway to measure and minimize ~~***the***~~ ***corrosion****. The first action that was taken was to tell the residents of the city of Benton Harbor that there were elevated levels of lead in the drinking water and how to protect themselves by properly running their water, and or, by obtaining a lead reducing water filter. Water filters have been available to residents at the Berrien County Health Department since the initial Action Level Exceedance for lead in 2018.*
  The City has also begun replacing lead service lines. This is an important step because the best way to reduce lead levels is by removing the sources of lead in the system. Because removal of all lead service lines is going to take quite some time, the city has also installed corrosion control treatment to help reduce the amount of corrosivity of the water, which in turn will reduce lead levels.
  Lastly, the City has increased the monitoring of lead and copper. The City is now sampling twice as many homes as they were previously, and they are sampling those homes more often (every 6 months instead of every 3 years). This sampling is done so that everyone knows the levels of lead and copper in the system, and to show when the corrosion control treatment has become effective in lowering the levels of lead. ~~*, including an increase sampling for lead and copper and water quality parameters (other indicators of corrosion). The biggest benefit should be from the installation of corrosion control treatment, which began in March of 2019. While the treatment takes time to work, we will continue to sample for lead and copper inside sixty homes ofwithin the city. In addition, we are planning to identify and begin removing lead service lines each year.*~~

  (insert section on filters)

- Since there is no lead in the water that comes from Lake Michigan or in the water as it leaves the water treatment plant, how does lead get into the water?

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Commented [MB1]: Sampling efforts have been expanded to include more homes.

Commented [OB(2]: I inserted some text about filters above but it can surely be expanded on.

Drinking water is free of lead until it is in contact with lead containing materials, such as lead service lines. Then as it sits in contact with lead containing materials the lead begins to be dissolved into the water. The longer that water sits motionless and in contact with lead containing materials the more lead it can "pick up". Most of the lead containing materials that can be in contact with drinking water are found in the service line (the water line coming from the water main in the street into your home) or within your home in the form of pipes, solder, or brass. This means that how you use water in your home effects the amount of lead that will be in your drinking water. The more often you use your water and the more water that you use, then the lower your lead levels in your drinking water will be. The two key times to make sure that you run your water before drinking it or using it to prepare food are right after you wake up and right after you come home from being gone all day (the times when no one has been using the water). After these time periods run your water to bring in fresh water from the street's water main and remove the water that has lead in it, or make sure to use a filter certified to reduce lead. Some ways to run your water but not waste it are to take a bath or shower, wash dishes, wash clothes, water your yard, or any other use of the water that is not for consumption.

~~*As water flows from the treatment plant to your tap, it can "pick up" lead along the way in various places. The most likely places water is in contact with lead to contain lead areis in the service line, and inside your home pluming and faucets, if they contain lead. Slower flowingNot using (or stagnant) water (stagnation) tends to make this worse, so flushing your water lines often is a good idea to reduce lead. If you have not used your water in more that six hours, like overnight or if you've been gone from the house, it is important to run your water for at least five minutes before using any of it for drinking or cooking.*~~

Residents that have been provided a lead-reducing filter should continue to use filtered water for drinking, cooking, preparing baby formula and washing fruits and vegetables. Maintain the filters according to the manufacturer's recommendations.

- What remains to be done in order to bring the water back into compliance with the state and federal laws that govern lead in tap water?

Compliance with the lead and copper rule is based on collecting samples from the proper number of homes, reporting the results to the residents of those homes, and reporting the results to the state. The city of Benton Harbor will no longer have an action level exceedance for lead when the City's 90th percentile for lead is below the action level of 15 parts per billion, for two back to back six month rounds of sampling. The city is also required to maintain its corrosion control treatment and to conduct a study of that corrosion control treatment to identify if the installed treatment could work more effectively if adjusted.

~~*Compliance is based on sample results, and re-assessed with each new set of data calculated every 6 months. When a 6 month sample round calculation shows levels of lead and copper*~~

Commented [MB3]: Should also mention LSL replacement requirements to remain in compliance

Commented [OB(4R3]: BH does not have a replacement requirement due to the ALE because they are not an optimized corrosion control treatment facility. Their LSLR activities have been voluntary so far. That will change in 2021 when the 5% on average requirement kicks in or when they are designated as having OCCT, which cannot happen until after they are no longer exceeding the action levels.

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~~*that drop below the action level (based on the 90th percentile), the city's water supply will return to compliance.*~~

~~*The city must also plan on maintaining and studying it's corrosion treatment, to make sure it is the best treatment possible. This will include lots of sampling of water quality beyond just lead. For example, phosphate levels will need to be kept within a certain range for compliance.*~~

~~*The city will begin replacing service lines in 2021 to further reduce residents exposure to lead.*~~

Commented [OB(5]: This is not true. The regs say "optimized" but remember that optimized only means…under the action levels.

- Can I have my water tested for lead? If so, how?

The city ~~is interested~~would like to include your home in their lead and copper sampling program, but only if you have a lead service line. To find out more, call the City at xxx-xxx-xxxx.

If you are ~~interested in non-compliance sampling~~not eligible for sampling under the city's compliance program, but would still like to have you home tested, you may wish to reach out to the Berrien County Health Department to explore sampling options. ~~-or-~~You can also contact any laboratory that is state certified ~~verified~~ for the analysis of lead and copper ~~analysis~~. ~~-~~A list of certified labs is available at www.michigan.gov/EGLElab.~~.~~

- What can I do as a resident to ensure my tap water is safe? (filters, maintenance info)

(DHHS/BCHD Flushing)

(DHHS/BCHD insert filter language here)

From:	Oswald, Eric (DEQ)
To:	Lachance, Amy (DEQ)
Cc:	Sarkipato, Ernest (DEQ); Onan, Brandon (DEQ); Bolf, Michael (DEQ); Bolt, Jennifer (DEQ); Krisztian, George (DEQ); Thurston, Brian (DEQ)
Subject:	RE: BH Regulatory Status Update
Date:	Wednesday, January 23, 2019 5:04:47 PM
Attachments:	Compliance Status - BH (003).docx

Jeni noticed an error, eight of the original sample were over 15 – corrected in this copy.

Eric

From: Oswald, Eric (DEQ)
Sent: Wednesday, January 23, 2019 4:45 PM
To: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: RE: BH Regulatory Status Update

Attached is the final approved version (2 minor changes). Thanks for the quick work on this.

Eric

From: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Sent: Wednesday, January 23, 2019 4:03 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: BH Regulatory Status Update

Eric – per Aaron's request, see attached (from Ernie with a couple of edits). Chelsea and Travis may want this as well.

Action Level Exceedance (ALE) for Lead

Benton Harbor's 2018 lead and copper monitoring resulted in a lead ALE, declared in October 2018. Of the 30 residential lead samples taken, eight were over the current lead action level of 15 parts per billion (ppb). This resulted in a lead 90th percentile value of 22 ppb. The city has conducted public advisories and education as required by Act 399. They have offered free sampling to residents, and have to date received 335 sample results for lead and copper. So far, 54 are above the action level of 15 ppb for lead (no elevated copper levels).

A number of actions have been taken to investigate the increase in lead levels in the city, but no specific causes have been identified. Benton Harbor has no previous action level exceedance on record, does not currently add a corrosion inhibitor, and according to operational records has not experienced changes in source water or treatment.

The DEQ has also been working with the City and Elhorn Engineering to begin design and permitting of a phosphate corrosion inhibitor system to help build a passivation layer in the system.

Best Case Timeline: Phosphate system installed 2/15/19; passivation layer improved 5/15/19; ALE lifted 6/30/20; system optimized for corrosion control 12/31/20.

Worst Case Timeline: Phosphate system installed 5/1/19; passivation improved 8/1/19; ALE lifted 12/31/20; system optimized for corrosion control 7/1/21.

Significant Deficiencies and Administrative Consent Order (ACO)

Separately from the lead ALE concerns described above, the DEQ has been working with the city since the summer of 2018 to conduct a sanitary survey, and address concerns found in the survey (significant deficiencies). We have proposed a draft ACO to allow for a corrective action schedule, which the city has verbally agreed to ***but not yet signed***. Our deadline for approval is 1/31/19. A non-inclusive list of significant deficiencies for correction follows:

-Move chemical feed point to proper location (design underway)

-Conduct a Rate Study, and streamline the Rate Collection Process

-Install metering capabilities on the finished water (design underway)

-Obtain adequate staffing levels at the water plant and distribution system

-Update cross connection program, consider hiring contractor for inspections/testing

-Install functioning chlorine analyzer at water plant

Next Steps (Regulatory Deadlines)

By January 31, 2019: enter into ACO for an alternative compliance schedule to significant deficiencies

By March 31, 2019: collect lead and copper sample from the entry point to distribution system

By March 31, 2019: submit a proposal for optimal corrosion control treatment or a corrosion control study.

2018 Violations

The city also accrued a number of violations of Act 399 in the 2018 calendar year, which are detailed on the attached Compliance History timeline.

From:	Krisztian, George (DEQ)
To:	Oswald, Eric (DEQ)
Cc:	Lachance, Amy (DEQ)
Subject:	RE: BH Regulatory Status Update
Date:	Thursday, January 24, 2019 8:21:32 AM
Attachments:	Compliance Status - BH (003).docx
Importance:	High

Once this gets approved by Aaron and Liesl I would like to share it with Tiffany. I have already given her a briefing this morning. Please let me know when I can do so.

George

George L. Krisztian
Assistant Director, Drinking Water and Municipal Assistance Division
Michigan Department of Environmental Quality

From: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Sent: Wednesday, January 23, 2019 5:04 PM
To: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
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Sent: Wednesday, January 23, 2019 4:03 PM
To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>

Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
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From:	Onan, Brandon (EGLE)
To:	Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE)
Cc:	Henderson, Shannon (EGLE); Sylvester, Matthew (EGLE)
Subject:	RE: BH phosphate feed & corrosion treatment
Date:	Friday, April 17, 2020 10:08:36 AM

The 3.0 ppm residual in the letter should be considered an interim designation target. If we are following the lead and copper rule, they will not receive actual designated WQP until after they have demonstrated through two consecutive six month rounds that they can meet the action levels.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, April 17, 2020 9:29 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Henderson, Shannon (EGLE) <HendersonS8@michigan.gov>; Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Subject: BH phosphate feed & corrosion treatment

Below statement from O'Malley confirms my suspicion about pump size (scroll down, highlighted). My calculations support it too, below.

It should be as simple as communication with the city, in writing, that the corrosion treatment appears to be lagging slightly, clarifying the target residual & location, and identifying this as a potential compliance issue. The inconsistency of dosed product is definitely a concern, and a good case for getting the right pump sized *and flow-paced*.

For context, we should also clarify with the city if/when they will have official targets and designated WQPs.

My calcs:

Pure chemical required: (3.5 ppm) x (2 MGD*8.34) = 58.4 lbs ortho as PO4 (2 MGD is typical average day demand for the WTP)

@90% ortho fraction = 64.9 lbs total phosphate as PO4

@32% strength as total PO4 = 202.8 lbs as product (32% strength as written by O'Malley on attached data sheet, assuming it is % as PO4)

Density = 11.26 lbs/gal

Gallons Per Day = 18 gal/day

However, the high service pumps are rated at 4 MGD, with means the target dosing rate is:

18 gal/day *2 = 36 gpd

This is based on a target rate of 3.5 mg/L which may be too low.

It is also very close to the rated capacity of 40 gpd capacity of the Stenner S3003 pump.

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Monday, February 24, 2020 6:03 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>

Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Daniel McGinnis <dmcginnis@cityofbentonharbormi.gov>; Michael Clark <mclark@cityofbentonharbormi.gov>; Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>; Dr R. Johansen <rjohansen@bchdmi.org>; Nicki Britten <nbritten@bchdmi.org>
Subject: Re: What constitutes "Gentle Flushing"
Thanks for the info.
Some of you may wonder why you are on the copy line. I believe if I reference someone or something done by someone, I add them to the copy line.
If you read through this, you will see where you fit in to this email.
Dr. Johanson, Nicki Britten, Chief McGinnis, and Deputy Police Chief Michael Clark.
Unfortunately this email is from Mike O'Malley, Operator IN Charge and not by the City Manager, Mr. Ellis Mitchell.
This is my take on the situation, and may not be Ellis Mitchell's opinion, but he is copied (as agreed) on this email.
The switch over from 70/30 OPP to 90/10 OPP was Friday 02 21 2020 in the morning.
It took Darold all day Thursday and me all day Friday to get the West Suction Line closed nearly 100% Proof for this valve being closed; was a flow through the new meter of 2,604 gpm which is roughly equal to 3.75 MGD, which is very close to what the High Service pump is expected to deliver.
Unfortunately, the new demanded feed rate of 3.0 mg/L as P requires the pump to function at Top Speed, (100%) speed the original Pump is designed for.
The Permit Change is something different and will take me awhile to properly fill out. I propose the permit that exists is still in force and has only been altered by the type of Chemical Make Up percentages "ORTHO"
I am working on it today. Maybe, you can send me a blank form of the one you used and I can copy/paste the appropriate existing conditions and basically only to add the new chemical treatment.
As you know the Orthopolyphosphate treatment scheme was decided upon by the EGLE staff with the recommendation of Elhorn Engineering.
The State also agreed to allow Benton Harbor to use the MDEQ Pilot Grant Funding to reimburse the expenditures that were incurred, Thank You.
EGLE pushed to have the OPP treatment in place before the proposed Suction Line Meter was installed, due to its long lead time.
Elhorn Engineering delivered the 1st set of 55-gallon barrels; set up the pump and injection point, and put in a Rack of various metals to determine the rate of decay.
This all started to take effect 3/26/2019.
A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.
With no background data, the results are not really worth noticing, just yet. But the Mild Steel decay was most troublesome at the Outside location. The lead result was pretty small, as well as the copper at both locations.
Hence, your letter drove us to remove the 2nd Rack on 2/17/2020 and send the coupons in for

analysis.
If, you had requested, or If you had waited a bit longer with the NOTICE; we may have seen results that indicated that the original corrosion treatment program was working enough to wait out the 18-Month time frame that we were told would be when a relatively full exchange would be evident. Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."
To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " *The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years*". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!
As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio.
*It was probably written before EPA knew about this chemical blend.
And, before the Dramatic Change in the Lead Rules.
I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).
And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; **and should not be**, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.
As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product. However either one of the treatment chemicals they supply is the same price but different results. Unfortunately, some would see this as a conflict of interest.
And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.
If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.
It appeared in your letter, that other systems have been involved in this type of corrosion treatment. Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.
Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with

high water levels, the residential portions of Benton Harbor are on top of the hills.
However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions., And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.
At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.
After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.
Sincerely,
Mike O'Malley
Benton Harbor Water Operator IN Charge.
On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike,
> Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:
> -The goal is to bring the newly treated water throughout the distribution system
> -The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.
> -It's best to start at the water plant and move to the ends of the system
> -For example, on a 6" pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it's a dead end run. As you can see, it can be easy to get into the scouring velocity range.
> -At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing level. Then, next day, move further into the system.
> I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.
> Hopefully that is helpful information,
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
> EGLE
> www.michigan.gov/drinkingwater
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Friday, February 21, 2020 4:56 PM
> **To:** Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>

Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: What constitutes "Gentle Flushing"

From: Onan, Brandon (DEQ)
To: Bolf, Michael (DEQ); Thurston, Brian (DEQ)
Subject: RE: Benton Harbor Phosphate Addition
Date: Thursday, February 7, 2019 11:38:23 AM

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

	MGD			
ppm PO4 total	2	3	5	8
1	4.4	6.7	11.1	17.7
2	8.9	13.3	22.2	35.5
3	13.3	20.0	33.3	53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.

Can you shine some light on this?

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality

906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Tuesday, February 05, 2019 8:34 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Crider, Steven (DHHS); Nicki Britten
Subject:	RE: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring
Date:	Thursday, June 13, 2019 9:29:29 AM

Thanks for clueing us in here Steve. If you would like to discuss any of this and get a more articulate/direct answer, please don't hesitate to reach out.
One clarification, not that you much care, the target dosing is 1.5 mg/L as total phosphate (PO4), Mike has an incorrect statement below about that aspect.
Ernie

From: Crider, Steven (DHHS) <CriderS1@michigan.gov>
Sent: Wednesday, June 12, 2019 7:49 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: FW: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring
Steve Crider
D: 517-284-9012
M: 517-230-2166
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, June 11, 2019 5:33 PM
To: Nicki Britten <nbritten@bchdmi.org>
Cc: Nick Margaritis <nmargaritis@bchdmi.org>; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Courtney Davis <cdavis@bchdmi.org>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring
Nicki,
Thank you for your response and the graphic. I will make a few copies and put them up at City Facilities.
You have all been great help, even if Berrien County has not done any testing, the MI DHHS has and has already given me some help.
So your question; with my reply in RED:

- Who is the main point of contact for compliance testing at the City? Mike O'Malley (269) 363-0575 momalley@cityofbentonharbormi.gov and Toni Wade desk phone (269) 447-1945 8:30 am to 4:00 pm. awade@cityofbentonharbormi.gov

Water Plant operator desk phone: (269) 204-2201 7:00 am to 2:00pm only.

- What is the process for collecting the water samples? EGLE has a new requirement: Homeowner receives 5 sample bottles; fills 1 after another starting with 1st draw then 2,3, 4 & 5.

- Who is providing the education to the resident on how to collect the sample? When? Where? On the instructions we will provide with the bottles.

- Where do residents get the water bottles? We will bring them, with instructions and a form to fill

out including **the code** I will supply.

- When does the testing need to be done (date)? June 30, 2019 (yes I am late) then if possible, again in September 2019.

- How will filled water bottles be collected/returned to the city? I will ask them to leave them on their porch, and we will pick them up.

- How will residents learn about their test results? How will residents know if there was a problem testing their samples? I will send a follow up letter with **their code** and their results.

- How will water sample results be shared with other entities? Same as last year. The home owner will get their results. The community and EGLE will get the necessary form with **the code only**, as required by rule.

I have done this same procedure each time since 1993. Including sharing only **the code** with results to anyone other than the residents.
The rules have changed. The original rule required Tier 1 sites and including known Lead service line locations.
The new rule has changed the Tier 1 sites to any lead components known and the original Tier 1 sites are now Tier 3 and will be un-acceptable to EGLE.
Since we dug up and investigated service line materials I have 40 some known lead sites.
They have already received a request to be a sampling site. We have about 4 volunteers from that group.
To fill in the gap, I chose to send letters to 50 or so sites that tested ≥ 15ppb for Lead in the Free Sampling pool of 350 locations.
We seem to still be at about 4 volunteers.
Every site that was above the action level in 2018 has been replaced with Copper all the way, so, I cannot use them any more.
I have received some help from MI DHHS and I think that brings me to 8 possible volunteers.
I will go deeper this week.
The State has demanded we go back to the original 1991 sampling of 60 locations. based on serving approximately 25,000 customers.
They refuse to change our status as a Medium system >3300 and < 10,000 people; that would require only 4 sample locations.
Keep in mind:

1. If I cannot get 60 people to volunteer; we will receive a violation notice from EGLE.
2. And, regardless of how many samples we take and the volunteers are diligent; The City will exceed the Action Level at probably 100% of samples taken.
3. Resulting in another EGLE Violation Notice.
4. Unless of course the Corrosion control treatment has an impact. However, I've been told it take months of treatment to have that kind of protection results.
5. We did start treatment March 26, 2019 and we are approaching the optimum level, but not there yet.

Wish us luck,
Sincerely,

Mike O'Malley
Benton Harbor Water Superintendent
On Tue, Jun 11, 2019 at 12:36 PM Nicki Britten <nbritten@bchdmi.org> wrote:

> Hi Mike,
> Nice to hear from you and have a bit of an update on what is going on in your world as it pertains to the Lead Action Level Exceedance.
> In terms of your request for assistance in seeking additional sampling locations to get to the required 60, I think we may be limited on what we can provide. First of all, the county has done absolutely no water testing in the city of Benton Harbor. This is not part of our role in the response. Even if EGLE allowed for other samples to count toward compliance, we would have nothing to offer in that regard.
> Second, we do have many residents that we have had continued contact with for water filter distribution. The Health Department would be willing to make some phone calls to residents that have remained engaged in that process to see if they would be willing to participate in your sampling pool, but we must have very clear guidance from the city about the process before we engage in that activity. If you can give clear responses and direction to the questions below so that we can effectively communicate and direct residents as to how to engage in compliance sampling, we can try to help.
>
> - Who is the main point of contact for compliance testing at the City?
> - What is the process for collecting the water samples?
> - Who is providing the education to the resident on how to collect the sample? When? Where?
> - Where do residents get the water bottles?
> - When does the testing need to be done (date)?
> - How will filled water bottles be collected/returned to the city?
> - How will residents learn about their test results? How will residents know if there was a problem testing their samples?
> - How will water sample results be shared with other entities?
>
> As you may be aware, we do water filter distribution on the first Monday of the month and the third Thursday of the month within the city (see attached flyer). The next one is June 20. You or another city staff member are welcome to be present at any of those to try to recruit people for compliance samples. This offer was made to Mr. Watson in late April so that we would not find ourselves scrambling for people to provide samples in June. Please consider utilizing this option moving forward.
> Look forward to hearing from you.
> Nicki
> **From:** Mike O'Malley [mailto:momalley@cityofbentonharbormi.gov]
> **Sent:** Friday, June 07, 2019 8:33 AM
> **To:** Nick Margaritis; Nicki Britten; Steven Crider
> **Cc:** Mike OMalley

Subject: Benton Harbor Water is looking for help building a June & September Sampling Pool for Lead and Copper return to full monitoring

Nick and Nicki,

You know, I get a kick out of seeing friends of mine being quoted in the local paper.

It makes you celebrities for my day!

I am hopeful the 3 of you might be able to help me.

Let me preface: with my insistence of protecting privacy of residents; and then finding out DHHS has HIPPA protection.

It occurs to me that the protection comes back on me at the Benton Harbor Water Department (even if the list originated from Benton Harbor).

So here goes;

I believe that both the State and County have conducted some testing in the Benton Harbor Water System.

But, I have only heard of 1 location and I have no documentation of what was being done.

I have sent out nearly 100 letters in the past 2 days to addresses that either:

- Tested high ≥ 15ppb for Lead in the free sampling pool. This was about 51 places. I could drop the number and increase the number of locations.
- Those home where we did a dig up inspection of service line materials and found a Lead Service on the Public side of the Curb Stop Valve. This was around 40+ locations.

Now, I expect it will take days for return calls, but I am nerveos that because I am way too late, I may not meet the 60 sample pool that EGLE has insisted upon.

I have attached a sample letter of one of the free testing locations.

attached: *BH Letter sample for 955 Ogden Mattie Johnson sent 06 04 2019.doc*

If you have a mind to assist, I was hoping for just that:

1. A pipe dream is that EGELE would accept results from samples taken in 2019 by DHHS State and County.
2. Or more realistically, you could contact those sites you have tested and asked them if they would be interested in helping Benton Harbor fill the 60 location pool for sampling this June and again for September and beyond.

So you know and you can tell the residents:

We started feeding a 70/30 Orthopolyphosphate (OPP) March 26, 2019.

Recent results have shown that sites in the system have results between 1.0 to 1.4 ppm as P.

The suggested target dose by the MDEQ and Contractor was 1.5 ppm as P.

So, 1 part of the testing I propose is to test each of the 60 locations for OPP in addition to Lead and Copper. We only need 10 ml for this test.

Please help me, if you can. Reply either way.

Thank You,

Mike O'Malley
Benton Harbor Water Superintendent
(269) 363-0575

From:	Sarkipato, Ernest (EGLE)
To:	Jason Marquardt; Onan, Brandon (EGLE)
Subject:	RE: City of Benton Harbor Corrosion Study
Date:	Wednesday, March 31, 2021 10:55:00 AM
Attachments:	image001.png image002.png image003.png image004.png image006.png

---

I'm good with it, and would prefer to do a pre-bid meeting for interested/qualified parties tomorrow if possible. I'm on AL after that, but could jump on depending on time/day.

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 31, 2021 10:28 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: FW: City of Benton Harbor Corrosion Study

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Ernie/Brandon,

Following up on this RFP. I have the BH Clerk ready to proceed.

Yesterday, a pre proposal discussion was discussed. It would be easy for me to set that up easily with a goto meeting as non-mandatory if you think that is helpful. Let me know if you have any thoughts as I try and get this out before tomorrow. If not tomorrow, then we may have to wait to get it out until after 4/12.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Jason Marquardt
Sent: Monday, March 29, 2021 1:38 PM
To: Ernie Sarkipato (sarkipatoe@michigan.gov) <sarkipatoe@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: City of Benton Harbor Corrosion Study

Gentlemen,

Attached is the latest Corrosion RFP after last Friday's meeting. Do you have any last comments based on our discussion with B&V?

We'll work on sending this out if no further comments.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager

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From:	Sarkipato, Ernest (EGLE)
To:	Jason Marquardt; Onan, Brandon (EGLE)
Subject:	RE: City of Benton Harbor Corrosion Study
Date:	Thursday, April 1, 2021 7:00:00 AM
Attachments:	image001.png image002.png image003.png image004.png image005.png

---

Looks like that is a particularly bad morning for our end.

Opens lots right now…
4/12 at 2PM or 3PM
4/14 at 11AM
4/15 at 10AM, 2PM, 3PM

From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Wednesday, March 31, 2021 9:08 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: City of Benton Harbor Corrosion Study

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Gentlemen,

I'll plan on putting as a part of the RFP and get it out ASAP. I'm working hard to coordinate it with the City getting it out, but it may end up being delayed as I'm preparing for my Spring Break also.

What if we set it up for an hour timeslot sometime on 4/13 between 8:00am-12:00pm?

Jason W. Marquardt, PE
Senior Project Manager
Abonmarche
D 269.926.4565
C 269.876.9304
O 269.927.2295 ext. 171
www.abonmarche.com

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Wednesday, March 31, 2021 11:27 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: City of Benton Harbor Corrosion Study

I'm good as well.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, March 31, 2021 10:55 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: City of Benton Harbor Corrosion Study

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Sent: Wednesday, March 31, 2021 10:28 AM
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Ernie/Brandon,

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Thanks,

Jason W. Marquardt, PE
Senior Project Manager
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From: Jason Marquardt
Sent: Monday, March 29, 2021 1:38 PM
To: Ernie Sarkipato (sarkipatoe@michigan.gov) <sarkipatoe@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: City of Benton Harbor Corrosion Study

Gentlemen,

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We'll work on sending this out if no further comments.

Thanks,

Jason W. Marquardt, PE
Senior Project Manager

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From:	Sasy, Ninah (EGLE)
To:	Strong, Regina (EGLE); Sarkipato, Ernest (EGLE); Hernandez, Poppy; rrice@cityofbentonharbormi.gov; nbritten@bchdmi.org; Crider, Steven (DHHS); Bator, Dan (DHHS-Contractor); Nshimyimana, Jean Pierre (DHHS); Speidel, Carin (DHHS); Wisinski, Courtney (DHHS)
Cc:	Frantz, Kimber (EGLE)
Subject:	RE: Conference Call - Public Involvement Discussion - Benton Harbor Lead Action Level Exceedance
Date:	Wednesday, March 4, 2020 10:52:43 AM
Attachments:	Meeting Agenda_ Benton Harbor Partners Meeting 3 5 20.pdf Proposed Engagement Plan for Benton Harbor Outreach.pdf Benton Harbor Partner Updates Feb 2020.docx

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Good morning,
I've attached the agenda for tomorrow's meeting- the focus will be on outreach as a result of the ALE. We will schedule a separate meeting to discuss the ACO and will keep partners updated.
Additional attachments:

- Proposed Timeline/ High-level Engagement Plan
- Benton Harbor Partner Updates

Please feel free to review and update the information included on the Benton Harbor Partner Updates document. FYI- I will add a section for the City. The overall intent of this document is to summarize previous efforts. This could be helpful as we engage community partners including the city council. It can also be used to help identify potential gaps. This draft document is a work-in-progress…
I look forward to speaking with you all tomorrow.
Ninah

Ninah Sasy, MSA, BS
Clean Water Public Advocate
Executive Office
Michigan Department of Environment, Great Lakes, and Energy
Office: 517-284-6843
Cell: 517-881-5219
Email: SasyN@michigan.gov

-----Original Appointment-----
From: Frantz, Kimber (EGLE) <FrantzK@michigan.gov>
Sent: Tuesday, February 25, 2020 5:58 PM
To: Frantz, Kimber (EGLE); Sasy, Ninah (EGLE); Strong, Regina (EGLE); Sarkipato, Ernest (EGLE); Hernandez, Poppy; rrice@cityofbentonharbormi.gov; nbritten@bchdmi.org; Crider, Steven (DHHS); Nshimyimana, Jean Pierre (DHHS); Speidel, Carin (DHHS); Wisinski, Courtney (DHHS)
Cc: Bator, Dan (DHHS-Contractor)
Subject: Conference Call - Public Involvement Discussion - Benton Harbor Lead Action Level Exceedance
When: Thursday, March 5, 2020 12:00 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Conference Call-In No.: 877-873-8018 Passcode: 7426654#
Call-in Number: 877-873-8018
Passcode: 7426654#
(Ninah will host.)
Participants:
Ellis Mitchell
Ninah Sasy

Regina Strong
Ernest Sarkipato
Poppy Hernandez
Nicole Britten
Steve Crider
Jean Pierre Nshimyimana
Carin Speidel
Courtney Wisinski
Meeting requested by Ninah Sasy, SasyN@Michigan.gov

AGENDA

Benton Harbor Communication Strategy Meeting

March 5, 2020
12 – 1PM

Invited:	Dan Bator, Nicole Britten, Steve Crider, Poppy Hernandez, Ellis Mitchell, Jean Pierre Nshimyimana, Ernest Sarkipato, Ninah Sasy, Regina Strong, Carin Speidel, Courtney Wisinski

12:00 – 12:05PM	**Roll call**
12:05 – 12:25PM	**Engagement Plan**
12:25 – 12:40PM	**Partner Communication**
12:40 – 1:00PM	**Timeline & Next Steps**

Additional Instruction:

The overall objectives of this meeting are to:

1) determine which community partners should be included in future meetings and planning as part of the development of our comprehensive outreach strategy,

2) determine strategy to ensure timely and effective communication between community, local, and state partners, and

3) determine the timeline for meeting with the city council and implementing the outreach strategy.

Engagement Plan for Outreach Strategy:

Engage Community Partners

Connect with trusted community partners- Andrews University, Dr. Murray, Freshwater Future, and Benton Harbor Community Water Council

Purpose:
Develop comprehensive outreach strategy

Engage City Council

BCH, EGLE, and MDHHS will present status updates & next steps

Purpose:
a) Feedback and buy-in regarding outreach strategy
b) Discuss next steps for addressing ACO

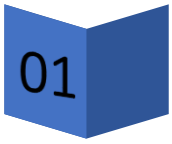
Engage Community Residents

Implement Outreach Strategy. Strategy is led by the City and BCHD and includes community partners but also has support from state department

Benton Harbor Partner Updates

To ensure transparency among community partners and the community residents that we serve, our communication strategy will provide an overview of previous and current efforts by state, county and city partners. Additionally, this summary is intended to will allow us collectively to identify gaps and develop long-term and short-term next steps.

Activities are summarized based on the following categories.



Lead and Copper Rule (LCR) Compliance

Activities that ensure compliance with Michigan's Lead and Copper Rule:

Sampling
Monitored Water Quality Parameters
Lead Service Line Identification

Education and Outreach

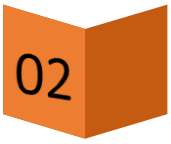
Activities as a result of an ALE. The ALE triggers a required public notification every six months if the 90th percentile of lead or copper exceeds the action level.

Water Filter Distribution
Public Education

DRAFT

Berrien County Health Department (BCHD)

The Berrien County Health Department continues to lead health outreach efforts by providing outreach to community residents, distributing filters, providing filter education and utilizing community partnerships to provide outreach to community residents.



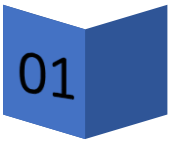
ALE Response

- Provided outreach through formal media channels, community partners, faith-based partners, direct to door mailers, social media and through partnerships with home visiting programs, and senior support services we did outreach and filter delivery via partners
- Provided follow-up with individuals who have already received a filter
- Distributed filters to residents by offering filter pick-up locations and home delivery of filters

Continuing in 2020, we will utilize social media and partners to share filter information and related updates. Berrien County Health Department has targeted late winter/early spring as a need for another direct to door mailer. Hotline and website information will remain active. Continued partnership with City and now Community Water Council will provide additional opportunities for outreach.

Michigan Department of Health and Human Services (MDHHS)

The Michigan Department of Health and Human Services continues to support efforts in Benton Harbor by supporting water testing efforts, supplying funding for water filter distribution, and providing additional capacity to water outreach efforts.



Lead and Copper Rule

- Executed door-to-door campaign to recruit on behalf of the city for LCR testing (multiple occasions)
- Reached out to every residence above 15 ppb
- Sampled over 75% of residences above 15 ppb
- Collected cyanotoxin samples for the city

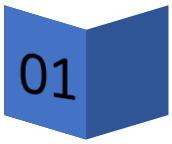
ALE Response

- Provided funding for city wide filter distribution
- Provided technical support to the Berrien County Health Department
- Attended various community events facilitated by Berrien County Health Department and other community partners
- Provided copies of MDHHS health education materials
- Consulted on filter distribution, providing guidance
- Attended 1-2 filter distribution days in August 2019

DRAFT

Michigan Department of Environment, Great Lakes and Energy (EGLE)

The Michigan Department of Environment, Great Lakes and Energy continue to support pursuing compliance with Act 399 and protecting public health by working with the City to address compliance issues and partnering at the state and local level to ensure that community residents receive pertinent information.



Lead and Copper Rule

- Reviewed water quality parameter data as indicators of water quality
- Worked closely with city officials to consult with water professionals to quickly install (and fund) corrosion treatment system at the water plant, consisting of a phosphate chemical
- Since March 2019, continue to monitor level of corrosion chemical and results of lead sampling in the system have been scrutinized for any trends
- Ordered change in corrosion control, based on consultation with experts and EPA, as a measure to protect public health

ALE Response

- Presented at ALE Public Meeting

DRAFT

From:	Sarkipato, Ernest (EGLE)
To:	"Mike Enlow"
Subject:	RE: Corrosion Plan update, and miscellaneous
Date:	Thursday, September 26, 2019 11:20:10 AM

Yes, todd isn't particularly good with responding in writing or answering phone calls. I understand he's busy and I was able to speak with him briefly a few weeks ago.

From: Mike Enlow <mike@michonline.net>
Sent: Thursday, September 26, 2019 11:12 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Corrosion Plan update, and miscellaneous

Hi Ernie, Thank you for requesting an updated request on the corrosion control study. Unfortunately, after the start-up of the Benton Harbor project I have bowed out out of it . Todd Luks is handling it from this point on. He will be in contact with you with a update. Thank you much and have a great rest of the week! Mike Enlow,Elhorn Eng.Co.

Sent from my Verizon 4G LTE Droid
On Sep 26, 2019 10:18 AM, "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov> wrote:

> City of Benton Harbor Officials and Elhorn Engineering Representatives,
>
> We'd like to request an update on the status of the corrosion coupon study that is being conducted currently at the City of Benton Harbor. As you know, this is a very important component of the interative process wherein we arrive at an optimized treatment methodology that reduces the exposure of the Benton Harbor residents to lead and copper in their water.
>
> I've attached the original corrosion treatment plan for your reference. I believe we could talk with Michigan DHHS regarding additional sequential sampling at this time, if there is a desire for another close look at lead release in the system.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Environmental Health Division
>
> MI Department of Environment, Great Lakes, and Energy
>
> 616-307-0261 mobile
>
> EGLE
>
> www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE)
Sent: Friday, August 9, 2019 1:11 PM
To: Mike Enlow <mike@michonline.net>; Todd Luks <elhorneng@aol.com>
Subject: Fwd: Corrosion Plan update, and miscellaneous

Do you guys plan on following up on the coupons at BH?

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

EGLE-Drinking Water and Environmental Health

616-307-0261

Begin forwarded message:

From: "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov>
Date: July 29, 2019 at 11:53:42 AM EDT
To: "momalley@cityofbentonharbormi.gov" <momalley@cityofbentonharbormi.gov>, "elhorneng@aol.com" <elhorneng@aol.com>, "Onan, Brandon (EGLE)" <OnanB@michigan.gov>
Cc: "Thurston, Brian (EGLE)" <THURSTONB@michigan.gov>, "dwatson@cityofbentonharbormi.gov" <dwatson@cityofbentonharbormi.gov>, "Bolf, Michael (EGLE)" <BOLFM@michigan.gov>, "mike@michonline.net" <mike@michonline.net>, "Bolt, Jennifer (EGLE)" <BOLTJ@michigan.gov>, "Crider, Steven (DHHS)" <CriderS1@michigan.gov>
Subject: RE: Corrosion Plan update, and miscellaneous

All,

By my calculations it is nearing time to pull the first round of coupons and get a baseline for corrosion rates in the system. Please indicate the plan for the next pull (another 90 days?), which is our next opportunity to draw some conclusions on the efficacy of the corrosion inhibitor treatment.

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Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; Mike Enlow; Todd Luks; Ellis Mitchell
Cc:	Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Subject:	RE: Corrosion Plan update, and miscellaneous
Date:	Thursday, September 26, 2019 10:19:05 AM
Attachments:	MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

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Cc: "Thurston, Brian (EGLE)" <THURSTONB@michigan.gov>, "dwatson@cityofbentonharbormi.gov" <dwatson@cityofbentonharbormi.gov>, "Bolf, Michael (EGLE)" <BOLFM@michigan.gov>, "mike@michonline.net" <mike@michonline.net>, "Bolt, Jennifer (EGLE)" <BOLTJ@michigan.gov>, "Crider, Steven (DHHS)" <CriderS1@michigan.gov>
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MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

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We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; Mike Enlow; Todd Luks; Ellis Mitchell
Cc:	Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Subject:	RE: Corrosion Plan update, and miscellaneous
Date:	Thursday, September 26, 2019 10:18:18 AM
Attachments:	MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

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616-307-0261 mobile

www.michigan.gov/drinkingwater

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MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
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Subject:	RE: Corrosion Plan update, and miscellaneous
Date:	Monday, July 29, 2019 11:54:38 AM
Attachments:	MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

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www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE)
Sent: Tuesday, April 30, 2019 7:46 AM
To: momalley@cityofbentonharbormi.gov; elhorneng@aol.com; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; mike@michonline.net; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
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Thank you for the quick phone call yesterday to discuss Elhorn's proposed corrosion control treatment plan for Benton Harbor (attached). Here's a summary of that, and the rest of our chat:

Corrosion Plan: Todd mentioned the attached corrosion treatment plan is a generic version he uses. We talked through the proposed series of events. Soon, sampling for water quality and lead and copper will begin at the racks. The next step is, the coupons will be pulled and tested after 90 days. Treatment adjustments will be made in-situ based on these initial results (assuming a good enough baseline is established), and this process should repeat for continued optimization. Currently, coupon racks are installed at the water plant and at city hall, both of which are treated tap water. We identified the benefit of having a treated water, pre-phosphate addition baseline rack installed at the water plant. Todd will look at options on Friday of this week when he is at the water plant. There was agreement on the phone this plan is acceptable.

Test Kit: Mike had inadvertently ordered a color wheel phosphate test kit, which is far too subjective. Todd mentioned he ordered an extra and will bring that Friday to the plant. We very much agree the city should not be using test equipment based on color comparators. *SIDE NOTE: If you guys could confirm what the ortho reading is at the plant tap (with high service running), as well as at city hall on Friday, that would be a really good data point.*

Meter Install: there are more delays in the McCrometer insertion meter, which is intended to measure HS flow and also pace the phosphate pump. We will keep pursuing that project to help with optimization of corrosion treatment.

Compliance Testing: We will not be reducing the city's required lead and copper sampling from 60 to 40 as requested by Mike O'Malley, based on population. This may occur in future years, particularly with another census around the corner. For this year, the additional sampling is needed to be most protective of public health and make well informed decisions regarding the treatment optimization. We recommend using the attached infographics to help residents sample the 5th liter correctly.

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Subject: Corrosion Plan update, and miscellaneous

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Corrosion Plan: Todd mentioned the attached corrosion treatment plan is a generic version he uses. We talked through the proposed series of events. Soon, sampling for water quality and lead and copper will begin at the racks. The next step is, the coupons will be pulled and tested after 90 days. Treatment adjustments will be made in-situ based on these initial results (assuming a good enough baseline is established), and this process should repeat for continued optimization. Currently, coupon racks are installed at the water plant and at city hall, both of which are treated tap water. We identified the benefit of having a treated water, pre-phosphate addition baseline rack installed at the water plant. Todd will look at options on Friday of this week when he is at the water plant. There was agreement on the phone this plan is acceptable.

Test Kit: Mike had inadvertently ordered a color wheel phosphate test kit, which is far too subjective. Todd mentioned he ordered an extra and will bring that Friday to the plant. We very much agree the city should not be using test equipment based on color comparators. *SIDE NOTE: If you guys could confirm what the ortho reading is at the plant tap (with high service running), as well as at city hall on Friday, that would be a really good data point.*

Meter Install: there are more delays in the McCrometer insertion meter, which is intended to measure HS flow and also pace the phosphate pump. We will keep pursuing that project to help with optimization of corrosion treatment.

Compliance Testing: We will not be reducing the city's required lead and copper sampling from 60 to 40 as requested by Mike O'Malley, based on population. This may occur in future years, particularly with another census around the corner. For this year, the additional sampling is needed to be most protective of public health and make well informed decisions regarding the treatment optimization. We recommend using the attached infographics to help residents sample the 5th liter correctly.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment Great Lakes and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

PLAN: Collect Water Quality Parameter (2 sets 24 hr. apart) samples from each entry point to the system and distribution system. Each sample to have analysis for Hardness, PH, Alkalinity, Calcium, Sulfate, Chloride, Conductivity, TDS, Iron, Manganese, Temperature, Langelier Index, Ortho Phosphate, Poly Phosphate & Total Phosphate. Based on sample results and existing treatment practices and procedures a recommendation will be designed to implement the corrosion control treatment study!

STUDY: A minimum of (2) Corrosion Coupon Test Racks containing Mild steel, Copper & Lead coupons will be installed. Test Rack #1 to be installed on the current finished water (either in the distribution system or POE of plant). Test Rack #2 to be installed on the current finished water along with the addition of the recommended corrosion inhibitor to be tested. Test racks will be sampled on a by-weekly basis for all above mentioned parameters. Test racks will remain online for 90 days at which point all coupons will be removed and sent to Carus Laboratory for complete analysis.

PROPOSAL: A formal proposal will be written based on all data collected. This data will be used to create the final draft for the DEQ permit application for Optimal Corrosion Control Treatment. If sufficient information or analysis data is not achieved within the initial test period, additional product recommendations maybe suggested along with a repeat 90-day test period? Any product recommendations or changes in treatment will be documented throughout any given test period and forwarded to the appropriate DEQ office for review.
We believe that this plan & study proposal will drastically improve water quality throughout our distribution system to greatly minimize the effects of Lead & Copper based corrosion. Treating the water at the source is always the best choice, along with continuous educational information being delivered to each customer within our distribution system regarding the effects of Lead & Copper in drinking water along with piping & fixture replacement safe practices.
*Not all of this plan may be necessary but is in place if needed!

Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	momalley@cityofbentonharbormi.gov; elhorneng@aol.com; Onan, Brandon (EGLE)
Cc:	Thurston, Brian (EGLE); dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE); mike@michonline.net; Bolt, Jennifer (EGLE); Crider, Steven (DHHS)
Subject:	RE: Corrosion Plan update, and miscellaneous
Date:	Monday, July 29, 2019 11:53:37 AM
Attachments:	MI 0600 Benton Harbor Corrosion Treatment Plan.pdf

All,

By my calculations it is nearing time to pull the first round of coupons and get a baseline for corrosion rates in the system. Please indicate the plan for the next pull (another 90 days?), which is our next opportunity to draw some conclusions on the efficacy of the corrosion inhibitor treatment.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (EGLE)
Sent: Tuesday, April 30, 2019 7:46 AM
To: momalley@cityofbentonharbormi.gov; elhorneng@aol.com; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; dwatson@cityofbentonharbormi.gov; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; mike@michonline.net; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Subject: Corrosion Plan update, and miscellaneous

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MI 0600 Benton Harbor
Corrosion Treatment Plan
4/23/19

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

CORROSION CONTROL TREATMENT PLAN & STUDY PROPOSAL

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Todd E. Luks

Vice President
Elhorn Company

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

From:	Sarkipato, Ernest (EGLE)
To:	"Mike Enlow"
Subject:	RE: Corrosion Plan update, and miscellaneous
Date:	Thursday, September 26, 2019 11:20:10 AM

Yes, todd isn't particularly good with responding in writing or answering phone calls. I understand he's busy and I was able to speak with him briefly a few weeks ago.

From: Mike Enlow <mike@michonline.net>
Sent: Thursday, September 26, 2019 11:12 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Corrosion Plan update, and miscellaneous

Hi Ernie, Thank you for requesting an updated request on the corrosion control study. Unfortunately, after the start-up of the Benton Harbor project I have bowed out out of it . Todd Luks is handling it from this point on. He will be in contact with you with a update. Thank you much and have a great rest of the week! Mike Enlow,Elhorn Eng.Co.

Sent from my Verizon 4G LTE Droid

On Sep 26, 2019 10:18 AM, "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov> wrote:

> City of Benton Harbor Officials and Elhorn Engineering Representatives,
>
> We'd like to request an update on the status of the corrosion coupon study that is being conducted currently at the City of Benton Harbor. As you know, this is a very important component of the interative process wherein we arrive at an optimized treatment methodology that reduces the exposure of the Benton Harbor residents to lead and copper in their water.
>
> I've attached the original corrosion treatment plan for your reference. I believe we could talk with Michigan DHHS regarding additional sequential sampling at this time, if there is a desire for another close look at lead release in the system.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Environmental Health Division
>
> MI Department of Environment, Great Lakes, and Energy
>
> 616-307-0261 mobile
>
> EGLE
>
> www.michigan.gov/drinkingwater
>
> ---
>
> **From:** Sarkipato, Ernest (EGLE)
> **Sent:** Friday, August 9, 2019 1:11 PM
> **To:** Mike Enlow <mike@michonline.net>; Todd Luks <elhorneng@aol.com>

Subject: Fwd: Corrosion Plan update, and miscellaneous

Do you guys plan on following up on the coupons at BH?

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

EGLE-Drinking Water and Environmental Health

616-307-0261

Begin forwarded message:

From: "Sarkipato, Ernest (EGLE)" <SARKIPATOE@michigan.gov>
Date: July 29, 2019 at 11:53:42 AM EDT
To: "momalley@cityofbentonharbormi.gov" <momalley@cityofbentonharbormi.gov>, "elhorneng@aol.com" <elhorneng@aol.com>, "Onan, Brandon (EGLE)" <OnanB@michigan.gov>
Cc: "Thurston, Brian (EGLE)" <THURSTONB@michigan.gov>, "dwatson@cityofbentonharbormi.gov" <dwatson@cityofbentonharbormi.gov>, "Bolf, Michael (EGLE)" <BOLFM@michigan.gov>, "mike@michonline.net" <mike@michonline.net>, "Bolt, Jennifer (EGLE)" <BOLTJ@michigan.gov>, "Crider, Steven (DHHS)" <CriderS1@michigan.gov>
Subject: RE: Corrosion Plan update, and miscellaneous

All,

By my calculations it is nearing time to pull the first round of coupons and get a baseline for corrosion rates in the system. Please indicate the plan for the next pull (another 90 days?), which is our next opportunity to draw some conclusions on the efficacy of the corrosion inhibitor treatment.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

From: Sarkipato, Ernest (EGLE)
To: momalley@bhcity.us; dharlan@fv-operations.com; Bolf, Michael (EGLE); elhorneng@aol.com; Onan, Brandon (EGLE); Thurston, Brian (EGLE); rrice@bhcity.us; losler@bhcity.us; emitchell@bhcity.us
Subject: RE: Corrosion Study Plan Discussion
Date: Friday, September 11, 2020 11:45:59 AM

Mr. Mitchell, please clarify with a response to this email, regarding your intentions for this meeting. When we spoke earlier today, you seemed to agree as to the importance of having this discussion with Mr. O'Malley and Mr. Luks.

-Ernie

From: Google Calendar <calendar-notification@google.com> **On Behalf Of** momalley@bhcity.us
Sent: Friday, September 11, 2020 11:33 AM
To: dharlan@fv-operations.com; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; elhorneng@aol.com; Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@bhcity.us; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; rrice@bhcity.us; losler@bhcity.us; emitchell@bhcity.us
Subject: Corrosion Study Plan Discussion

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ellis Mitchell cannot make this call and does not want to miss it.
I suggested we just cancel it.

This meeting is cancelled.

Enjoy your weekend!

Mike O'Malley
Benton Harbor Operator IN Charge.

Corrosion Study Plan Discussion

When: Fri Sep 11, 2020 2pm – 3pm Eastern Time - New York

Where: Microsoft Teams Meeting (map)

Who:
- Sarkipato, Ernest (EGLE) - organizer
- momalley@bhcity.us - creator
- elhorneng@aol.com
- emitchell@bhcity.us
- Lesia Osler
- Bolf, Michael (EGLE)
- Darold Harlan
- Onan, Brandon (EGLE)
- rrice@bhcity.us - optional
- Thurston, Brian (EGLE) - optional

Attachments MI 0600 Benton Harbor Water Corrosion Plan for ACO (detailed).pdf

We would like to request a discussion with the City and Mr. Luks with Elhorn, regarding the detailed corrosion study plan (attached).

Join Microsoft Teams Meeting

+1 248-509-0316 United States, Pontiac (Toll)

Conference ID: 536 789 180#

Local numbers | Reset PIN | Learn more about Teams | Meeting options

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From: Sarkipato, Ernest (EGLE)
To: momalley@bhcity.us; dharlan@fv-operations.com; Bolf, Michael (EGLE); elhorneng@aol.com; Onan, Brandon (EGLE); Thurston, Brian (EGLE); rrice@bhcity.us; losler@bhcity.us; emitchell@bhcity.us
Subject: RE: Corrosion Study Plan Discussion
Date: Friday, September 11, 2020 11:46:05 AM

Mr. Mitchell, please clarify with a response to this email, regarding your intentions for this meeting. When we spoke earlier today, you seemed to agree as to the importance of having this discussion with Mr. O'Malley and Mr. Luks.

-Ernie

From: Google Calendar <calendar-notification@google.com> **On Behalf Of** momalley@bhcity.us
Sent: Friday, September 11, 2020 11:33 AM
To: dharlan@fv-operations.com; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; elhorneng@aol.com; Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@bhcity.us; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; rrice@bhcity.us; losler@bhcity.us; emitchell@bhcity.us
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Corrosion Study Plan Discussion

When: Fri Sep 11, 2020 2pm – 3pm Eastern Time - New York

Where: Microsoft Teams Meeting (map)

Who:
- Sarkipato, Ernest (EGLE) - organizer
- momalley@bhcity.us - creator
- elhorneng@aol.com
- emitchell@bhcity.us
- Lesia Osler
- Bolf, Michael (EGLE)
- Darold Harlan
- Onan, Brandon (EGLE)
- rrice@bhcity.us - optional
- Thurston, Brian (EGLE) - optional

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Join Microsoft Teams Meeting

+1 248-509-0316 United States, Pontiac (Toll)

Conference ID: 536 789 180#

Local numbers | Reset PIN | Learn more about Teams | Meeting options

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From: Sarkipato, Ernest (EGLE)
To: elhorneng@aol.com; Onan, Brandon (EGLE); momalley@cityofbentonharbormi.gov
Subject: RE: Coupon Test Report
Date: Thursday, October 17, 2019 10:24:48 AM

Thanks Todd.

I assume there are new coupons back in these two racks?

And, did you get a pre-phosphate rack installed?

Ernie

From: elhorneng@aol.com <elhorneng@aol.com>
Sent: Thursday, October 17, 2019 9:41 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov
Subject: Coupon Test Report

Guys,

Please see attached coupon results.

Todd

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

From:	Sarkipato, Ernest (EGLE)
To:	rrice@bhcity.us; emitchell@bhcity.us; Mike O"Malley
Cc:	Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Thurston, Brian (EGLE)
Subject:	RE: Declined: Corrosion Study Plan Discussion @ Thu Sep 10, 2020 2pm - 3pm (EDT) (Sarkipato, Ernest (EGLE))
Date:	Tuesday, September 1, 2020 8:22:01 AM

Hi Ms. Rice,

I'm confused as to why this appointment is being declined. Can the city please provide an explanation? We feel it is important to have a discussion with city officials regarding the corrosion treatment plan, as it pertains to the ACO compliance timeline.

Alternatively, do you see other times/days that week that are open for such a discussion?

Ernie

-----Original Appointment-----
From: Google Calendar <calendar-notification@google.com> **On Behalf Of** rrice@bhcity.us
Sent: Tuesday, September 1, 2020 8:17 AM
To: Sarkipato, Ernest (EGLE)
Subject: Declined: Corrosion Study Plan Discussion @ Thu Sep 10, 2020 2pm - 3pm (EDT) (Sarkipato, Ernest (EGLE))
When: Thursday, September 10, 2020 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

rrice@bhcity.us has declined this invitation.

Corrosion Study Plan Discussion

When	Thu Sep 10, 2020 2pm – 3pm Eastern Time - New York
Where	Microsoft Teams Meeting (map)
Calendar	Sarkipato, Ernest (EGLE)
Who	• Sarkipato, Ernest (EGLE) - organizer • rrice@bhcity.us - creator, optional
Attachments	MI 0600 Benton Harbor Water Corrosion Plan for ACO (detailed).pdf

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Conference ID: 536 789 180#

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Invitation from Google Calendar

You are receiving this courtesy email at the account sarkipatoe@michigan.gov because you are an attendee of this event.

To stop receiving future updates for this event, decline this event. Alternatively you can sign up for a Google account at https://www.google.com/calendar/ and control your notification settings for your entire calendar.

Forwarding this invitation could allow any recipient to send a response to the organizer and be added to the guest list, or invite others regardless of their own invitation status, or to modify your RSVP. Learn More.

From:	Bolf, Michael (EGLE)
To:	Sarkipato, Ernest (EGLE)
Cc:	Onan, Brandon (EGLE)
Subject:	RE: Detroit News Inquiry - Benton Harbor
Date:	Monday, March 8, 2021 8:17:00 AM
Attachments:	image001.png

Ernie,

I agree with your additions/edits. Let's make sure to put units in the results table in the final version.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Saturday, March 06, 2021 9:25 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Dean, Scott (EGLE) <DeanS4@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: Detroit News Inquiry - Benton Harbor

I've added in blue, made some edits to Mike's draft. Thanks Mike. We would need to run this by Ninah Sasy's office before sending out, much of the public information efforts have been lead by her office.

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Friday, March 5, 2021 3:12 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Dean, Scott (EGLE) <DeanS4@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: RE: Detroit News Inquiry - Benton Harbor

Ernie,

For what it's worth, here are some initial thoughts in red below:

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, March 05, 2021 2:13 PM
To: Lfleming@detroitnews.com
Cc: Dean, Scott (EGLE) <DeanS4@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: Detroit News Inquiry - Benton Harbor

Good afternoon Mr. Fleming,

I wanted to reach out following our conversation today regarding the City of Benton Harbor lead levels. Below are the questions I took down from our conversation. **I wanted to let you know, it will be difficult to have concise answers for you on many of these questions particularly by your deadline of Monday.**

1. Summary of 90th Percentile #'s starting in 2018?

90th Percentiles	2018	2019-1	2019-2	2020-1	2020-2
Lead	22	27	32	23	24
Copper	61	0	15	35	28
# Samples	30	46	39	63	67

2. How are these in comparison to flint 90th percentiles? Our records don't include direct comparisons. You can refer to Flint's data (https://www.michigan.gov/flintwater/) for comparisons.
3. What is the cause of the lead corrosion problem? Corrosion of lead materials in customer service lines and plumbing systems.
4. What is EGLE doing to help the city resolve the issue? Established interim corrosion control strategy, public messaging (advisories, education, and communication), coordinating sample collection efforts, coordinating with DHHS and local health, assisting with grants, assisting with corrosion control study planning…
   "EGLE has been proactively meeting with city officials on a weekly basis to ensure requirements of the LCR are met, as well as all other drinking water requirements. This has included increasing the numbers of samples, broadening the sampling to include other water quality parameters, establishing interim corrosion control treatment strategy, and informing residents on the risks of lead in drinking water and ways to mitigate exposure. We have also partnered with the Office of the Clean Water Public Advocate to form a strategy for public communication that goes beyond the requirements of the LCR. Two attached communications were prepared in conjunction with outreach partners for the local free paper, the Benton Spirit, intended to reach a more broad audience than other paid news subscriptions. "
   What have we advised? Interim corrosion control strategy, direction of an in-depth Corrosion control study, managing records of service line materials and sample site addresses, adjusting corrosion inhibitor dosage, improving sample record keeping, working with local partners to help communicate with the residents.

What have we required? All Act 399 requirements associated with exceeding a lead action level including a corrosion control study, sampling, water quality parameters, public education, corrosion treatment, organization of distribution system materials inventory.

5. How many lead lines have been replaced to date, specifically with state funds from the Lead Service Line Pilot Grant? According to data provided by the City's engineer Abonmarche, the city replaced 17 lead service lines as a part of the EGLE Grant for Lead Service Lines. In addition, they identified another 67 lines as being lead, and 26 as being non-lead. Note, additional lead service lines have been replaced since that program as the city has begun replacing aged cast iron water main with LSL attached to it.
6. How is EGLE 'policing' the lead levels? EGLE is following the requirements of the lead and copper rule per Act 399. This approach combines increased monitoring, public messaging, and studying corrosion control options. It also involves working closely with DHHS-Drinking Water to request and review results of investigative sampling.

1. Is there a corrosion control study?
    a. How is it being conducted? The city's chemical supplier attempted a coupon study involving installations at the water plant and in distribution beginning shortly following the ALE in 2018. The results were inconclusive, and EGLE has asked the City to engage a third-party qualified consultant to conduct a study to determine the optimal corrosion treatment. The city is now working on an RFP for a qualified consulting firm to design and perform this study.
    b. What are the treatment options? Options include chemical corrosion inhibitors, pH/alkalinity adjustment, stabilizing disinfection residuals, or a combination thereof.
2. How many homes have been sampled? Compliance sampling is summarized above. In addition to this, the City conducted a free sampling event in the early months of 2019 in response to the initial ALE. Other sampling has been conducted by DHHS-Drinking Water sanitarians at select locations to study potential sources of lead.
    a. Is there a good case to be made for more sampling? Yes. EGLE encourages the city to conduct widespread sampling so homeowners know if their water has lead. In fact, an increased number of samples has been required due to the ALE. EGLE has required 60 samples after the ALE, which applies to population bracket of 10,001 to 100,000. This decision was made to be most protective of public health and collect ample data on the water system.
3. How will residents be brought into the conversation about corrosion treatment? They have been notified through PN's that the city has started CCT and will be performing a study to determine optimal treatment. The CWPA's office is also planning a community forum later this month to engage residents (hybrid format).
    a. Are there options for purchasing from another systems? This would require motivation from the City, and successful negotiations between the City and a neighboring community. There are also water quality/compatibility issues that would need to be addressed.

    b. What are the neighboring systems? The city of Benton Harbor is physically connected to, but with normally closed valves, both the City of St. Joseph and Benton Charter Township water systems.

4. Are they getting enough volunteers to collect compliance samples? This has been an ongoing challenge requiring much effort and coordination, but the city was successful in getting enough samples in the last two rounds. This was coordinated with the help of local volunteers.
    a. Are they all collected at homes w/ LSLs? Yes, based on the city's certification forms. Ongoing attempts to verify the service line materials are being integrated into the sampling efforts.
5. Has BH considered applying for DWRF funds to LSL?
    a. Looking for information on LSL pilot grant? Yes, see above. Additional grants are currently underway, including $5.6M from EPA.
6. Is bottled water service being offered? The state is not aware of any bottled water services, but the city or other local organizations may be offering it.
    a. Berrien Co has filters, but some residents may prefer bottled?

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
616-307-0261
www.Michigan.gov/communitywater

From:	Sarkipato, Ernest (EGLE)
To:	Philip, Kris (EGLE); Klein, Jeremy (EGLE); Bolf, Michael (EGLE)
Cc:	Thurston, Brian (EGLE); Lachance, Amy (EGLE)
Subject:	RE: Draft BH VN
Date:	Tuesday, August 13, 2019 8:18:09 AM
Attachments:	RE Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor.msg

Added a bit, somewhat based on the email communications to the city regarding the 60 lead samples (attached).

From: Philip, Kris (EGLE) <PHILIPK@michigan.gov>
Sent: Monday, August 12, 2019 4:40 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Lachance, Amy (EGLE) <LACHANCEA1@michigan.gov>
Subject: Draft BH VN

Staff here started a DRAFT VN for BH. There still needs to be a decision about handling the CCR, but you can get started reviewing what is drafted. Use track changes and mark-up as needed. This VN will be routed through Exec before sending.

MV Letter

MV PN

From: Sarkipato, Ernest (EGLE) []
To: Mike O'Malley [momalley@cityofbentonharbormi.gov]
CC: Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Onan, Brandon (EGLE) [OnanB@michigan.gov]; Bolt, Jennifer (EGLE) [BOLTJ@michigan.gov]; Darwin Watson [dwatson@cityofbentonharbormi.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]
Subject: RE: Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor
Sent: Tuesday, April 30, 2019 09:15:56
Attachment 1: image003.jpg

Mike – we received your request to review our population determination, as well as the number of samples required for lead and copper in 2019 for BH. Below are some notes but I'll cut to the chase. We are keeping the previously determined population for now (9,970), AND will not be reducing the number to 40 this year as you requested. Since I know you appreciate legal references, the authority to designate sampling outside the population windows in the law comes from Rule 732 of the Safe Drinking Water Act administrative rules<https://dtmb.state.mi.us/ORRDocs/AdminCode/1928_2019-035EQ_AdminCode.pdf>.

Further notes:

-The DEQ's previous population determination from 2011 followed our policy, by relying upon the most recent census count with a known adjustments. It will remain at 9,970, likely until the 2020 census data becomes available or some other reliable method of counting residents.

-This population is very close to the 10,000 breakpoint for sampling, which affects the number of lead and copper samples required among other things.

-This number is an estimate of the number of residents of Benton Harbor. There is practically speaking no way to know the exact number of residents in Benton Harbor without a real-time head count. We have to be realistic about the error involved in estimating population.

-Since the population was established in 2011, the city has remained on a sample schedule for lead and copper for systems in the 10,000-100,000 population bracket.

-The actual size of the distribution system has not changed. The nature of the population of Benton Harbor is somewhat unique, consisting of a number of rentals and multi-family units. In addition, there are certainly a number of vacant or abandoned houses.

-The city is currently working on addressing lead in the drinking water and has identified this as a major issue presently affecting public health.

For the above reasons the EGLE has asked the city to conduct "full monitoring" for lead and copper, being two 6-month rounds of 60 samples in 2019. This is technically above the designated population of 9970, and allowed by Rule 732 of the Safe Drinking Water Act. This monitoring is most protective of public health. Future changes in population estimates may result in a reduction of this requirement.

I know this means a lot more headache and work for you specifically. Please lean on educational materials we have developed (previously sent) and consider also leaning on the Health Department's efforts to educate the public on reducing exposure. If there are other ways we can support your sampling efforts and

better protect public health, I’m all ears.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater<http://www.michigan.gov/drinkingwater>

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, April 11, 2019 10:17 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor has begun to feed Orthopolyphosphate as a corrosion inhibitor

So, you are back from vacation, and right back in the saddle.

We basically are doing remote sampling at the new Coupon Rack at City Hall.

I have to improve the sampling system. There was a serious mix up.

HACH quit making DR200 portable kits, but yesterday I found out they have DR 300 kits. I am thinking it best to purchase one of those.

The sampling equipment I bought is a color comparator and it is REAL HARD for our old eyes to see that shade of blue.

I did another WQP set, since I was not crazy about the 1st ones.

I would attaché the results to this email, if I had them cleaned up, so soon.

The real reason for my reply since you copied Jeni and Brandon is this:

Today is April 11, 2019, besides taxes being due in 4 days; lead/copper 1st round sampling is due by the end of June.

1st things 1st. Benton Harbor became a medium water system defined in the SDWA Lead System. However, the Benton Harbor water system was never changed to a medium system when BCT and SJCT left.

BCT and SJCT were both required to collect Lead/Copper based on the change, but Benton Harbor was never granted any kind of change.

Time for it now, don't you think? We talked about it before, but now I have to go out and find new samples (next issue). I would propose 40 of them.

2nd thing 2nd: What sites shall Benton Harbor use? Keep in mind:

1. The City replaced ALL of those 2018 AL exceeded sites with the Pilot Grant.
2. The City also has done service line material assessments, with the Pilot Grant and (probably) identifying several Lead/Galvanized services and even Lead/Lead services.
3. The City did extensive Free Water Lead/Copper sampling and the most recent count for high lead (>16 ppbs, there were no 15 ppbs) is 54 homes.

And, I received some information via a letter but I cannot find the actual documentation on the MDEQ Web Site.

So, stew over thing 1 and thing 2 and let me know.

Thanks,

Mike O'Malley

Benton Harbor Water Superintendent

On Thu, Apr 11, 2019 at 9:32 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>> wrote:

Thank you Mike! Your work in keeping this system operating consistently will be vital in the coming months to help mitigate exposure to lead for BH citizens. I trust we will be conducting follow up sequential

sampling in the near future to ‘test’ the efficacy of the treatment.

Also, please remember to conduct monitoring of ortho phosphate in the distribution system to study the coating. Residuals may be low at first as the coating builds, but should stabilize close to the calculated dose over time.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Mar 27, 2019, at 12:03 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov<mailto:momalley@cityofbentonharbormi.gov>> wrote:

All involved (Ernie you better be on vacation!),

We started feeding the Orthopolyphosphate into the water distribution system here at the plant on Monday afternoon.

We need a few days in a row to iron out a dose of 1.5 ppm. So far we have:

Monday into Tuesday: 1.35 ppm
Tuesday into Wednesday: 1.18 ppm

Ernie and Brandon did tons of work to help us get this going.
Elhorn Engineering is our go-to Contractor for Corrosion Control. They will continue to work with us to evaluate the treatment and make adjustments as needed.

Berrien County has been a REAL PARTNER in this whole lead thing. I do not remember all the names so if you 2, Nicki and Nick can let the others that helped know, that would be great.

Thank you all for all the hard work you put into this whole lead exceedence issue in Benton Harbor.

Some time (hopefully near future) the pipes serving all the residents and business in the City of Benton Harbor's water system will have this protection.

Love (actually, just like) you all,

Mike O'Malley
Benton Harbor Water Superintendent
(269) 363-0575

From:	Ruch, Suzann (EGLE)
To:	Sarkipato, Ernest (EGLE)
Cc:	Nelson, Maureen (EGLE)
Subject:	RE: EGLE Letter to Benton Harbor - Amended ACO
Date:	Monday, March 23, 2020 10:03:34 AM
Attachments:	Exhibit A - Extensions Summary.pdf

Morning –
Shouldn't this attached document (Exhibit A – Extensions Summary) have also been sent to BH, along with the letter and the Amended ACO?
Just wondering – thought that should be part of the package.

Suzann J. Ruch
Senior Executive Management Assistant to Eric Oswald
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
P.O. Box 30817
Lansing, Michigan 48909-8311
517-284-6544 | RuchS@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, March 20, 2020 4:57 PM
To: mmuhammad@cityofbentonharbormi.gov
Cc: emitchell <emitchell@cityofbentonharbormi.gov>; momalley@cityofbentonharbormi.gov; rrice <rrice@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; nbritten@bchdmi.org; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Strong, Regina (EGLE) <StrongR1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Ruch, Suzann (EGLE) <RuchS@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>
Subject: EGLE Letter to Benton Harbor - Amended ACO

Dear Mayor Muhammad,

Please find attached a letter that is intended to provide an update on the Administrative Consent Order (ACO) between the State of Michigan and the City of Benton Harbor, and seek a renewed effort to address remaining items. Your staff has accomplished much over the last 18 months, especially considering the additional challenges they have faced. At this time, we would like to open discussion around a revised ACO to address the remaining items, as you will see in the enclosed documents.

We sincerely appreciate any opportunity to discuss with matter with you and your staff, and expect to fully participate in the search for resolutions to the remaining ACO items. Given our restrictions on meeting in person, it may be best to schedule a group phone call after you've discussed the letter internally. With that said, this matter is of extreme importance to us as well as you, and we are committed to also meeting in person when the time comes.

A hard copy of the letter and attachment will follow next week, although due to reduced staffing levels in the office due to COVID-19, it may be delayed some time. Please do not hesitate to reach out with your initial questions and concerns,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

EXHIBIT A

ACO Compliance Timeline Progress Summary for City of Benton Harbor

Item	Initial Deadline	Extended Deadline	Extension History
Submit a rate study	4/1/19	(completed)	
Upgrade SCADA system for data access and storage	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Install continuous chlorine analyzer on WTP tap	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Corrosion Treatment Study	4/1/19	(completed)	
Distribution Operator in charge	4/1/19	(completed)	1-from 4/1/19 to 5/1/19 2-from 5/1/19 to 5/22/19
Permit and Construct coagulant feed to existing rapid mix	6/1/19	(completed)	1-from 6/1/19 to 8/2/19
Submit plan to implement rate increases	4/1/19	7/1/20	1-from 4/1/19 to 9/30/19 2-from 9/30/19 to 7/1/20
Install flow meter on finished water	4/1/19	12/15/2019 (completed)	1-from 4/1/19 to 6/15/19 2-from 6/15/19 to 9/30/19 3-from 9/30/19 to 12/15/19
Submit updated rate collections plan	5/1/19	12/31/19	1-from 5/1/19 to 9/30/19 2-from 9/30/19 to 12/31/19 ***Deadline not met***
Updated cross connection program including residential accounts	6/1/19	3/31/20	1-from 6/1/19 to 12/31/19
Submit maintenance plan for valves and hydrants	6/1/19	6/30/20	1-from 6/1/19 to 9/30/19 2-from 9/30/19 to 6/30/20
Conduct professional inspection of water tower, or conduct cleaning and repaint interior	6/30/19	12/31/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 12/31/20
Install/repair mussel control system at intake	6/30/19	4/1/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 3/1/20
Repair filter to waste valves	1/31/20	9/1/20	1-from 1/31/20 to 9/1/20

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley
Cc:	Onan, Brandon (EGLE); Ellis Mitchell; Darold Harlan; Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject:	RE: EGLE discussion of Phosphate
Date:	Friday, December 20, 2019 2:44:59 PM

Afternoon it is

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, December 20, 2019 2:41 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: Re: EGLE discussion of Phosphate

Ernie,
Ellis Mitchell and I are on the board of directors of the BH SJ Joint WasteWater Treatment plant.
The board meets the 3rd Thursday of every month.
And the January 16th meeting may be a crucial one for the City of Benton Harbor's Sanitary Sewer System, and I do not want to miss voting and neither should Mr. Mitchell.
(This crucial vote is the main reason I asked the City Commission to appoint me to that Board)

Please change the timing. Enough time before 10:00 am or after the board meeting 1:00 pm.

Or some other possible date and time.

Thanks,

Mike O'Malley
Benton Harbor Water (everything) Superintendent

On Fri, Dec 20, 2019 at 2:25 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Change to accommodate Brandon Onan’s schedule.
>
> Meeting at the WTP to discuss concerns with the current setup for phosphate.

From:	Darold L. Harlan
To:	Sarkipato, Ernest (EGLE); Mike O"Malley; Onan, Brandon (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Cc:	Ellis Mitchell
Subject:	RE: EGLE discussion of Phosphate
Date:	Thursday, January 2, 2020 9:44:33 AM

Just FYI……I will not be able to attend on the 15th. I have a mandatory company meeting on that day. I am fine with getting the information from Ernie and Mike after the meeting, but wanted to make everyone aware of my absence.

Thanks,
Darold Harlan

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Thursday, January 2, 2020 9:17 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Darold L. Harlan <dharlan@fv-operations.com>
Subject: RE: EGLE discussion of Phosphate

If this is in direct response to the increased efforts by the city to collect water rates, the city manager's office should work to support the water distribution staff as it pertains to rate collection. Also, please continue to inform and educate the commission members of the imperative to collect rates. Note, the rate collections plan that was due on 12/31/2019 per the ACO should be discussed with the commission as well.

I'm going to propose to move the meeting to 1/15/2020 at 10AM, as this appears to work for Brandon and myself.

Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, January 2, 2020 9:00 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: EGLE discussion of Phosphate

All,

The meeting Thursday 1/16/2020 afternoon is cancelled.

I have been subpoenaed to 5th District Court on that day.

A subpoena mean all else has to wait, you cannot blow it off.

I found out why on Saturday. It is likely for turning the water off at the NO Tell Motel at 655 Riverview Drive.
Why I got a subpoena, all I did was turn the water off. I better see some support from the City of Benton Harbor.

Mike O'Malley
Benton Harbor Water Operator IN Charge.

On Fri, Dec 20, 2019 at 3:03 PM Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:

> Thanks, I'll be there.
>
> Happy Holidays,
>
> Mike O
>
> On Fri, Dec 20, 2019 at 2:45 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:
>
> > Change to accommodate Brandon Onan's schedule.
> >
> > Meeting at the WTP to discuss concerns with the current setup for phosphate.

The information contained in this message and any attachment may be proprietary, confidential, and privileged or subject to the work product doctrine and thus protected from disclosure. If the reader of this message is not the intended recipient, or an employee or agent responsible for delivering this message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify me immediately by replying to this message and deleting it and all copies and backups thereof. Thank you.

From:	Sarkipato, Ernest (EGLE)
To:	Bolf, Michael (EGLE)
Subject:	RE: Extension
Date:	Tuesday, December 17, 2019 8:08:25 AM
Attachments:	BH Compliance Timeline.pdf

Hi Mike, just a reminder email on this request. We should probably get something drafted up today, as it's after the 12/15/19 deadline for the meter.

From: Sarkipato, Ernest (EGLE)
Sent: Friday, December 13, 2019 2:33 PM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: FW: Extension

See below for a very simple extension request for an ACO item. Mike O is arguing the need for a meter on the finished water, and furthermore is too distracted this month with lead and copper sampling as well as who knows what else.

I'm inclined to allow this extension to focus on lead and copper sample collection, but not sure I want to allow it until June 30. My issue is, since they have phosphate installed and it is based on this metered flow, it's important for the meter to be working and accurate. I'd propose a date of February 28, 2020.

Let me know what you think,

Ernie

From: Roena Rice <rrice@cityofbentonharbormi.gov>
Sent: Friday, December 13, 2019 1:53 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: Extension

Good afternoon Ernie,

I am sending you this email, Per City Manager Ellis Mitchell, requesting an extension on the Finished Water Metering in the ACO to June 30, 2020.

Please confirm the extension and date by contacting City Manager Ellis Mitchell.

Thank you.

--
Roena Rice
City of Benton Harbor
Assistant to the City Manager

Timeline Summary of Benton Harbor Water System Requirements

Completed?	Project Details	Due By	Notes
	Install metering capabilities	12/15/2019	ACO. Extended due to lead time on meter and logistics
	Submit Lead Consumer Notice for 1st round of sampling in 2019	12/21/2019	Reporting violation letter dated November 21, 2019
	Submit rate collection plan	12/31/2019	ACO.
	Collect 60 samples for lead and copper, remembering 1st/5th liter	12/31/2019	Action Level Exceedance (ALE) Requirement
	Collect 10 WQP distribution samples as required by ALE letter	12/31/2019	Action Level Exceedance (ALE) Requirement
	Collect Synthetic Organic Compound sample (SOC)	12/31/2019	quarterly monitoring
	Report Lead and copper samples & WQPs taken by 12/31/2019	1/10/2020	Action Level Exceedance (ALE) Requirement
	Submit updated cross connection control program, staffing support	3/31/2020	ACO. Ensure adequate staffing or contract support for program
	Send Consumer Notice of lead and copper, and sample of the notice	3/31/2020	Action Level Exceedance (ALE) Requirement
	Collect 10 WQP distribution samples as required by ALE letter	3/31/2020	Action Level Exceedance (ALE) Requirement
	Collect Synthetic Organic Compound sample (SOC)	3/31/2020	quarterly monitoring
	Install working mussel feed control system at the raw water intake	4/1/2020	ACO. Submit permit application by 3/1/2020
	Submit plan to inventory valves, and plan for ongoing maintenance	6/30/2020	ACO.
	Collect 60 samples for lead and copper, remembering 1st/5th liter	6/30/2020	Action Level Exceedance (ALE) Requirement
	Collect 10 WQP distribution samples as required by ALE letter	6/30/2020	Action Level Exceedance (ALE) Requirement
	Collect Synthetic Organic Compound sample (SOC)	6/30/2020	quarterly monitoring
	Submit plan to implement rate increases	7/1/2020	ACO.
	CCR is due	7/1/2020	All violations and ALE's from 2019 must be included. *Submit draft for EGLE review is needed.*
	Report Lead and copper samples & WQPs taken by 7/1/2020	7/10/2020	Action Level Exceedance (ALE) Requirement
	Repair filter to waste valves	9/1/2020	ACO.
	Send Consumer Notice of lead and copper, and sample of the notice	9/29/2020	Action Level Exceedance (ALE) Requirement
	Collect 10 WQP distribution samples as required by ALE letter	9/30/2020	Action Level Exceedance (ALE) Requirement
	Collect Synthetic Organic Compound sample (SOC)	9/30/2020	quarterly monitoring
	Annual Compliance Monitoring Due	9/30/2020	See monitoring schedule for 2020.
	Annual Fee Due	11/30/2020	
	Collect Synthetic Organic Compound sample (SOC)	12/31/2020	quarterly monitoring
	Conduct professional inspection of water tower	12/31/2020	ACO. Delayed pending approval to conduct work through DWRF
	Collect one LCR sample from entry point to distribution	3/31/2022	Action Level Exceedance (ALE) Requirement

From:	Ruch, Suzann (EGLE)
To:	Bolf, Michael (EGLE)
Subject:	RE: GLELC Letter
Date:	Tuesday, December 3, 2019 10:29:49 AM
Attachments:	2019-11-26 Nick Leonard - GLELC - Corrosion Control.pdf

Here you go.

Suzann J. Ruch
Senior Executive Management Assistant to Eric Oswald
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
P.O. Box 30817
Lansing, Michigan 48909-8311
517-284-6544 | RuchS@Michigan.gov
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From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Tuesday, December 03, 2019 9:56 AM
To: Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Subject: GLELC Letter

Hi Suzann,

Do you by chance have a copy of the signed letter to the Great lakes Environmental Law Center. I think it went out last week and was signed by Eric.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

November 26, 2019

VIA EMAIL

Mr. Nick Leonard
Great Lakes Environmental Law Center
4444 2nd Avenue
Detroit, Michigan 48201

Dear Mr. Leonard:

SUBJECT: Benton Harbor Corrosion Control – Response

Thank you for your letter of November 6, 2019, regarding the city of Benton Harbor's (City) corrosion control treatment efforts. We appreciate your interest in this issue and welcome suggestions that may lead to optimizing water quality for the residents of the City. We offer the following information about steps taken and factors considered in our decisions.

Following the action level exceedance for lead for the Benton Harbor water system, the City worked closely with the Michigan Departments of Environment, Great Lakes, and Energy (EGLE) and Health and Human Services (DHHS), as well as with the Berrien County Health Department (BCHD). In addition to fulfilling requirements to inform the public of the risks of lead in drinking water, these organizations partnered to provide and distribute point of use filters that are third-party certified to remove lead from drinking water. To date, about 2,500 filters have been distributed and replacement cartridges are presently being distributed daily from the BCHD office. This initial and ongoing process of mitigating exposure to lead in drinking water with filters cannot be emphasized enough and speaks to your concerns in the final paragraph on Page 4 of your letter as a mitigating measure to protect public health.

Both federal and state lead and copper regulations allow the state of Michigan to determine if a corrosion control study is necessary. If deemed necessary, the supply has a year to conduct the study (Michigan regulation), followed by the State having six months to evaluate the results and specify an optimal corrosion control treatment (OCCT). The supply then has one year to install treatment (Michigan regulation). Under this schedule, the City would not have had corrosion control treatment installed and online until May of 2021. Additionally, stabilization can take a year or more to become effective. That means the City may not have realized the full benefit of corrosion control treatment until around May 2022.

To be most protective of the residents of the City, EGLE, in consultation with the City, Carus Corporation, Elhorn Engineering, and the United States Environmental Protection Agency (USEPA) – Region 5, approved installation of corrosion treatment equipment at

the Benton Harbor water plant as quickly as possible. EGLE's approval of the corrosion treatment currently installed is predicated on a requirement for continued study of the efficacy of the corrosion inhibitor through both sequential sampling at various locations in the system, as well as the coupon racks referenced in your letter.

To approve an initial corrosion inhibitor chemical and treatment dose, EGLE relied on recommendations by Carus Corporation, by way of Elhorn Engineering. This recommendation was based on the City's water quality and distribution system materials. It is also supported by observations of analogous water systems with similar source water chemistry.

Because coupon studies can provide meaningful information more quickly than pipe-loop studies, this method was approved to provide information about the effectiveness of the selected treatment. The results from the initial coupon study that Elhorn Engineering performed (post installation of corrosion control treatment) at the City showed that the blend and the dosage currently being used by the City is effectively reducing corrosion rates. The lead coupons showed a corrosion rate in the distribution system of 0.03 mils per year (MPY) on average (ranged from 0.01 to 0.04 MPY). For reference, 0.13 MPY is an acceptable corrosion rate or satisfactory service life of the metals tested and exposed in the plumbing system (ASTM D 2688-94 (1999)). To supplement the coupon study data, it is our intention to coordinate another round of sequential sampling at certain taps in the City. This dataset provides a detailed view of lead release from a variety of sources throughout the distribution system.

Your letter also expresses concern that the USEPA's OCCT manual was not followed in the decision-making process for the City. The manual was, in fact, considered, noting specifically that calcium hardness adjustment (A.K.A. Calcium Stabilization) is not preferred. Additionally, the manual's flow diagrams, based on the City's water quality, suggest they either add caustic soda to raise the pH to 9 – 9.5 or add orthophosphate. In order to facilitate a quickly implemented solution, we determined the orthophosphate addition option would be more reliable. This is due to the number of analogous systems using phosphate as a successful corrosion control treatment, again with similar source water.

The use of proprietary or "trademarked" blends is not uncommon, with many chemical suppliers offering competing products. These products are extremely comparable and are typically readily available.

Finally, regarding your request to stop the current corrosion control study, the City, EGLE, the DHHS, and the BCHD are relying on water filter distribution and public education during this time to mitigate exposure to lead in the system. Upon receipt of additional data from coupon tests and water tap sampling, as well as water quality parameter sampling, we will re-assess the need for a comprehensive corrosion study of different chemicals and dosages.

I would like to invite you to meet in person or via conference call to discuss corrosion control strategies not only for the city of Benton Harbor, but across the state. We can work with you to arrange a date and time for the meeting. If you have questions, please contact me at 517-284-6544; Oswalde1@Michigan.gov; or EGLE, Drinking Water and Environmental Health Division, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Eric J. Oswald, Director
Drinking Water and Environmental Health Division

cc: Ms. Nikki Britten, BCHD
Mr. Steve Crider, DHHS
Mr. Aaron B. Keatley, Chief Deputy Director, EGLE
Ms. Ninah Sasy, EGLE
Ms. Regina Strong, EGLE
Ms. Kris Philip, EGLE
Mr. Brian Thurston, EGLE
Mr. Brandon Onan, EGLE
Mr. Ernie Sarkipato, EGLE

From:	Sarkipato, Ernest (DEQ)
To:	Onan, Brandon (DEQ)
Subject:	RE: Getting Closer to feeding OPP at BH Water Plant
Date:	Thursday, March 7, 2019 1:34:34 PM

I think:

Tapping the header.

Isolating the valve

Running the line for chem feed

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Thursday, March 7, 2019 1:18 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: RE: Getting Closer to feeding OPP at BH Water Plant

Glad to see some progress. Do we know what is holding things up from this being fully completed?

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Thursday, March 7, 2019 12:55 PM
To: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>
Cc: Crider, Steven (DHHS) <CriderS1@michigan.gov>; Nicki Britten <nbritten@bchdmi.org>
Subject: FW: Getting Closer to feeding OPP at BH Water Plant

Folks – an encouraging update from Mr. O'Malley is below. In short, phosphate treatment may begin as early as next week.

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, March 6, 2019 8:28 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: Getting Closer to feeding OPP at BH Water Plant

Ernie,

Thanks for sending the approved Permit No. FEB 25 '199015.

Everything attached to the Permit are here except the McCrometer. That is going to take awhile.

I have an order in for a local contractor to put in my 1 inch live tap for the OPP injector, thinking Thursday.
I will soon have an order in to Elhorn Engineering for 4 Barrels of Carus 8600 and a 30 inch tapping saddle for a 2 inch tap.
My same contractor is confident that he can make that tap as well.

I pulled my contractor Mead and White off of the New Alum Supply project and on to a High Service Pump only Activated 110V Recepticle

They did it today. See attached Pump On Light On: *Req S332682 Mead and White HS Pump on Lights are on.jpeg*
I can start feeding soon but only when the pump is in manual with the proper settings.

I checked and I was told, that even when the power goes off, the Pump will resume where it left off when power returns.
That was a big concern of my electrician this morning.

Now, I still need to find the right testing apparatus for Orthopolyphosphate. The price is not that much.
Now the catalog says "Reactive Phosphate Residual" or some so much, is this what I want?

Tell them in Lansing, that this is soon to be running,

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent

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Tell them in Lansing, that this is soon to be running,
Thanks,
Mike O'Malley
Benton Harbor Water Superintendent

From:	Sarkipato, Ernest (DEQ)
To:	Oswald, Eric (DEQ)
Cc:	Lachance, Amy (DEQ); Krisztian, George (DEQ)
Subject:	RE: Lead levels in Benton Harbor
Date:	Thursday, February 28, 2019 4:13:00 PM
Attachments:	2018-10-22 - City of Benton Harbor - ALE - FNAL.pdf Benton Harbor Compliance Timeline.pdf Summary.png

Hi Eric, see below for a first crack.

-The city's regularly scheduled monitoring in 2018 for lead and copper found an increased number of elevated levels of lead, resulting in the 90th percentile for lead being 22 parts per billion (ppb). This is the city's first exceedance of the action level since the law was implemented in 1992.
-The city has complied with required public education and notification due to the ALE.
-The city offered bottled water to homes with high results.
-The city offered to conduct lead sampling for any resident. So far, about 300 samples have been taken, and the data support the initial 90th percentile of 22 ppb for lead.
-The city is also currently administering a DEQ Lead Pilot Grant to identify and remove lead service lines.
-The DEQ is working with the city to install phosphate chemical treatment to inhibit corrosion system-wide, utilizing the DEQ Grant
-DHHS and DEQ have coordinated with Berrien County Health to investigate the nature of lead in the system (sequential sampling, see attached summary)
-DHHS and DEQ have coordinated with Berrien County Health to provide alternate sources of water (filters).

Let me know if you were thinking of more/different info.

Ernie

From: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Sent: Thursday, February 28, 2019 3:55 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Cc: Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Krisztian, George (DEQ) <krisztiang@michigan.gov>
Subject: FW: Lead levels in Benton Harbor

Ernie – can you give me just a few bullets? Also, if you could attach the background documents (compliance history). Short and to the point. I plan to copy DHHS in my response so they can cover their issues.

Eric

From: Cook, Kara <CookK14@michigan.gov>
Sent: Thursday, February 28, 2019 3:42 PM

To: Oswald, Eric (DEQ) <OswaldE1@michigan.gov>; Seidel, Teresa (DEQ) <SEIDELT@michigan.gov>
Cc: Hernandez, Poppy <HernandezP3@michigan.gov>; Clark, Liesl (DEQ) <ClarkL20@michigan.gov>
Subject: Lead levels in Benton Harbor

Hi Eric and Teresa,

Our West Michigan Director, Poppy Hernandez (CC'd here), wanted more information on the lead situation in the Benton Harbor area. Could you point us in the right direction of who could provide her with some background and an update on the issue?

Thank you!

Kara Cook

Policy Advisor on Energy and Environmental Protection

Office of Governor Gretchen Whitmer
Cookk14@michigan.gov

***This email and any associated documents may contain information that is privileged, confidential, and exempt from disclosure. It is intended for use only by the person to whom it is addressed. If you have received this in error, please (1) do not forward or use this information in any way; and (2) contact me immediately.*

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL and U.S. MAIL

Mr. Darwin Watson
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: 0600
Supply: Benton Harbor
County: Berrien

Dear Mr. Watson:

SUBJECT: Lead and Copper Monitoring - Action Level (AL) Exceedance

The city of Benton Harbor community water supply's ninetieth percentile exceeded the AL for lead during the most recent round of lead and copper monitoring of drinking water taps from June 1, 2018, through September 30, 2018, as summarized below.

Contaminant	AL	MCLG*	90th Percentile Value	Number of Samples Above AL	Range of Sample Results	Typical Source of Contaminant
Lead	15 parts per billion (ppb)	0	22	8	0 ppb - 60 ppb	Corrosion of household plumbing systems; Service lines that may contain lead; Erosion of natural deposits
Copper	1.3 parts per million (ppm)	1.3	0.1	0	0 ppm - 0.1 ppm	Corrosion of household plumbing systems; Erosion of natural deposits

*MCLG: Maximum contaminant level goal means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

An AL exceedance is not a violation, but it triggers other requirements under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). Requirements include water quality parameter (WQP) monitoring, source water monitoring, corrosion control treatment, and public education (PE). Please refer to the "Timetable of Upcoming Requirements" for your specific deadline for each of the following requirements.

Issue a Public Advisory

An amendment to Act 399 on March 29, 2017, requires a public water supply to issue a Public Advisory (PA) within three business days to inform all persons served about the lead AL exceedance. It is the intent of the Department of Environmental Quality (DEQ) to work with you to develop the PA materials to ensure it complies with the requirements set forth in Act 399. Enclosed with this letter is a checklist to document the PA

distribution activities. Please contact the DEQ if you plan to use broadcast media as your delivery method.

Deliver Consumer Notice of Lead and Copper Results
Within 30 days of learning the results, you must provide individual lead and copper tap results to the people who receive water from sites that were sampled, even if lead and copper were not detected. You must also send us certification that you met all delivery requirements along with a sample copy of your consumer notice 90 days after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format, visit http://michigan.gov/deq. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms.

Distribute PE
Sixty days after the end of the monitoring period that exceeded the AL, deliver PE materials to all consumers. Repeat each year until the lead AL is no longer exceeded. This material is intended to educate consumers about lead health effects, sources, and steps to minimize exposure. Enclosed is a template you may use to meet the requirement. Note that the PE material must include information about the exceedance in your water supply, information about what you are doing to reduce lead levels, information about lead service lines in your distribution system, and information about the history of lead levels in your water supply.

Also attached is a checklist of PE activity requirements with a certification form to return to us, no later than ten days after the PE is due, along with a sample copy of the PE material.

Conduct WQP Monitoring
Six months after the start of the monitoring period that exceeded the AL, collect two sets of Water Quality Parameter (WQP) samples, at least 24 hours apart, from your entry point to the distribution system, TP001 (Treatment Plant Tap), and from ten locations in the distribution system. Essentially, WQP sampling must be done twice from each location (entry point and distribution system locations) within a six-month period but cannot be at the same site on the same day. The WQP samples shall be analyzed for pH, alkalinity, calcium, conductivity, chloride, sulfate and temperature. Temperature and pH are field tests and should be completed at the time of sample collection.

If you use the DEQ laboratory, order bottles by calling 517-335-8184 or by downloading the form EQP 2301 *Bottle Order Form* from http://michigan.gov/deqlab. Click on Drinking Water. The tests are analyzed from one sample bottle per location. Request the analyses using the following test codes:

Test Code	Cost	Bottle Number	Test Description
CORR	$51.00	33	Conductivity, Alkalinity, Phosphate, and Calcium
CPH	$13.00	33	pH Determination
R	$18.00	32,33	Chloride, Sulfate

Conduct Source Water Monitoring
By November 30, 2018, collect one set of WQP samples from a source water tap that is representative of raw water before treatment. If you need assistance determining the appropriate sampling point, please contact your District Engineer. The samples should be analyzed for all of the parameters above.

Six months after the end of the monitoring period that exceeded the AL, collect one sample for lead and copper at your entry point to the distribution system. Repeat every third year until both lead and copper ALs are met during the entire three-year period.

Correct the Problem
Minimize lead and copper in drinking water by reducing corrosion of water pipes and household plumbing that contain lead and copper. To accomplish this, you must propose a corrosion control treatment plan or propose to perform a corrosion control study by six months after the end of the monitoring period that exceeded the AL. If treatment is found to be necessary, it must be installed and samples collected to ensure the lead and copper ALs are consistently met. Contact us for guidance on corrosion control options.

Lead and Copper Monitoring
To show the ALs can be met, collect lead and copper samples from 60 sites between January 1 and June 30, 2019, and again between July 1 and December 31, 2019.

You may discontinue the corrosion control study and installation of corrosion control treatment if the action levels are met during future rounds of monitoring.

When selecting new sites, choose the highest Tier criteria available within the distribution system, giving Tier 1 sites first priority. Please see the enclosed tiering criteria to help inform your site selection process. Within 30 days of learning of results, provide individual lead tap results to people who receive water from sites that were sampled. If you have Tier 1, or Tier 2 sites, i.e., sites with a lead service line, compliance sampling will require that you collect a 1st liter and 5th liter sample from each sampling location. Specific instructions regarding the 1st and 5th liter sample collection procedures are currently being developed and will be provided before January 1, 2019. Within 30 days of learning of results from the 1st and 5th liter samples, provide individual lead tap results to people who receive water from sites that were sampled. Even if lead

was not detected, all monitoring, reporting, consumer notification, and DEQ certification requirements remain in effect.

Consumer Confidence Report (CCR)
Include this AL exceedance in your CCR, which is due to our office, your customers, and the local health department by July 1, 2019. You may use the table format from the first page of this letter.

Also, because the lead AL was exceeded, include the following health effects language:

> *Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.*

What Happens Next?
If you can show that both lead and copper ALs are met in two consecutive six-month periods, then many of the requirements outlined in this letter will no longer apply.

However, in the meantime, you must propose a corrosion control treatment plan or propose to perform a corrosion control study. If treatment is found to be necessary, it must be installed. We will work with you to complete these corrosion control steps to optimize your corrosion control treatment.

Timetable of Upcoming Requirements

Complete By	Requirement	Comments
Within three business days	Distribute a Public Advisory	Distribute a Public Advisory to inform all persons served by the water supply of the lead AL exceedance. Distribution of the notice must be in a form and manner designed to fit the specific situation and must be reasonably calculated to reach all persons served by the public water supply.
Right away	Deliver *Consumer Notice of Lead and Copper Results* to persons served at each site tested within 30 days of knowing the result.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
November 29, 2018	Perform PE activities including delivering PE materials to all consumers.	PE required activities are listed in enclosed template and checklist. Repeat every year until the lead AL is met in the most recent round of sampling.
November 30, 2018	Collect WQP raw water samples.	Collect one set of WQP samples that are representative of raw water before treatment.
November 30, 2018	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.

Complete By	Requirement	Comments
December 9, 2018	Send us certification of PE compliance along with a sample copy of the materials delivered.	Sample certification enclosed. Required within ten days of PE distribution.
December 29, 2018	For the Jun-Sep 2018 monitoring, send us certification of consumer notice of lead and copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Microsoft Word or PDF format from http://michigan.gov/deqleadcopper.
Between January 1 and June 30, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due July 10, 2019.**
Between January 1 and June 30, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
March 31, 2019	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.
March 31, 2019	Submit a proposal for optimal corrosion control treatment or a corrosion control study.	Contact us for guidance on corrosion control options. Corrosion control study and treatment installation may cease if both ALs are met during two consecutive six-month monitoring periods.
July 1, 2019	Report the 2018 AL exceedance in the Consumer Confidence Report.	Specific lead health effects language must be included.
Between July 1 and December 31, 2019	Collect 60 samples from the distribution system and have them analyzed for lead and copper.	Report the results to the DEQ and deliver the consumer notice of individual lead and copper results using the downloadable *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate*. **Report due January 10, 2020.**
Between July 1 and December 31, 2019	Collect WQP samples.	Collect two sets of WQP samples from your entry point to the distribution system. Collect two sets of WQP samples at least 24 hours apart from ten locations in the distribution system. Repeat each lead and copper monitoring period until both ALs are met.
September 28, 2019	For the Jan-June 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2020	For the July-Dec 2019 monitoring, send us certification of Consumer Notice of Lead and Copper results compliance along with a sample copy of the notice delivered.	Download *Lead and Copper Report and Consumer Notice of Lead and Copper Results Certificate* in Word or PDF format from http://michigan.gov/deqleadcopper.
March 31, 2022	Collect one lead and copper sample from your entry point to the distribution system.	Repeat every third year until both ALs are met for the whole three-year period.

We recognize that the Lead and Copper Rule is complex and may be confusing. We will continue to offer assistance in implementing these regulations. If you have any questions, please contact us at boltj@michigan.gov; onanb@michigan.gov; or at the phone numbers provided below.

Sincerely,

Jeni Bolt
Environmental Quality Specialist
Technical Support Unit
Drinking Water and Municipal
Assistance Division
517-331-5161

Brandon Onan
Corrosion Control Engineer
Engineering Unit
Drinking Water and Municipal
Assistance Division
616-307-6736

Enclosures (Public Advisory Checklist, Public Education Material Template and Sample Certificate, WQP report form, Tier Criteria)
cc/enc: Mr. Mike O'Malley, City of Benton Harbor
Mr. Ernie Sarkipato, Surface Water Specialist, DEQ
Mr. Jeremy Klein, District Analyst, DEQ

City of Benton Harbor

Water Supply Compliance Summary

2/9/15 Disinfection Byproduct MCL violation for HAA5

6/15/16 TOC sample missed

10/26/17 Missed samples: VOC, Cyanide

2/25/18 Near violation of turbidity limits

3/10/18 Missed E Coli sample

4/17/18 Violation for lack of DBP Precursor (TOC) Removal

4/30/18 - Lead Pilot Grant Awarded $284k

8/1/18 E Coli reporting violation

8/9/18 Violation for TOC removal

8/17/18 Invalidated 3 TOC samples

9/1/18 Invalidated 1 TOC Sample

10/11/18 Missed samples: cyanide, VOC, SOC

11/1/18 Invalidated Sample but August THM>80ppb

11/20/18 Violation TOC removal (3rd Quarter)

2015 *July 16*

Sanitary Survey

Findings of Deficiency for:

-lack of valves in distribution

-poor cross connection program

2016 *April 4*

SS Follow-up

Letter to follow-up, referencing:

-lack of valves, ongoing leaks

-Capital Improvement Plan overdue

2018 *April 16*

Compliance Communication

-Move alum feed point

-VFDs for low lift

-SCADA upgrades

-Filter to Waste

-Coagulant feed model

-High service pumps

2018 *October 3*

Sanitary Survey

Nine Significant Deficiencies Identified, requiring a compliance schedule. See Draft Administrative Consent Order

2018 *October 22*

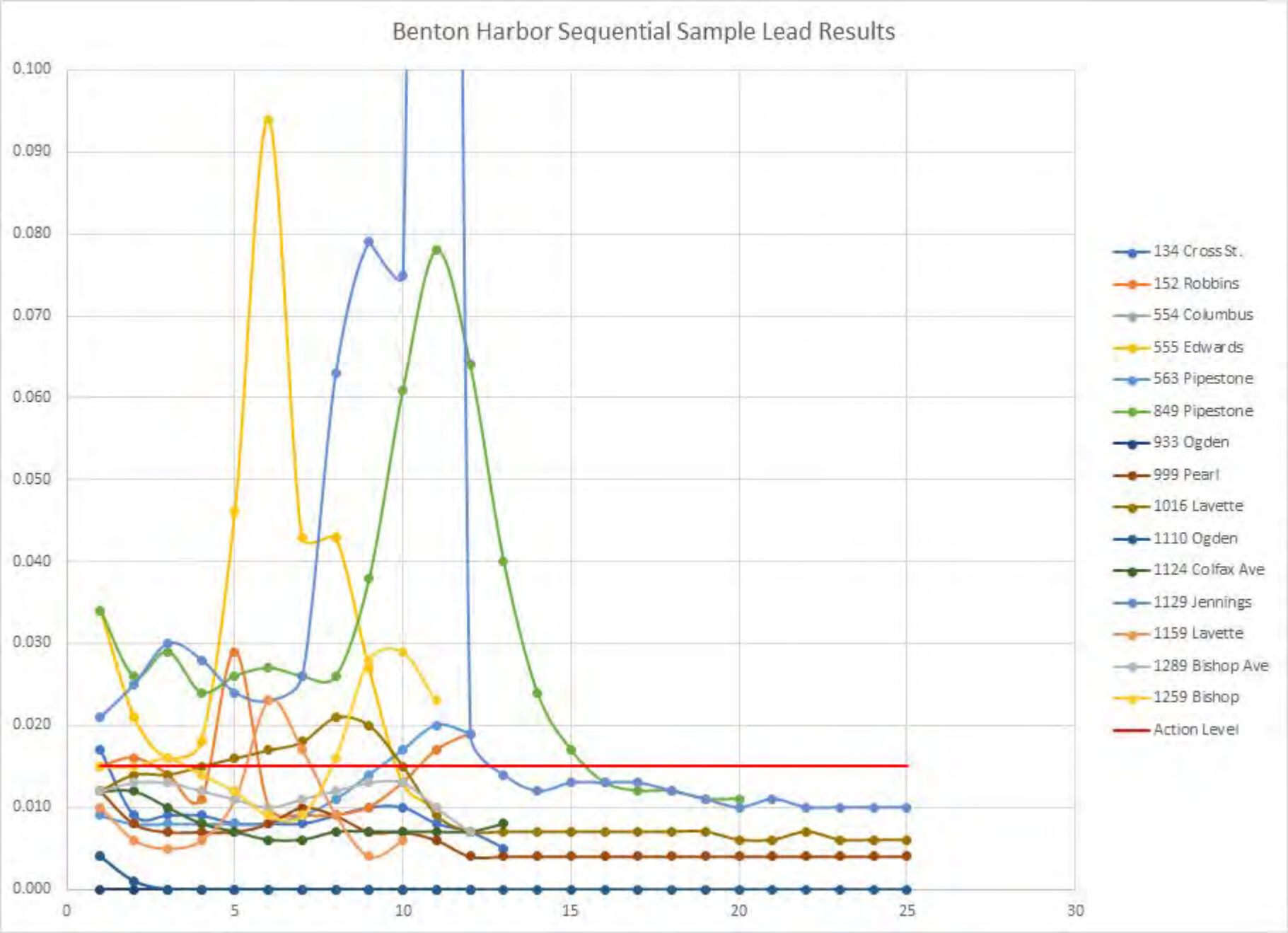
Lead Exceedance

90th Percentile of 22 parts per billion of lead.

Follow-up sampling confirms corrosive water leaching metals from plumbing materials.

11.30.2018

MDEQ - DWMAD


Benton Harbor Sequential Sample Lead Results
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
0
5
10
15
20
25
30
134 Cross St.
152 Robbins
554 Columbus
555 Edwards
563 Pipestone
849 Pipestone
933 Ogden
999 Pearl
1016 Lavette
1110 Ogden
1124 Colfax Ave
1129 Jennings
1159 Lavette
1289 Bishop Ave
1259 Bishop
Action Level

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Bolt, Jennifer (EGLE)
Subject:	RE: MI 0600 Benton Harbor Corrosion Treatment Plan
Date:	Friday, April 26, 2019 1:21:22 PM

Figured. Sure.

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Friday, April 26, 2019 1:21 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Subject: RE: MI 0600 Benton Harbor Corrosion Treatment Plan

We should discuss it and likely will need a conference call or meeting at the plant with Elhorn and Mike to go over expectations and to see what is currently being done.

Can you take lead on setting something up?

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, April 26, 2019 1:04 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Subject: FW: MI 0600 Benton Harbor Corrosion Treatment Plan

Should we discuss this plan?

Do we need to approve it (I assume)?

Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, April 23, 2019 8:28 AM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: MI 0600 Benton Harbor Corrosion Treatment Plan

Please see attached: *MI 0600 Benton Harbor Corrosion Treatment Plan.pdf*

Thank you,
Mike O'Malley
Benton Harbor Water Superintendent

From:	Onan, Brandon (EGLE)
To:	Sarkipato, Ernest (EGLE)
Cc:	Bolt, Jennifer (EGLE)
Subject:	RE: MI 0600 Benton Harbor Corrosion Treatment Plan
Date:	Friday, April 26, 2019 1:20:39 PM

We should discuss it and likely will need a conference call or meeting at the plant with Elhorn and Mike to go over expectations and to see what is currently being done.

Can you take lead on setting something up?

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

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From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, April 23, 2019 8:28 AM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: MI 0600 Benton Harbor Corrosion Treatment Plan

Please see attached: *MI 0600 Benton Harbor Corrosion Treatment Plan.pdf*

Thank you,
Mike O'Malley
Benton Harbor Water Superintendent

From:	Sarkipato, Ernest (EGLE)
To:	elhorneng@aol.com; momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE); mike@michonline.net
Cc:	dwatson@cityofbentonharbormi.gov; Bolt, Jennifer (EGLE)
Subject:	RE: MI 0600 Benton Harbor Corrosion Treatment Plan
Date:	Friday, April 26, 2019 2:59:52 PM

I'm going to hail mary and hope Mr. O'Malley will have a little time Monday afternoon. Will send out a meeting invitation with call-in number.

From: elhorneng@aol.com <elhorneng@aol.com>
Sent: Friday, April 26, 2019 2:20 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE) <OnanB@michigan.gov>; mike@michonline.net
Cc: dwatson@cityofbentonharbormi.gov; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Subject: Re: MI 0600 Benton Harbor Corrosion Treatment Plan

Guys,

I'm in Kalamazoo Monday morning, will be returning to my office around 2-3 pm. Tuesday in Oakland County doing sanitary surveys and do not know when I will return?
I will be in office Wednesday AM and gone PM.

Todd Luks

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

-----Original Message-----
From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
To: momalley@cityofbentonharbormi.gov <momalley@cityofbentonharbormi.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net <mike@michonline.net>
Cc: dwatson@cityofbentonharbormi.gov <dwatson@cityofbentonharbormi.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Sent: Fri, Apr 26, 2019 1:30 pm
Subject: FW: MI 0600 Benton Harbor Corrosion Treatment Plan

Hello Gentlemen,

Brandon and I would appreciate a chance to chat with you to discuss the corrosion treatment plan (attached).

Can you reply with your availability next week Monday afternoon or Tuesday afternoon?

I can set up a call-in number, so we can avoid a coordinated trip out to the water plant.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment Great Lakes and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, April 23, 2019 8:28 AM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: MI 0600 Benton Harbor Corrosion Treatment Plan

Please see attached: *MI 0600 Benton Harbor Corrosion Treatment Plan.pdf*

Thank you,

Mike O'Malley

Benton Harbor Water Superintendent

From: Sarkipato, Ernest (DEQ)
To: Bolt, Jennifer (EGLE); Onan, Brandon (EGLE)
Subject: RE: MI 0600 Benton Harbor Lead and Copper Reports for Action Level in 2018 due 03 31 2019
Date: Friday, April 12, 2019 9:33:27 AM

I see they were to have submitted a plan for optimizing corrosion control treatment by 3/31/2019 per the ALE letter. Anything from Elhorn on this? I recall Mike Enlow saying they would basically describe their proposal for a coupon rack, but I haven't seen anything.

From: Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>
Sent: Friday, March 29, 2019 12:58 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: FW: MI 0600 Benton Harbor Lead and Copper Reports for Action Level in 2018 due 03 31 2019

I received Benton Harbor's source water sample, due by March 31, 2019.

Just an FYI, since you weren't directly copied on the email.

Jeni Bolt

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, March 27, 2019 8:39 AM
To: DEQ-DWMA-Kalamazoo <DEQ-DWMA-Kalamazoo@michigan.gov>; DEQ-DWMA-Grand-Rapids <DEQ-DWMA-Grand-Rapids@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Bolt, Jennifer (DEQ) <BOLTJ@michigan.gov>
Subject: MI 0600 Benton Harbor Lead and Copper Reports for Action Level in 2018 due 03 31 2019

See attached report from *Eurofins Eaton Analytical Lead and Copper sampling on the Water Plant's Raw and Tap lines.pdf*

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent

From: Oswald, Eric (EGLE)
To: Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject: RE: Meeting to discuss corrosion treatment
Date: Friday, February 28, 2020 3:21:54 PM

I am OK with this as long as Dave is willing. We are trying to get him on contract to provide these types of services and others.

Eric

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, February 28, 2020 3:20 PM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: Fwd: Meeting to discuss corrosion treatment

Eric, looking for your go ahead to involve Dr Cornwell in discussions with BH about the corrosion treatment, only as a national expert not as a proposed consultant (at least not formally)

From: David A. Cornwell <DCornwell@cornwellinc.com>
Sent: Friday, February 28, 2020 3:17 PM
To: Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject: RE: Meeting to discuss corrosion treatment

Just making sure Eric is ok with me getting involved. It was he and I and Brandon that first discussed switching Benton Harbor. Its important to keep in mind I haven't seen any of their water chemistry.

I could do 9 am the 5th or later but not 10 am.

I can do 2:30 the 6th

Dave

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, February 28, 2020 3:05 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; David A. Cornwell <DCornwell@cornwellinc.com>
Subject: RE: Meeting to discuss corrosion treatment

Good afternoon Mr. Cornwell,

I wanted to reach out to you to inquire about scheduling a phone conversation with you and the City of Benton Harbor officials regarding their corrosion control treatment. They have been struggling to reduce lead numbers using a 70/30 poly/ortho blend, and we recently designated a chemical composition and treatment target for them. They would like some more discussion regarding that decision, and your name was brought up as an expert in the field. I know you have talked with Brandon Onan in the past, so he will reach out to you to fill you in.

Would you be available either of the following for a phone call with the city officials?

3/5/2020-10:00AM

3/6/2020-02:30PM

Thank you in advance,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Friday, February 28, 2020 2:20 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Meeting to discuss corrosion treatment

Hey,

Just call me Monday. Not sure if this is an action item for me or the city…If you are speaking of Cornwell as the "national expert" I have to know ASAP so that I can get his availability.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, February 28, 2020 1:56 PM
To: rrice@cityofbentonharbormi.gov
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Meeting to discuss corrosion treatment

Good afternoon Ms. Rice,

Please consider the following appointments for a phone conversation with City Manager Mitchell regarding the new corrosion treatment in Benton Harbor. We will be looking to invite a national expert in corrosion control treatment, so please indicate which options are available and we will try to coordinate schedules.

3/3/2020 11:00AM

	1:30PM
	3:00PM
3/5/2020	10:00AM
	1:30PM
	3:00PM
3/6/2020	2:30PM

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Oswald, Eric (EGLE)
To: Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Subject: RE: Meeting to discuss corrosion treatment
Date: Friday, February 28, 2020 3:21:56 PM

I am OK with this as long as Dave is willing. We are trying to get him on contract to provide these types of services and others.
Eric

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, February 28, 2020 3:20 PM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: Fwd: Meeting to discuss corrosion treatment
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Sent: Friday, February 28, 2020 3:17 PM
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Subject: RE: Meeting to discuss corrosion treatment
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I could do 9 am the 5th or later but not 10 am.
I can do 2:30 the 6th
Dave

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Sent: Friday, February 28, 2020 3:05 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; David A. Cornwell <DCornwell@cornwellinc.com>
Subject: RE: Meeting to discuss corrosion treatment
Good afternoon Mr. Cornwell,
I wanted to reach out to you to inquire about scheduling a phone conversation with you and the City of Benton Harbor officials regarding their corrosion control treatment. They have been struggling to reduce lead numbers using a 70/30 poly/ortho blend, and we recently designated a chemical composition and treatment target for them. They would like some more discussion regarding that decision, and your name was brought up as an expert in the field. I know you have talked with Brandon Onan in the past, so he will reach out to you to fill you in.
Would you be available either of the following for a phone call with the city officials?
3/5/2020-10:00AM
3/6/2020-02:30PM
Thank you in advance,
Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Friday, February 28, 2020 2:20 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Meeting to discuss corrosion treatment

Hey,

Just call me Monday. Not sure if this is an action item for me or the city…If you are speaking of Cornwell as the "national expert" I have to know ASAP so that I can get his availability.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, February 28, 2020 1:56 PM
To: rrice@cityofbentonharbormi.gov
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Meeting to discuss corrosion treatment

Good afternoon Ms. Rice,

Please consider the following appointments for a phone conversation with City Manager Mitchell regarding the new corrosion treatment in Benton Harbor. We will be looking to invite a national expert in corrosion control treatment, so please indicate which options are available and we will try to coordinate schedules.

3/3/2020 11:00AM
1:30PM
3:00PM
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1:30PM
3:00PM
3/6/2020 2:30PM

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley
Cc:	Ellis Mitchell; Darold Harlan; Thurston, Brian (EGLE); Bolf, Michael (EGLE); Onan, Brandon (EGLE); Nelson, Maureen (EGLE)
Subject:	RE: Meter at Benton Harbor Water Plant
Date:	Friday, December 20, 2019 10:52:39 AM

We understand your frustration, and appreciate the feedback and information regarding the phosphate project and it's place at the high service suction header. We are interested in discussing your concerns further. Please consider a meeting on January 9 at 10:00AM at the water plant to discuss. We'd also like Mr. Mitchell and Mr. Harlan to be present.

Regarding the need for a finished water meter, please note the reference below. I'm interpreting "means to measure the volume and rate" as only being accomplished by a flow meter with totalizer.

R325.11005 Each treatment system shall be provided with a means to measure the volume and rate of finished water produced.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, December 19, 2019 6:26 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>
Subject: Meter at Benton Harbor Water Plant

Ernie in your email today at 4:09pm you said:

I also will note we received a request to extend the last deadline to fix the finished water meter, which was due on 12/15/2019. This request for an extension is still under discussion, as our staff feel strongly the meter plays an integral part in controlling the amount of corrosion control chemical being added to the drinking water, as well as measuring the amount of water produced.

You have forgotten. That metered control was disabled almost immediately after it was installed. It did not do as intended.

We returned it to Manual Control and plugged the pump back into the Receptacle that is powered up only on a High Service pump running.
The original way I set the plant up so we could feed OPP before the meter came. That began on March 26, 2019.

The idea to close off the suction line a 30" 1949 pipe and valve has proven itself to be a failure.
I did not want to do that, but you all insisted it would work.
Well guess what.

Now I have no clue what happens in my High Service Lift Pump room!

And as you pointed out in an earlier email today, my system is working pretty darn well.

I do not think the special $13,000 meter will do anything like you all think it will.
So, for now, all of you can take this out of consideration.

And as you have referenced in the Regulations:
A water supply must supply a means to determine volume and flow on the finished water.;
And Finished water is defined in the regulation definition section as: *Finished water, is that water that the Water Supply conveys to a community water system.*

And, that is exactly what we have done since 1/1/2019. And added it to a MOR that originally did not have a space for such a number.

Darold Harlon can attest to the great amount of effort and misery this has caused us.

We have asked for an extension for you insistence on an actual meter on the high service lines. And now you say it is under consideration for control of OPP.

Things were so mixed up, that I asked City Manager Ellis Mitchell to request an extension to sort this out.

Sincerely,

Mike O'Malley
Benton Harbor Water Superintendent
And, Acknowledged Operator IN Charge of the Benton Harbor Water System

From:	Green, Kelly (EGLE)
To:	Krisztian, George (EGLE); Sarkipato, Ernest (EGLE)
Cc:	Bolf, Michael (EGLE); Sasy, Ninah (DHHS); Thurston, Brian (EGLE)
Subject:	RE: Opportunities for BH
Date:	Monday, April 6, 2020 9:18:53 AM

It appears that our new grant programs are being considered discretionary and are on hold at this time. Sorry, I cant explain what that means as I'm not sure myself yet. When I have more info I will share, until then and unless Covid-19 related per the Governor's ED, we are not entering into any new grant agreements at this time.

From: Krisztian, George (EGLE) <krisztiang@michigan.gov>
Sent: Monday, April 6, 2020 8:34 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Green, Kelly (EGLE) <GreenK1@michigan.gov>
Subject: RE: Opportunities for BH

Hi Ernie,

I'm looping in Kelly Green, if there is any funds to be had, she would know where they would be. I think that we are in the process of getting a contract together with Cornwell that we might be able to leverage.

George

George L. Krisztian
Assistant Director, Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, April 06, 2020 8:22 AM
To: Krisztian, George (EGLE) <krisztiang@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: Opportunities for BH

Hi George,

Just curious if you've got any nuggets of information regarding possible financial support for the city of Benton Harbor? We are presenting to city commission on Wednesday on a revised ACO, and have some big asks of them including a 'water system capacity study'. I've been informed about three buckets of grants, and I'm just trying to be as well informed as I can going into the presentation.

Three projects that could utilize grant funding are:

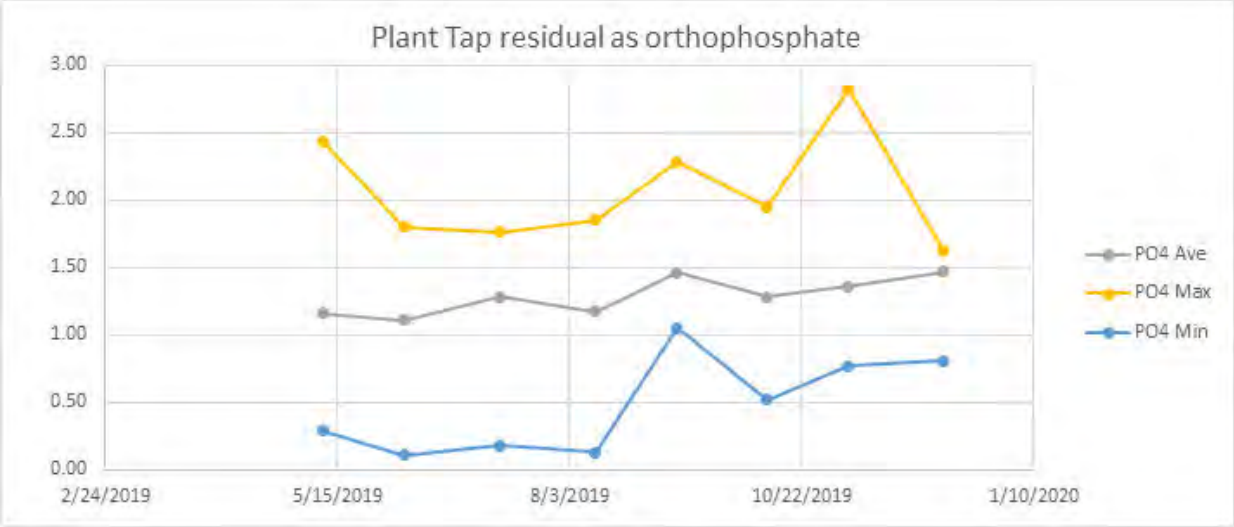
-Mike McDaniel's predictive LSL modeling project
-Curt Wolf at U of M, research on innovated asset management
-capacity study of water system (required by ACO)
-corrosion study, possibly with Dave Cornwell (required by ACO)
-regionalization study

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

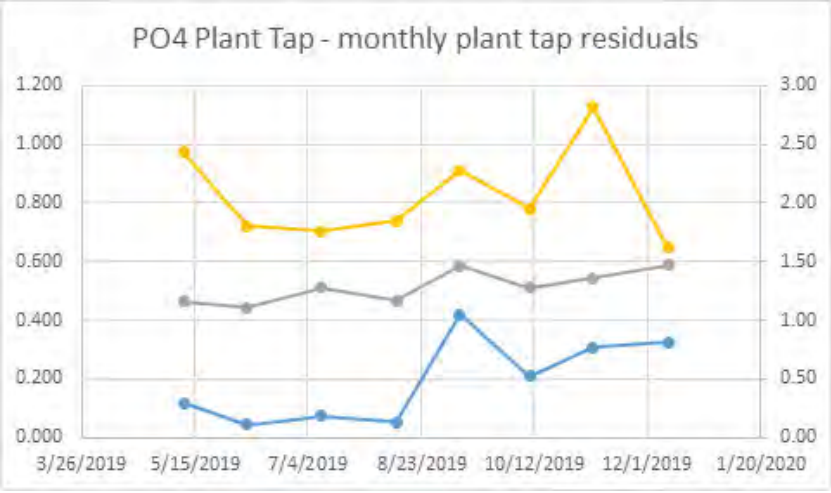
From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject:	RE: PO4 data - Benton Harbor
Date:	Wednesday, December 18, 2019 11:28:36 AM
Attachments:	image005.png RE Benton Harbor Phosphate Addition.msg emails with omalley.pdf image001.png

Better graph, sorry. Target is 1.5 mg/L as total phosphate per attached, although ***I don't see where we have directly communicated this treatment target to the city.*** Based on Mike O's email upon starting up the system, he references 1.5 mg/L but doesn't specify total PO4 or just the orthophosphate portion.



From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, December 18, 2019 11:09 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: PO4 data - Benton Harbor

FYI:



Ernie Sarkipato, P.E.

Surface Water Treatment Specialist
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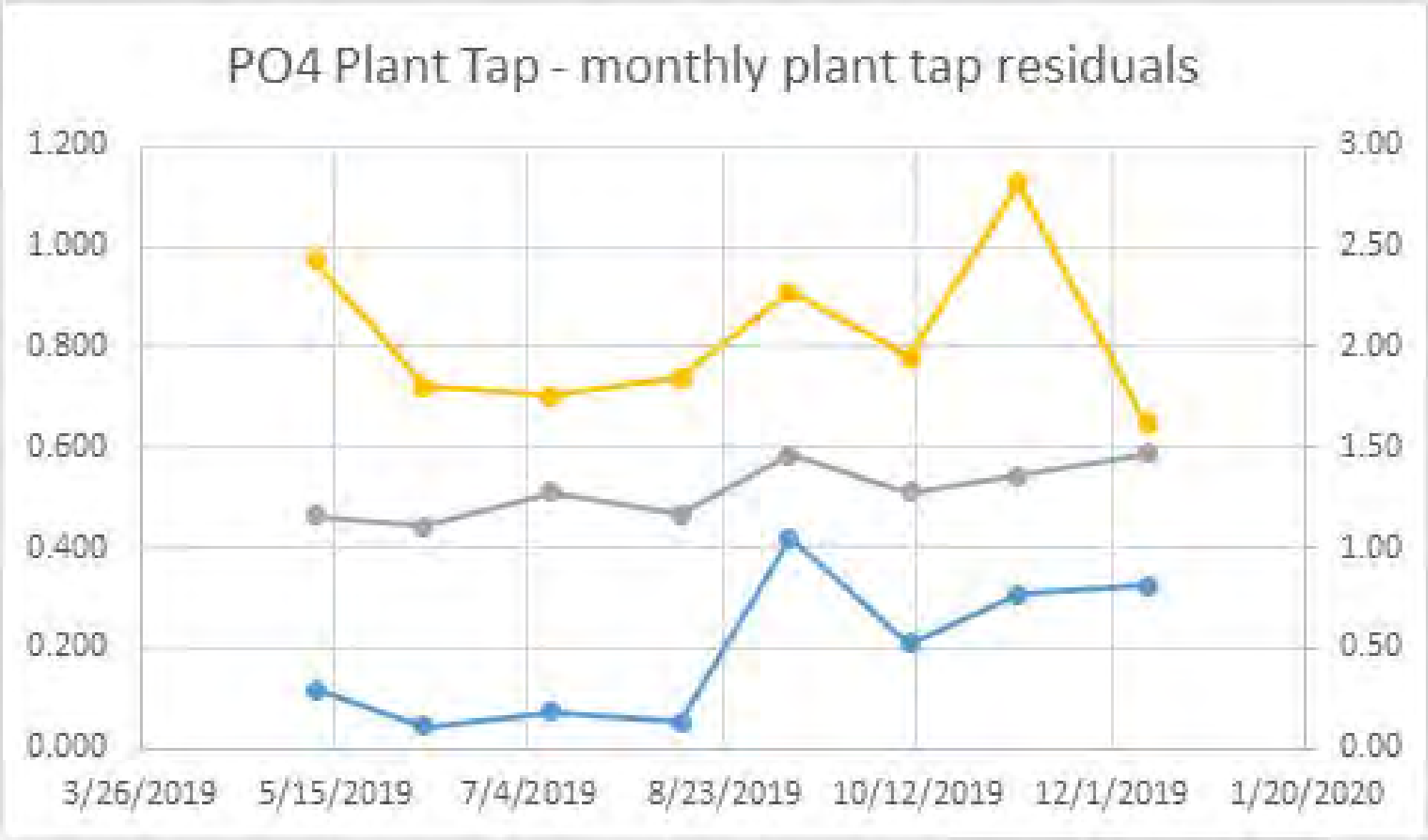

PO4 Plant Tap - monthly plant tap residuals
1.200
1.000
0.800
0.600
0.400
0.200
0.000
3.00
2.50
2.00
1.50
1.00
0.50
0.00
3/26/2019
5/15/2019
7/4/2019
8/23/2019
10/12/2019
12/1/2019
1/20/2020

From: Onan, Brandon (EGLE) []
To: Bolf, Michael (EGLE) [BOLFM@michigan.gov]; Thurston, Brian (EGLE) [THURSTONB@michigan.gov]
CC:
Subject: RE: Benton Harbor Phosphate Addition
Sent: Thursday, February 07, 2019 12:38:24

During subsequent discussions with Elhorn we have agreed to feed at 1.5 ppm as total PO4.

I believe that the feed rates in the table are as total PO4 but when I do the math I get slightly different numbers. Using the chemical concentration of 33%, a product density of 11.4 lbs/gal and the weight of water as 8.34 lbs/gal.

I'm calculating it in the following manor: [(ppm PO4 total)*(MGD*8.34)]/[0.33*11.4] = gpd of product

The following table is setup the same as the one on page 12 utilizing the equation above

MGD

ppm PO4 total

2

3

5

8

1

4.4

6.7

11.1

17.7

2

8.9

13.3

22.2

35.5

3

13.3

20.0

33.3

53.2

Based off this I think the pump selection still holds for up to 5 MGD but will be inadequate for 8 MGD

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

(p) 616.307.6736

onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Bolf, Michael (DEQ) <BOLFM@michigan.gov>
Sent: Thursday, February 7, 2019 10:00 AM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: RE: Benton Harbor Phosphate Addition

Brandon,

I am not in agreement with the chemical use flow rate calculations on Page 12 of the pdf. Elhorn recommends a dose of 1.0 mg/L as PO4. Here again we get into the question of what is meant by PO4? I thought Elhorn and other suppliers usually express their recommended dose as product. So if the 1, 2, and 3 mg/L doses in the table are as product, then the chemical feed rates in gpd are not correct. If the chemical flow rates are based on actual PO4, then I'd like to see how it is calculated.

Can you shine some light on this?

Michael Bolf, P.E.

Engineering Unit Supervisor

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

906-630-4107 (mobile)

From: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Sent: Tuesday, February 05, 2019 8:34 AM
To: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov<mailto:THURSTONB@michigan.gov>>
Subject: FW: Benton Harbor Phosphate Addition
Importance: High

Gentlemen, as the PRT please review the attached permit and let me know if you have any comments.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

(p) 616.307.6736

onanb@michigan.gov<mailto:onanb@michigan.gov>

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>>
Sent: Monday, February 4, 2019 1:53 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: RE: Benton Harbor Phosphate Addition

The proposed meter was changed to a multi-point mag meter from McCrometer, to increase accuracy and provide NSF coating on the stainless steel. Please find an updated permit application attached, for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

www.michigan.gov/drinkingwater<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7COnanB%40michigan.gov%7C638fdccdaab84eb68e4f08d68d0cfbb0%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636851484227380656&sdata=tBgaPt3Euv3p5Lm%2FZjNF5SdMV3Dwfk8oTIzt3CdBoWA%3D&reserved=0>

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 3:22 PM
To: Onan, Brandon (DEQ) <OnanB@michigan.gov<mailto:OnanB@michigan.gov>>
Cc: Bolf, Michael (DEQ) <BOLFM@michigan.gov<mailto:BOLFM@michigan.gov>>
Subject: PRT: Benton Harbor Phosphate Addition

Per our discussion today, please find attached a permit application for corrosion inhibitor for review and recommendation by the Peer Review Team.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

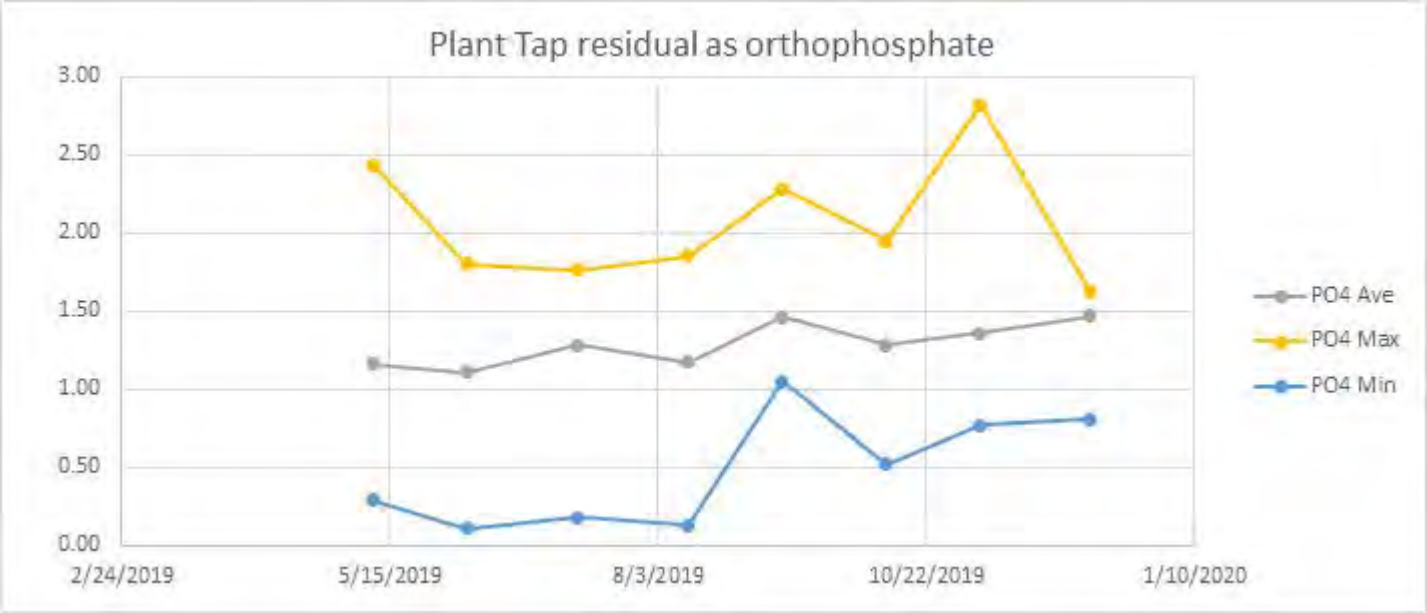
Department of Environmental Quality

616-307-0261 mobile

www.michigan.gov/drinkingwater<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7COnanB%40michigan.gov%7C638fdccdaab84eb68e4f08d68d0cfbb0%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C636851484227390664&sdata=3tUYjd4mf65T%2FumhiMFohOR7%2F%2BfjGezWBUNJAu8g80U%3D&reserved=0>

On Thu, Apr 11, 2019 at 9:32 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thank you Mike! Your work in keeping this system operating consistently will be vital in the coming months to help mitigate exposure to lead for BH citizens. I trust we will be conducting follow up sequential sampling in the near future to 'test' the efficacy of the treatment.
>
> Also, please remember to conduct monitoring of ortho phosphate in the distribution system to study the coating. Residuals may be low at first as the coating builds, but should stabilize close to the calculated dose over time.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> DEQ-Drinking Water and Municipal Assistance Division
> 616-307-0261
>
> On Mar 27, 2019, at 12:03 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:
>
> All involved (Ernie you better be on vacation!),
>
> We started feeding the Orthopolyphosphate into the water distribution system here at the plant on Monday afternoon.
>
> We need a few days in a row to iron out a dose of 1.5 ppm. So far we have:
>
> Monday into Tuesday: 1.35 ppm
> Tuesday into Wednesday: 1.18 ppm
>
> Ernie and Brandon did tons of work to help us get this going.
> Elhorn Engineering is our go-to Contractor for Corrosion Control. They will continue to work with us to evaluate the treatment and make adjustments as needed.
>
> Berrien County has been a REAL PARTNER in this whole lead thing. I do not remember all the names so if you 2, Nicki and Nick can let the others that helped know, that would be great.
>
> Thank you all for all the hard work you put into this whole lead exceedence issue in Benton Harbor.
>
> Some time (hopefully near future) the pipes serving all the residents and business in the City of Benton Harbor's water system will have this protection.
>
> Love (actually, just like) you all,
>
> Mike O'Malley
> Benton Harbor Water Superintendent
> (269) 363-0575


Plant Tap residual as orthophosphate
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/24/2019
5/15/2019
8/3/2019
10/22/2019
1/10/2020
PO4 Ave
PO4 Max
PO4 Min

From:	Onan, Brandon (EGLE)
To:	London, Bob (EGLE); Thurston, Brian (EGLE)
Cc:	Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE)
Subject:	RE: PRT Review for Benton Harbor Phosphate Treatment
Date:	Wednesday, December 4, 2019 2:37:28 PM

Nothing is being asked at this time. We will be having a conversation about BH and CCT in the near future but no action for the PRT now, unless you feel as though you have documentation that has not made its way into this folder:

T:\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\Peer Review Team\00600_Benton Harbor

Thanks,

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: London, Bob (EGLE) <LONDONR@michigan.gov>
Sent: Wednesday, December 4, 2019 2:24 PM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: PRT Review for Benton Harbor Phosphate Treatment

It's not clear whether anything is being asked of the PRT at this time. Could someone fill me in?

Bob London
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
989-450-7834
londonr@michigan.gov
michigan.gov/EGLE

From: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Sent: Wednesday, December 04, 2019 2:00 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; London, Bob (EGLE) <LONDONR@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>

Subject: PRT Review for Benton Harbor Phosphate Treatment

Brandon,

During our phone call earlier today, I was looking for the PRT file folder on this review and was unable to find a folder. I did find the attached e-mail string in my inbox. I am sure you may have more information. Could you create a folder under PRT and place in relevant notes and supporting materials. Also based on the continued Pb ALE we may want to re-open this review with recent LCR data and WQP data since the treatment was started.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E.
Field Operations Section Manager
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
231-590-3430 | thurstonb@michigan.gov
Follow Us | **Michigan.gov/EGLE**

From:	Sarkipato, Ernest (EGLE)
To:	Oswald, Eric (EGLE); Bolf, Michael (EGLE)
Cc:	Thurston, Brian (EGLE); Philip, Kris (EGLE); Nelson, Maureen (EGLE); Krisztian, George (EGLE); Onan, Brandon (EGLE); Ruch, Suzann (EGLE); Strong, Regina (EGLE)
Subject:	RE: Pre-discussion: BH
Date:	Friday, December 20, 2019 8:50:13 AM
Attachments:	extensions summary.xlsx

Mike asked me to put together a status update and summary of extensions to the ACO, attached.

-----Original Appointment-----
From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, December 18, 2019 10:10 AM
To: Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE)
Cc: Thurston, Brian (EGLE); Philip, Kris (EGLE); Nelson, Maureen (EGLE); Krisztian, George (EGLE); Onan, Brandon (EGLE); Ruch, Suzann (EGLE); Strong, Regina (EGLE)
Subject: Pre-discussion: BH
When: Friday, December 20, 2019 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: Skype Meeting

Probably don't need an hour, but blocking it off.

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone

Toll number: +1 (248) 509-0316,,697207073# (Dial-in Number) English (United States)

Find a local number

Conference ID: 697207073

Forgot your dial-in PIN? | Help

_____

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Wednesday, December 18, 2019 10:04 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Subject: RE: Benton Harbor ACO

Mike, thanks for the information. I told Ernie yesterday that we need to closely look at any more extensions and draw a line in the sand so to speak. If you and Ernie recommend not extending a deadline we will take a look and support that. We need to address the next steps after a deadline is missed and how we take action from there to achieve compliance.

Lets set up a call for Friday morning to go over our position.

Eric

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Wednesday, December 18, 2019 9:54 AM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: Benton Harbor ACO
Importance: High

Good Morning Eric,

I have two concerns regarding Benton Harbor that I want to bring to your attention. First, I understand from talking to Ernie and Kris Philip that the meeting with Great Lakes Environmental Law Center and other parties is scheduled for this Friday. Given the number of folks participating and the topic is mainly related to lead, Ernie and I don't necessarily need to participate. However, I recommend we have a brief internal pre-meeting to ensure we work out some potential differences in opinion so we have a unified message. I can have Ernie set this up.

Second, the city has missed yet another ACO deadline and has a request into us for another extension. Maureen, Ernie, and I are all reluctant to continue this pattern and I am requesting that we get direction from the EGLE front office on a strategy. We feel caught between a rock in a hard place. If we take the usual course of action to achieve compliance including escalated enforcement and stipulated penalties, the city may not be willing or able to pay, it will corrode our commitment to work cooperatively, and it still may not be effective. However, if we continue the pattern of allowing them to miss deadlines and request extensions, then the water system remains vulnerable and we are potentially culpable if a problem occurs. Both scenarios have EJ ramifications. Furthermore, we continue to have a difficult time communicating with the city mainly due to the operator in charge. I have asked Ernie not to respond to the most recent extension request until we get the necessary input from department leadership on the best strategy. Please advise.

It should also be emphasized that although lead is the topic getting most attention right now, that is only one of many water system concerns. The last sanitary survey cited multiple significant deficiencies which lead to the ACO. Many of the deficiencies are likely the result of insufficient TMF capacity which has not been resolved. The community public health is vulnerable when the water system is run without proper TMF.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

There were 13 original items to the ACO. This is an update as of 12/20/19:

Item	Initial Deadline	Extended Deadline	Extension History
Submit a rate study	4/1/19	(completed)	
Submit plan to implement rate increases	4/1/19	7/1/20	1-from 4/1/19 to 9/30/19 2-from 9/30/19 to 7/1/20
Upgrade SCADA system for data access and storage	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Install flow meter on finished water	4/1/19	12/15/19	1-from 4/1/19 to 6/15/19 2-from 6/15/19 to 9/30/19 3-from 9/30/19 to 12/15/19
Install continuous chlorine analyzer on WTP tap	4/1/19	(completed)	1-from 4/1/19 to 5/15/19
Distribution Operator in charge	4/1/19	(completed)	1-from 4/1/19 to 5/1/19 2-from 5/1/19 to 5/22/19
Corrosion Treatment Study	4/1/19	(completed)	
Submit updated rate collections plan	5/1/19	12/31/19	1-from 5/1/19 to 9/30/19 2-from 9/30/19 to 12/31/19
Updated cross connection program including residential accounts	6/1/19	3/31/20	1-from 6/1/19 to 12/31/19
Permit and Construct coagulant feed to existing rapid mix	6/1/19	(completed)	1-from 6/1/19 to 8/2/19
Submit maintenance plan for valves and hydrants	6/1/19	6/30/20	1-from 6/1/19 to 9/30/19 2-from 9/30/19 to 6/30/20
Conduct professional inspection of water tower, or conduct cleaning and repaint interior	6/30/19	12/31/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 12/31/20
Install/repair mussel control system at intake	6/30/19	4/1/20	1-from 6/30/19 to 12/31/19 2-from 12/31/19 to 3/1/20
Repair filter to waste valves	1/31/20	9/1/20	1-from 1/31/20 to 9/1/20

From:	Sarkipato, Ernest (EGLE)
To:	Oswald, Eric (EGLE); Nelson, Maureen (EGLE); Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Cc:	Krisztian, George (EGLE); Bishop, Heather (EGLE); Ruch, Suzann (EGLE)
Subject:	RE: Proposed Benton Harbor Letter and ACO
Date:	Monday, March 2, 2020 9:12:18 AM

Thank you Eric. Brandon mentioned he was looking at the ACO relative to any reference to the corrosion study, and was intending to move it over to a central file location for Maureen's purview. I'd like to get a last look before it's out also.

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Monday, March 2, 2020 7:49 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Cc: Krisztian, George (EGLE) <krisztiang@michigan.gov>; Bishop, Heather (EGLE) <BishopH@michigan.gov>; Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Subject: FW: Proposed Benton Harbor Letter and ACO

We are cleared to proceed with the Benton Harbor ACO and cover letter.

From: Keatley, Aaron (EGLE) <KeatleyA@michigan.gov>
Sent: Friday, February 28, 2020 4:15 PM
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Subject: RE: Proposed Benton Harbor Letter and ACO

Thanks for the reminder. I am OK with this. The only question I had was related to our previous discussion on the penalty level. I am comfortable with you making the decision on what you think is best on that front.

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Friday, February 28, 2020 9:50 AM
To: Keatley, Aaron (EGLE) <KeatleyA@michigan.gov>
Subject: FW: Proposed Benton Harbor Letter and ACO

Aaron, this is the email I was referencing. Both the cover letter and the ACO are attached.

Eric

From: Oswald, Eric (EGLE)
Sent: Monday, February 10, 2020 2:00 PM
To: Keatley, Aaron (EGLE) <KeatleyA@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Strong, Regina (EGLE) <StrongR1@michigan.gov>
Cc: Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Subject: Proposed Benton Harbor Letter and ACO

Both are attached for review. We are looking at providing a direct grant to the city to pay for both the TMF study and additional corrosion control studies. We have kept the $500 fine in but will use that to defer cost of compliance activities. We are focusing on one additional staffing position in the city. A position above Mike O'Malley.

We plan to have a meeting in the city to negotiate the timeline. Please let me know if you have any comments or concerns.

Eric

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; dwatson@cityofbentonharbormi.gov
Cc:	Bolf, Michael (EGLE)
Subject:	RE: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad
Date:	Thursday, May 16, 2019 8:36:59 AM
Attachments:	R325.11008.docx Copy of SW MOR Template.xlsx

Mike –

Thank you for the thorough response**.** *Your extension for the meter installation is granted*. Attached is an updated workflow with new due dates. Please note: **DARWIN we need to talk about rate adjustments based on the rate study, as well as your plan for revamping the rate collection process.**

Mike's detailed reply brings in a couple follow-up questions/comments:

-Individual Filter turbidities should also be available on the historian (maybe when the meter gets integrated)
-Who is Darold Harlan …. Is this person from F&V?
-When will F&V be onsite, and what is the contractual arrangement for being onsite (i.e. frequency, on-call, etc)?
-You asked for a legal reference for metering finished water. Finished water is required to be measured (not calculated) by R325.11008 (9), see attached excerpt. Hopefully this satisfies your request for a reference.
-With respect to the DEQ's format on the MOR, I tend to agree with you we need to have a space for both raw and finished water pumping. For the BH plant, the finished water number would be used to calculate approximate phosphate dosage, but the raw water number is needed for the alum. Depending on chlorine application points, you might use either/both. Attached is our current DRAFT template, which I will make a note to add finished water. Regardless, the above legal reference should be sufficient to justify the ACO finding and the project you are currently undertaking.

Thank you, and take care.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>

Sent: Wednesday, May 15, 2019 4:09 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Marcus Muhammad <mmuhammad@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad

Ernie,

I did not particularly know just who to follow up this email to.
I literally do not know a few of the EGLE people on the copy line.
And for some foolish reason, I thought not even the Director of EGLE DW and MAD.

The letter came from Michael Bolff? so he is included. to Mayor Mhhammad, so he is included.
And emailed to Darwin and I , so included.

Since the letter is stating pretty much all plant stuff and S2, I felt compelled to respond.
And, frankly this was your best bet to get it today.
The dates are not dead on, but the activities described are what I believe you needed.

And, forgive me, but I made a brief exception to the ACO Metered Distribution Requirement, as I asked you about this morning.
I plan to continue with my calculated metering for OPP addition; until such time as we have an actual Suction line meter.
Note though:

Benton Harbor will need an extention for the metering requirement as it will take > 8 weeks for the actual meter to be built. and a little time to get a SCADA technician in to add the values.

Add to notes:
The Chlorine injection pump to raw water has been installed but the plugging problem at the intake has returned.
The Alum Supply Line is in and works very well to the re-purposed Polymer Tank.
The 1st Alum pump is here. I need a plumber to install it and the 2nd to arrive.

See Attached:*Reply to letter dated April 1_ 2019 City of Benton Harbor ACO Compliance Schedule.pdf*

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent

R 325.11008 Complete treatment system; design and operation requirements.
Rule 1008. (1) A minimum of 2 units shall be provided for each treatment process for coagulation, sedimentation, and filtration.
(2) A sufficient primary coagulant dose shall be added to create a settleable or filterable floc at all times that a conventional filtration or direct filtration plant is in operation.
(3) Essential chemical systems for the application of disinfectants, primary coagulants, and other chemicals, as required by the department, shall be equipped to provide service at the maximum allowable treatment rate with the largest unit removed from service.
(4) Equipment provided for disinfection required under subrule (3) of this rule shall be capable of treatment at the rated treatment capacity with the largest unit removed from service.
(5) Application points for disinfection shall be provided, or be available, at all of the following locations:
(a) Before coagulation.
(b) Immediately preceding filtration.
(c) Immediately following filtration.
(d) Immediately before entry of finished water into the distribution system.
(6) Each unit or element of a complete treatment system shall be provided with a means to remove it from service without interrupting the treatment process. However, a complete bypass of the coagulation, sedimentation, or filtration processes is prohibited.
(7) Each unit or element of a complete treatment system shall be provided with a means to drain and with overflow control sufficient to prevent flooding of the facility.
(8) Common walls between finished water and water of lesser quality are prohibited.
(9) Each complete treatment system shall be provided with a means to measure the volume and rate of raw water supplied and finished water produced.
(10) A complete treatment system shall be protected from the highest recorded flood elevation or the 100-year flood elevation, whichever is greater.
(11) Components of a complete treatment system which are essential for the protection of the public health and which are required for the production of drinking water on a continuous basis shall be protected from flooding.

History: 1979 AC; 1991 AACS; 2003 AACS.

R 325.11009 Rescinded.
History: 1979 AC; 2003 AACS

Coagulation Parameters

Supply Name : _____
WSSN:

DATE	Million Gallons Treated	Coagulant	Coagulant Applied	Raw		
				Number of Samples	Avg.	Max.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

31						
AVG	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
MAX	0.000	0.0	0.00	0	0.00	0.00
MIN	0.000	0.0	0.00	0	0.00	0.00
TOTAL	0.000	0.0				

Mth/Yr : ___________

Turbidity, Units							
Applied	Individual Filters			Filter Confluence			
Applied Avg.	Max	Max after 15 min	Filter No.	Number of Samples	Avg.	Max	No. of 4 Hr. Compliance periods

#DIV/0!				2	#DIV/0!	#DIV/0!	#DIV/0!
0.00				0	0.00	0.00	0
0.00				0	0.00	0.00	0
				0			**0**

		Plant tap
No. of 4 Hr. Compliance periods >.3 NTU	No. of Samples >0.3 NTU	Plant tap NTU

#DIV/0!	#DIV/0!	#DIV/0!
0	0	0.00
0	0	0.00

From:	Sarkipato, Ernest (EGLE)
To:	Darwin Watson
Cc:	Mike O"Malley; Bolf, Michael (EGLE)
Subject:	RE: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad
Date:	Friday, May 17, 2019 9:01:27 AM

Thank you, please also provide his contact information so I can set up a meeting.

From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Thursday, May 16, 2019 3:53 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Re: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad

Good Afternoon Ernie,

Please find below the answers to questions posed in your email:

Darold Harlan is the person from F&V who has been on site since May 7, 2019. I will provide a copy of the contract no later than Monday, May 20, 2019.

Thanks

On Thu, May 16, 2019 at 8:37 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike –
>
> Thank you for the thorough response**.** *Your extension for the meter installation is granted*. Attached is an updated workflow with new due dates. Please note: **DARWIN we need to talk about rate adjustments based on the rate study, as well as your plan for revamping the rate collection process.**
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> -Individual Filter turbidities should also be available on the historian (maybe when the meter gets integrated)
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used to calculate approximate phosphate dosage, but the raw water number is needed for the alum. Depending on chlorine application points, you might use either/both. Attached is our current DRAFT template, which I will make a note to add finished water. Regardless, the above legal reference should be sufficient to justify the ACO finding and the project you are currently undertaking.

Thank you, and take care.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, May 15, 2019 4:09 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Marcus Muhammad <mmuhammad@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad

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And emailed to Darwin and I , so included.

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Benton Harbor will need an extention for the metering requirement as it will take > 8 weeks for the actual meter to be built. and a little time to get a SCADA technician in to add the values.

Add to notes:
The Chlorine injection pump to raw water has been installed but the plugging problem at the intake has returned.
The Alum Supply Line is in and works very well to the re-purposed Polymer Tank.
The 1st Alum pump is here. I need a plumber to install it and the 2nd to arrive.

See Attached:*Reply to letter dated April 1_ 2019 City of Benton Harbor ACO Compliance Schedule.pdf*

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent

From:	Patton, Karol (DEQ)
To:	Darwin Watson
Cc:	Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Lachance, Amy (DEQ); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE)
Subject:	RE: Request for Alternate Use of Lead Pilot Grant (City of Benton Harbor)
Date:	Wednesday, January 9, 2019 11:49:53 AM

Darwin,

Your request to reallocate approximately $20,000 of the Pilot Grant funds towards corrosion control is approved. You will also receive an approval letter via mail.

Karol Patton
Acting Section Manager
Revolving Loan Section
Drinking Water and Municipal Assistance
PO Box 30817
Lansing, Michigan 48909-8311
517.284.5415

From: Onan, Brandon (DEQ) <OnanB@michigan.gov>
Sent: Tuesday, January 08, 2019 4:19 PM
To: Patton, Karol (DEQ) <PATTONK@michigan.gov>
Cc: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>; Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov>; Bolf, Michael (DEQ) <BOLFM@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>
Subject: RE: Request for Alternate Use of Lead Pilot Grant (City of Benton Harbor)

Karol,

Will this suffice what we need to re-allocate a portion of Benton Harbor's Grant? I attached your previous email for reference.

Thanks for your help and we are eager to get this approved so that the city can begin implementing corrosion control treatment.

Brandon Onan, P.E.
Corrosion Control Engineer
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
(p) 616.307.6736
onanb@michigan.gov

From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Tuesday, January 8, 2019 4:03 PM
To: Patton, Karol (DEQ) <PATTONK@michigan.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Subject: Request for Alternate Use of Lead Pilot Grant (City of Benton Harbor)

Good Afternoon All,

I am sending this email as a follow-up to my email from December 13, 2018.

The City of Benton Harbor ("the City") is not proposing to abandon the activities that were identified in the original grant agreement. The request is to reallocate approximately $20,000 to facilitate the activities identified in the December 13, 2018 email.

The purpose of the request for alternate use of the lead pilot grant is to enhance the corrosion controls that are under the control of the City. This change is attributed to the change in circumstances following the Lead and Copper sampling results for 2018. At the time of application submittal the City had not received its 2018 Lead and Copper results. Subsequently, the City

received the results and it was found that the sample at the 90th percentile exceeded the Action Level.

As a result of the changes in the circumstances in the City, we are proposing to modify the methodologies of the treatment process to implement more corrosion controls. Thus, the request to utilize the grant funding to assist in achieving better public health throughout the community.

If you have any additional questions, feel free to contact me.

Darwin Watson, City Manager

From:	Ruch, Suzann (EGLE)
To:	"nicholas.leonard@glelc.org"
Cc:	nbritten@bchdmi.org; Crider, Steven (DHHS); Keatley, Aaron (EGLE); Sasy, Ninah (DHHS); Strong, Regina (EGLE); Philip, Kris (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE); Sarkipato, Ernest (EGLE); Oswald, Eric (EGLE); Shaler, Karen (EGLE)
Subject:	RE: Response regarding the City of Benton Harbor"s corrosion control treatment efforts
Date:	Wednesday, November 27, 2019 2:34:54 PM
Attachments:	GLELC Inquiry.pdf

Attaching the original November 6 correspondence, for your reference.

Suzann J. Ruch
Senior Executive Management Assistant to Eric Oswald
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
P.O. Box 30817
Lansing, Michigan 48909-8311
517-284-6544 | RuchS@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: Ruch, Suzann (EGLE)
Sent: Wednesday, November 27, 2019 10:37 AM
To: 'nicholas.leonard@glelc.org' <nicholas.leonard@glelc.org>
Cc: nbritten@bchdmi.org; Crider, Steven (DHHS) <CriderS1@michigan.gov>; Keatley, Aaron (EGLE) <KeatleyA@michigan.gov>; Sasy, Ninah (EGLE) <SasyN@michigan.gov>; Strong, Regina (EGLE) <StrongR1@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Thurston, Brian (DEQ) <THURSTONB@michigan.gov>; Brandon Onan (DEQ) (OnanB@michigan.gov) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Shaler, Karen (EGLE) <SHALERK@michigan.gov>
Subject: Response regarding the City of Benton Harbor's corrosion control treatment efforts

Good Morning:

Attached is correspondence from Eric J. Oswald, Director, Drinking Water and Environmental Health Division, Michigan Department of Environment, Great Lakes, and Energy regarding the City of Benton Harbor’s corrosion control treatment efforts.

Please note: This letter is dated 11/26/19; however, due to an internet outage for state offices yesterday, I was not able to send it until this morning. Apologies for the delay.

Suzann J. Ruch
Senior Executive Management Assistant to Eric Oswald
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
P.O. Box 30817
Lansing, Michigan 48909-8311

517-284-6544 | RuchS@Michigan.gov
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ENVIRONMENTAL LAW CENTER

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November 6, 2019

Eric Oswald
Michigan Department of Environment, Great Lakes, and Energy
Drinking Water and Environmental Health Division
Constitution Hall
P.O. Box 30817
Lansing, MI 48909-8311

Re: Benton Harbor Corrosion Control

Dear Mr. Oswald,

As you know, tap sample results collected for the community water supply in Benton Harbor exceeded the lead action level during the monitoring period ending on September 30, 2018. In the wake of the lead action level exceedance, the supply recommended optimal corrosion control treatment and began implementing this treatment in March 2019. Nonetheless, Benton Harbor again exceeded the lead action level during the monitoring period ending on June 30, 2019.

The Great Lakes Environmental Law Center is concerned that Benton Harbor has not properly identified optimal corrosion control treatment for its community water system, and that as a result residents served by that system are being exposed to elevated levels of lead in their drinking water.

The Michigan Lead and Copper Rule outlines the steps that small and medium size water supplies must take regarding the introduction or modification of corrosion control treatment when the supply exceeds the lead action level.[1] First, a water supply is required to recommend optimal corrosion control treatment within 6 months after the end of the monitoring period in which the supply exceeded the lead action level.[2] After this initial recommendation from the water supply, EGLE can either require the water

[1] Mich. Admin. Code R. 325.10604f(2)(e)
[2] Mich. Admin. Code R. 325.10604f(2)(e)(i)

supply to conduct a corrosion control study, or it can specify the optimal corrosion control treatment that the water system must implement.[3] The EPA recommends that any system with lead service lines be required to conduct a corrosion control study.[4] In addition to the Michigan lead and copper rule, the EPA has issued guidance regarding how small and medium water suppliers and state agencies are to meet their obligations for identifying effective corrosion control treatment in the wake of a lead action level exceedance.

Benton Harbor has contracted with the Elhorn Engineering Company ("Elhorn") to identify optimal corrosion control treatment as required by the Michigan lead and copper rule. We are concerned that Elhorn has not conducted a thorough investigation of different corrosion control options to ensure optimal treatment for Benton Harbor. Specifically, Benton Harbor recommended use of a trademarked, blended phosphate inhibitor. This inhibitor, referred to as Carus 8600, consists of an orthophosphate and polyphosphate blend. Additionally, Elhorn proposed to test the efficacy of this treatment using corrosion coupon test racks. We believe there are several problems with this recommendation, and the proposed testing.

First, in recommending the Carus 8600 blend as the corrosion inhibitor, Elhorn does not appear to have followed EPA guidance regarding the development of optimal corrosion control treatment recommendations. Elhorn recommended this corrosion control treatment based on the "generic plan" that it uses, not the unique conditions present in the Benton Harbor water supply. The EPA has provided guidance for the preliminary identification of corrosion control inhibitors in a series of flowcharts.[5] Based on the pH levels detected in finished water samples, EPA guidance identifies a range of potential corrosion control inhibitors that may be appropriate. Neither Benton Harbor nor EGLE appear to have taken this guidance into account, and neither considered other potential corrosion control treatments that may be more effective given the specific conditions present in the Benton Harbor water supply. Instead, Elhorn immediately recommended not only what it believe to be the optimal corrosion control treatment without following EPA guidance, it also recommended a specific dose and equipment to introduce the recommended inhibitor into the system. It appears that Benton Harbor began implementing this recommended corrosion control treatment in March 2019, before it

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[3] Mich. Admin. Code R. 325.10604f(2)(e)(ii)

[4] U.S. EPA, Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems, at 53, Mar. 2016, available at https://www.epa.gov/sites/production/files/2016-03/documents/occtmarch2016.pdf

[5] Id. at 32.

even finalized its corrosion control treatment study design. This is particularly alarming given that the EPA has stated that "special considerations" must be taken into account when introducing blended phosphates. Specifically, the polyphosphate portion of the blend my counteract the benefit of the orthophosphate portion, leading to poor corrosion control.[6] As such, the EPA has stated that "[b]lended phosphates should be used with caution," and recommends that state agencies require a demonstration study and additional monitoring to ensure that it is effective.[7]

Second, the Corrosion Control Treatment Plan and Study Proposal ("Study Proposal") provided by Elhorn does not comply with the requirements of the Michigan or federal lead and copper rule. Both rules require a water supply that performs a corrosion control study to evaluate the effectiveness of several different treatment techniques to inhibit corrosion. These treatment techniques include: alkalinity and pH adjustment; calcium hardness adjustment, and; the addition of a phosphate or silicate based corrosion inhibitor.[8] However, the Study Proposal submitted by Elhorn only stated that it would test the efficacy of the Carus 8600 ortho and polyphosphate blend. It did not call for the study of different corrosion control treatments (as required by the Michigan and federal lead and copper rule), nor did it call for the study of variable doses of the recommended corrosion inhibitor, or different blend ratios of the recommended corrosion inhibitor.

Additionally, we believe there are issues with the testing method proposed by Elhorn. In its Study Proposal, Elhorn stated that it would utilize at least two coupon test racks to determine the efficacy of its recommended corrosion control inhibitor. However, the EPA has noted that while "coupon studies can be useful in determining the corrosion rate" they are of limited use "in predicting the concentration of lead…in water."[9] Other guidance has stated that coupon studies "may be useful for determining corrosion rates of clean metals, but are not relevant for evaluating lead release and lead control at the tap."[10] Despite these warnings,, the coupon study was the only corrosion control study method utilized by the Elhorn Company in its corrosion control study. We believe it's

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[6] Id. at 48.

[7] Id at 43.

[8] Mich. Admin. Code R. 325.10604f(3)(c)(i); 40 C.F.R. 141.82(c)

[9] U.S. EPA, Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems, Appendix F at F-2, Mar. 2016, available at https://www.epa.gov/sites/production/files/2016-03/documents/occtmarch2016.pdf

[10] Id. at 35.

necessary for Benton Harbor to utilize other corrosion control study methods to more accurately predict how the proposed method of corrosion control will limit the concentrations of lead in drinking water. This study should follow the recommendations made by the EPA for demonstration studies.[11]

In summary, Elhorn did not take into account EPA guidance or the unique characteristics of Benton Harbor's water supply in providing its optimal corrosion control treatment recommendation. Instead, it provided a "generic plan" to introduce a blended phosphate to the Benton Harbor water system. Despite the EPA cautioning against the use of this corrosion control treatment without careful examination, it was introduced to Benton Harbor's water supply without examining whether alternative corrosion control treatment would be more effective. Similarly, the Study Proposal did not provide for the analysis of the range of corrosion control treatments as required by both the Michigan and federal lead and copper rule. Instead, the Study Proposal appears to have been written to justify the use of the Carus 8600 corrosion inhibitor recommended by Elhorn.

Aside from the issues described above, the use of a proprietary blend by Benton Harbor presents other issues as well. Even slight changes to a polyphosphate blend can alter its effectiveness at inhibiting corrosion. If the manufacturer of the Carus 8600 blend goes out of business, or raises its prices to the point where Benton Harbor must select another blend, it will need to switch to a different corrosion inhibitor quickly. As such, Benton Harbor should evaluate what alternatives may be substituted for the Carus 8600 blend now, so that it is ready to quickly change its corrosion control treatment without compromising water quality and exposing residents to elevated lead in drinking water.

The Great Lakes Environmental Law Center recommends that EGLE immediately stop the ongoing Benton Harbor corrosion control study and ensure that Benton Harbor provides a study plan that is consistent with the Michigan and federal lead and copper rule, and EPA guidance. Continuing to implement the current study plan continues to divert spending that could be used for an effective corrosion control study. Delay of an adequate corrosion control study continues to expose drinking water customers in Benton Harbor to elevated levels of lead and copper that could be mitigated by distribution of filters, bottled water, and/or improved water treatment. These actions should be taken immediately to protect the residents of Benton Harbor.

---

[11] Id, Exhibit 4.8.

Please contact me so that we can discuss appropriate next steps and track the changes you are making to correct this problem.

Sincerely,

/s/Nick Leonard

Nick Leonard
Executive Director
Great Lakes Environmental Law Center
nicholas.leonard@glelc.org | 313-782-3372

cc: Brandon Onan
Kris Philip
Regina Strong
Ninah Sasy

From:	Sarkipato, Ernest (EGLE)
To:	Sylvester, Matthew (EGLE)
Cc:	Onan, Brandon (EGLE); Bolf, Michael (EGLE)
Subject:	RE: Rough draft: corrosion study rfp
Date:	Tuesday, February 23, 2021 12:53:00 PM
Attachments:	image001.png image002.png

Thank you all for the input!

To clarify, Brandon you added Arcadis to the list but cautioned against providing it. In other words, the list should be removed from this RFP (no doubt), but should it be provided to Abonmarche for the purposes of solicitation?

Ernie

From: Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>
Sent: Tuesday, February 23, 2021 12:01 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Rough draft: corrosion study rfp

I had a few comments , but I think most if not all were addressed in Brandon's edits. The original did not speak to the usage of solubility tests rather than the standard weight loss coupon method. I also questioned the list of vendors, but I am not familiar with how these are usually written/handled. One item that I do not feel has been addressed is the concept of dosages in the "Scope of Work" section. It talks about various corrosion control treatments, but I am not sure if that is specific to both phosphate products and dosages.
Those are my two cents,

-Matt

From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Tuesday, February 23, 2021 11:38 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Rough draft: corrosion study rfp

I've bled all over this…Please feel free to let me know if you want to discuss. I would not provide a list of vendors in this format. I would advise them to complete their RFP and announce it for bid through their normal channels.

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Tuesday, February 23, 2021 9:45 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Rough draft: corrosion study rfp

Checking to see where we are headed with this document, as I have an update meeting w/ the city this afternoon at 3PM.

From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, February 17, 2021 10:36 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Rough draft: corrosion study rfp

Re-sending link, as it didn't work for Mike:

00600_BH_OCCT RFP_ES.docx

From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, February 17, 2021 7:55 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sylvester, Matthew (EGLE) <SylvesterM1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Rough draft: corrosion study rfp

Good morning all,

At the request of Abonmarche on behalf of the city of Benton Harbor, the below draft is the result of my quick and dirty attempt at an RFP for a corrosion optimization study. We are being asked to provide the technical language for this document, for the purpose of (a) getting this study going in earnest, and (b) securing EPA funds through the recent WIIN grant.

Most of the language/ideas here have come from our conversations, and communications we have sent the city regarding this requirement. I realize the LCU's recent effort to develop a state-wide RFP for these services is likely much, much more detailed. Please mark this up as needed bearing in mind the level of detail can likely remain limited. Or, start from scratch if that is easier!

Also please consider adding/deleting from the list of suggested consultants.

CORROSION STUDY RFP DRAFT.docx

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist

Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
616-307-0261
www.Michigan.gov/communitywater

LET'S STAY SAFE TOGETHER

From:	Chris Cook
To:	Sarkipato, Ernest (EGLE)
Subject:	RE: Status Update on City of Benton Harbor EPA WIIN Grant
Date:	Monday, February 1, 2021 3:08:35 PM
Attachments:	image001.png image002.png image003.png image004.png

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Agree. I will let EPA know where we stand.

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, February 1, 2021 2:44 PM
To: Chris Cook <cjcook@abonmarche.com>
Subject: RE: Status Update on City of Benton Harbor EPA WIIN Grant

Indications are that the city manager would prefer to 'start fresh' with a new corrosion expert to propose a study. I think that leaves us squarely back at the start. Step 1, solicitation of proposals by qualified bidders?

From: Chris Cook <cjcook@abonmarche.com>
Sent: Monday, February 1, 2021 1:33 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: Status Update on City of Benton Harbor EPA WIIN Grant

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

What should I tell them? We don't have anything yet? Delete it from the grant? Hold it open for as long as possible?

Christopher J. Cook, PE
President

D 269.926.4548
O 269.927.2295 ext. 132
C 269.876.9290
abonmarche.com

ABONMARCHE

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, February 1, 2021 10:26 AM
To: Chris Cook <cjcook@abonmarche.com>
Subject: RE: Status Update on City of Benton Harbor EPA WIIN Grant

Hi Chris. The last one we had going was not yet acceptable, so I'm hesitant to send anything over. Is this pertaining to the EPA grant?

From: Chris Cook <cjcook@abonmarche.com>
Sent: Friday, January 29, 2021 4:28 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: FW: Status Update on City of Benton Harbor EPA WIIN Grant

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Do you have a copy of the corrosion control study proposal/work plan?

Christopher J. Cook, PE
President

D 269.926.4548
O 269.927.2295 ext. 132
C 269.876.9290
abonmarche.com

ABONMARCHE

From: Bielanski, Andrew <bielanski.andrew@epa.gov>
Sent: Friday, January 29, 2021 4:15 PM
To: Joelle Regovich <jregovich@abonmarche.com>
Cc: Chris Cook <cjcook@abonmarche.com>; Roena Rice (rrice@bhcity.us) <rrice@bhcity.us>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>; Jason Marquardt <jmarquardt@abonmarche.com>; Marquardt, Steve <marquardt.steve@epa.gov>
Subject: Status Update on City of Benton Harbor EPA WIIN Grant

Hi Joelle,

I was getting ready to put together a status email message but you beat me to the punch with this request. I did get your phone message earlier this morning but delayed responding since I had a check-in meeting with my boss Steve Marquardt to discuss your grant. Hopefully a little delay didn't hurt.

First and foremost, I want to let you know that things are proceeding much slower on our end. The information I had before the holidays was overly optimistic and now I do not believe that your grant award can be made in late January or early February timeframe. Grant awards can proceed when all items

needed to make the award are complete and right now I do not know when that will be – I am not going to make any more predictions unless I have better information. My apologies for situation and we will try to do the best we can to accommodate your project schedule.

I did review your work plan and would like to get more information on the corrosion control optimization study – what's involved, is it a demonstration study or desk study, etc. We do have a Lead and Copper rule expert here in our office and I would like to run the optimization study information by her. I am also required to perform a cost review analysis on your work plan so this additional detail on the study will help me perform my analysis.

There are a few outstanding items from our initial meeting and below is a summary of where things currently stand:

- Davis-Bacon wage requirement – I can confirm that there will be a Davis-Bacon wage requirement for the grant. It will be nearly identical to the Michigan EGLE Davis-Bacon requirement for its SRF loans so whatever actions and activities you are doing to satisfy those SRF loans will be the same actions and activities to satisfy the grant requirement.
- American Iron and Steel (AIS) or Buy American – AIS would not apply to your grant since it is a SRF requirement. However, President Biden did sign a new Executive Ordre earlier this week with a new Buy American requirement and EPA attorneys are evaluating the impacts this new Executive Order will have on its programs and grants. Based on experience with other Drinking Water SRF funded lead service line replacement projects there has been little impact with regards to AIS (most materials are not iron or steel) with the possible exemption of cast iron curbside boxes. The new Executive Order may be more stringent and cover other items so please take this into consideration when selecting materials for your project. Again, not sure of the impacts right now but my advice is to err on the side of caution.
- NEPA Environmental Review – There will be a NEPA environmental review but details are still pending.
- Reporting – There will be reporting requirements as part of grant terms and conditions but details are still pending.

As a next step I would like to have another meeting to discuss your project schedule and pending items. I'm not going to schedule anything right now since I would like to see details of your corrosion control optimization study – I may or may not include our Lead and Copper rule expert in this follow-up meeting. Given the slower pace of information being rolled out I anticipate a few more meetings and back-and-forth's in order to iron things out before a grant award is made – my apologies!

If you have any other questions or issues then please let me know.

Thanks!

Andy

Andrew J. Bielanski
Environmental Engineer
State Revolving Fund -- State &Tribal Programs & Support Branch
Phone: (312) 886-0208
Fax: (312) 980-8709

From: Joelle Regovich <jregovich@abonmarche.com>
Sent: Friday, January 29, 2021 1:40 PM

To: Bielanski, Andrew <bielanski.andrew@epa.gov>
Cc: Chris Cook <cjcook@abonmarche.com>; Roena Rice (rrice@bhcity.us) <rrice@bhcity.us>; Ellis Mitchell (emitchell@bhcity.us) <emitchell@bhcity.us>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: EPA-WO-OGWDW-19-01 City of Benton Harbor EPA Grant

Hi Andy,
I am just checking in on this. Is there a status update you can share?

Thanks!
Joelle

Joelle Regovich
Grant Administrator

D 269.926.4579
O 269.927.2295 ext. 150
C 269.326.5442
abonmarche.com

ABONMARCHE

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CONFIDENTIALITY NOTICE: This e-mail and any attachments are for the exclusive and confidential use of the intended recipient. If you are not the intended recipient, please do not read, distribute or take action in reliance upon this message. If you have received this e-mail in error, please notify us immediately and promptly delete this message and its attachments from your computer system. We do not waive any work product privilege by the transmission of this message.

From: Sarkipato, Ernest (EGLE)
To: Oswald, Eric (EGLE); Bolf, Michael (EGLE)
Subject: RE: Time for a call
Date: Thursday, May 20, 2021 1:16:00 PM

No, it's the second that I can recall. I spoke with Jill yesterday and noticed she had that talking point as well. I let her know some of the status on the boil, Corrosion study RFP, and treatment status.

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Thursday, May 20, 2021 1:14 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Fwd: Time for a call

Is this their 3rd boil in 7 months!

Eric

Sent from my iPhone

Begin forwarded message:

> **From:** "Cook, Kara" <CookK14@michigan.gov>
> **Date:** May 20, 2021 at 1:12:03 PM EDT
> **To:** "Oswald, Eric (EGLE)" <OswaldE1@michigan.gov>
> **Cc:** "Keatley, Aaron (EGLE)" <KeatleyA@michigan.gov>, "Clark, Liesl (EGLE)" <ClarkL20@michigan.gov>
> **Subject: Fw: Time for a call**
>
> Hi,
>
> I'll likely call Jill but I'd like an update before doing so so I can communicate our work effectively.
>
> Kara Cook
> Energy and Environment Policy Advisor
> Executive Office of Governor Whitmer
> Michigan.gov/Whitmer
>
> ***This email and any associated documents may contain information that is privileged, confidential, and exempt from disclosure. It is intended for use only by the person to whom it is addressed. If you have received this in error, please (1) do not forward or use this information in any way; and (2) contact me immediately.*
>
> ---
>
> **From:** Jill Ryan <jill@freshwaterfuture.org>
> **Sent:** Thursday, May 20, 2021 12:53 PM
> **To:** Cook, Kara <CookK14@michigan.gov>

Subject: Time for a call

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hi Kara,

I would love to have a short chat about what is going on in Benton Harbor with their lead ALE and now their third boil alert in 7 months. Could we schedule a time to discuss ideas for solutions?

Thanks,
Jill

Jill M. Ryan
Executive Director
Freshwater Future
P.O. Box 2479
Petoskey, MI 49770
(231)348-8200
jill@freshwaterfuture.org
Follow us: Facebook Twitter

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; Onan, Brandon (EGLE)
Cc:	Darold Harlan; Ellis Mitchell; Daniel McGinnis; Michael Clark; Jim and Todd Luks Elhorn Engineerint; Dr R. Johansen; Nicki Britten; Bolf, Michael (EGLE)
Subject:	RE: What constitutes "Gentle Flushing"
Date:	Monday, March 2, 2020 9:45:02 AM

Good morning Mike & all,

We appreciate the quick action to make this improvement. In response to your email, we are scheduling a meeting this Friday, 3/6/2020 at 2:30 PM with City officials, to discuss this change to the city's corrosion treatment along with a national expert on corrosion control treatment, Dr. David Cornwell.

To help inform our meeting attendees, we are requesting the city submit the technical data sheet for the new chemical **as soon as possible.** This should have been done prior to the switch.

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Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Monday, February 24, 2020 6:03 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Daniel McGinnis <dmcginnis@cityofbentonharbormi.gov>; Michael Clark <mclark@cityofbentonharbormi.gov>; Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>; Dr R. Johansen <rjohansen@bchdmi.org>; Nicki Britten <nbritten@bchdmi.org>
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A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.
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Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: What constitutes "Gentle Flushing"

From:	Oswald, Eric (EGLE)
To:	Nicholas Leonard; Ruch, Suzann (EGLE)
Cc:	Krisztian, George (EGLE); Philip, Kris (EGLE); Onan, Brandon (EGLE); Roper, Cyndi; Charlotte Jameson; Orr, Jeremy
Subject:	RE: meeting with GLELC et al re Benton Harbor Corrosion Control
Date:	Friday, December 13, 2019 2:42:15 PM

Cyndi Roper had the same request and Elin has been added to the meeting.

Eric

From: Nicholas Leonard <nicholas.leonard@glelc.org>
Sent: Friday, December 13, 2019 2:40 PM
To: Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Roper, Cyndi <croper@nrdc.org>; Charlotte Jameson <charlotte@environmentalcouncil.org>; Orr, Jeremy <jorr@nrdc.org>
Subject: Re: meeting with GLELC et al re Benton Harbor Corrosion Control

Good afternoon everyone.

I'd like to ask that Elin Betanzo be included on the attendee list for this meeting, particularly for the discussion regarding corrosion control issues.

Nick Leonard
Executive Director
Great Lakes Environmental Law Center
4444 Second Avenue
Detroit, MI 48201
313-782-3372

On Mon, Dec 9, 2019 at 1:46 PM Ruch, Suzann (EGLE) <RuchS@michigan.gov> wrote:

> Outside Attendees:
>
> • Meeting Location: Constitution Hall, 525 West Allegan, Lansing (Map attached)
> • Parking: Public Paid lot at East Entrance; also on-street metered parking and parking in visitor/public paid lots (Map attached)
> • Enter at East Entrance. Photo ID required.
> • Please direct the guard to call Suzann Ruch (517-284-6544 or 517-282-5340) and she will meet them and escort to the meeting room

From:	Sarkipato, Ernest (EGLE)
To:	Bolt, Jennifer (EGLE)
Cc:	Bolf, Michael (EGLE); Lachance, Amy (EGLE); Thurston, Brian (EGLE); Nelson, Maureen (EGLE)
Subject:	Re: BH LCR discussion
Date:	Monday, July 29, 2019 1:21:07 PM

Darwin thinks we should give it a week or two, as his first meeting wish the city manager isn't until next Tuesday.

On Jul 29, 2019, at 10:34 AM, Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov> wrote:

Ernie,

I'd be happy to help with the lead portion of the call, if you'd like.

Jeni

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Monday, July 29, 2019 10:18 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Lachance, Amy (EGLE) <LACHANCEA1@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: RE: BH LCR discussion

Ernie,

I don't think there is any harm in you giving the interim city manager a courtesy call making him aware of the urgency of the ACO. If you are suggesting someone else contact him, let me know. Otherwise feel free to give him a call.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, July 26, 2019 8:31 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Lachance, Amy (EGLE) <LACHANCEA1@michigan.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Klein, Jeremy (EGLE) <KLEINJ1@michigan.gov>
Subject: Re: BH LCR discussion

Darwin was temporarily re-appointed by the mayor, but last night a new city manager was

appointed by the commission. I think our division needs to reach out to him ASAP to make him aware of the ACO, and lead issues. With the school debate ongoing, this is likely low on his radar.

https://www.wsjm.com/2019/07/25/city-commission-appoints-interim-manager/

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
EGLE-Drinking Water and Environmental Health
616-307-0261

On Jul 23, 2019, at 4:57 AM, Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

FYI, It appears the city commission voted to fire Darwin Watson last night, which is going to significantly affect the city's managerial capacity. We need to include Mike O'Malley and probably Mayor Muhammad on any correspondence in the meantime.

https://www.wndu.com/content/news/Benton-Harbor-fires-city-manager-513068521.html

Bear in mind, this has been the subject of debate for some time:

https://www.heraldpalladiuhttps://www.heraldpalladium.com/news/local/watson-s-status-as-city-manager-is-now-unclear/article_6fbd8e79-807f-5448-b71a-c822a973383b.htmlm.com/news/local/watson-s-status-as-city-manager-is-now-unclear/article_6fbd8e79-807f-5448-b71a-c822a973383b.html

Ernie Sarkipato, P.E.
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EGLE-Drinking Water and Environmental Health
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From: Sarkipato, Ernest (DEQ)
To: Lachance, Amy (DEQ)
Cc: Bolf, Michael (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE)
Subject: Re: BH Priority
Date: Friday, February 22, 2019 2:52:10 PM

I met with Mike O'MALLEY and three contractors at the plant yesterday, to discuss the installation of the phosphate feed system. I witnessed Elhorn Engineering installing a scale and mounting a chem pump on the wall, which is good progress... albeit a little ahead of the permit being issued. While the flowmeter is 4 to 8 weeks out for delivery, we are going to move forward with installation in a more simplistic manner until such time the meter can be installed and integrated.

With the peer review team approval today, I would anticipate the permit being issued on Monday.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 22, 2019, at 10:29 AM, Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov> wrote:

Approving the BH permit and then working with the city to get the treatment installed is a high Division priority. Also, Ernie, can you ask them for the status of the ACO again? Thanks - Amy

Amy Lachance, Assistant Director
Drinking Water and Municipal Assistance Division
Michigan Department of Environmental Quality
Work Cell: 616-490-9590

From:	Sarkipato, Ernest (DEQ)
To:	Thurston, Brian (DEQ)
Cc:	Lachance, Amy (DEQ); Bolf, Michael (DEQ); Onan, Brandon (DEQ)
Subject:	Re: BH Priority
Date:	Friday, February 22, 2019 3:09:06 PM
Attachments:	image002.png

I sent an email today asking for an update
On Feb 22, 2019, at 2:55 PM, Thurston, Brian (DEQ) <THURSTONB@michigan.gov> wrote:

Do we know the status to the city's process on approving and signing the ACO?

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E., Community Water Supply Section Manager (Acting)
Drinking Water & Municipal Assistance Division
Michigan Department of Environmental Quality
E-mail: thurstonb@michigan.gov
Direct: (231) 590-3430
Fax (231) 775-4050

Cadillac District Office
120 W. Chapin Street
Cadillac, Michigan 49601
<image002.png> www.michigan.gov/deq

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Subject: Re: BH Priority

I met with Mike O'MALLEY and three contractors at the plant yesterday, to discuss the installation of the phosphate feed system. I witnessed Elhorn Engineering installing a scale and mounting a chem pump on the wall, which is good progress... albeit a little ahead of the permit being issued. While the flowmeter is 4 to 8 weeks out for delivery, we are going to move forward with installation in a more simplistic manner until such time the meter can be installed and integrated.

With the peer review team approval today, I would anticipate the permit being issued on Monday.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 22, 2019, at 10:29 AM, Lachance, Amy (DEQ) <LACHANCEA1@michigan.gov> wrote:

Approving the BH permit and then working with the city to get the treatment installed is a high Division priority. Also, Ernie, can you ask them for the status of the ACO again? Thanks - Amy

Amy Lachance, Assistant Director
Drinking Water and Municipal Assistance Division
Michigan Department of Environmental Quality
Work Cell: 616-490-9590

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

From:	Thurston, Brian (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Vincent, Courtney (EGLE); Sarkipato, Ernest (EGLE); Philip, Kris (EGLE); Oswald, Eric (EGLE); Nelson, Maureen (EGLE); Bolt, Jennifer (EGLE); Bolf, Michael (EGLE); Krisztian, George (EGLE)
Subject:	Re: BH letter of corrosion control treatment
Date:	Wednesday, February 12, 2020 9:12:04 AM

I have no additional comments. Please proceed.

Brian Thurston

Sent from my iPhone

On Feb 11, 2020, at 3:56 PM, Onan, Brandon (EGLE) <OnanB@michigan.gov> wrote:

> Courtney,
>
> Please finalized the letter that is attached to this email for my signature. I anticipate signing this and sending it out tomorrow morning.
>
> Thanks,
>
> Brandon Onan, P.E.
> Lead and Copper Unit Supervisor
> Drinking Water & Environmental Health Division
> Michigan Department of Environment, Great Lakes, and Energy
> 525 West Allegan St.
> P.O. Box 30817
> Lansing, MI 48909
> (p) 616.307.6736
> onanb@michigan.gov
>
> <image001.jpg>
>
> <Draft_Benton Harbor OCCT update_20200203.docx>

From:	Thurston, Brian (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Vincent, Courtney (EGLE); Sarkipato, Ernest (EGLE); Philip, Kris (EGLE); Oswald, Eric (EGLE); Nelson, Maureen (EGLE); Bolt, Jennifer (EGLE); Bolf, Michael (EGLE); Krisztian, George (EGLE)
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> <Draft_Benton Harbor OCCT update_20200203.docx>

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE); Thurston, Brian (EGLE)
Cc:	Bolf, Michael (EGLE)
Subject:	Re: BH sampling
Date:	Thursday, June 13, 2019 1:40:40 PM

(thumbs up) Really appreciate it.

Ernie Sarkipato, P.E.
Drinking Water and Municipal Assistance Division
Michigan Dept. of Environmental Quality
616-307-0261 (cell)

From: Onan, Brandon (EGLE)
Sent: Thursday, June 13, 2019 1:27:57 PM
To: Thurston, Brian (EGLE)
Cc: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE)
Subject: BH sampling

FYI, Steve Crider from DHHS has agreed to use his staff to help out Benton Harbor by finding participants to sample and dropping off kits. The city will need to pick up the samples and send them in for analysis.

I spoke with Mike O and he is happy to get the help. It sounded like from our conversation that he is planning on using the state lab.

I'll continue to work with DHHS and Mike O to make sure things keep progressing and I'll keep you guys in the loop.

Brandon Onan, P.E.
Corrosion Control Engineer
DEQ-DWMAD
(p) 616.307.6736
onanb@michigan.gov

From: Mike O"Malley
To: mike@michonline.net
Cc: Onan, Brandon (EGLE); Mike OMalley; Sarkipato, Ernest (EGLE)
Subject: Re: Benton Harbor Equipment
Date: Monday, December 3, 2018 11:30:31 AM

Brandon,

Your idea is a good one. Particularly because it is on the pump(s) suction line.
Only change: Because we are on the pump suction line, the flow transmitter will need to be IN FRONT of the 1st possible pump to distribution.
I marked up the photo. The 2 pieces of equipment need to nearly be side by side. Unless we do not use the 1st 2 pumps (#1 & # 2)

Thanks,

Mike O'Malley
Benton Harbor Water Supt.

attached: Location of existing corp stop on suction line w notes.jpeg
Corp Stop measure diameter.jpeg

On Mon, Dec 3, 2018 at 10:42 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Brandon and I can touch base this morning and get you a photo of the injection tap we'd hopefully be able to use.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Municipal Assistance Division
>
> Department of Environmental Quality
>
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Monday, December 3, 2018 10:20 AM
> **To:** mike@michonline.net; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>

Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Re: Benton Harbor Equipment

Brandon,

Mike Enlow has a question about a 1-inch Corporation Tap for the proposed quill injection.

He would like to see a picture of the one we have? Could you help me and Mike by letting me know where your idea is going to be located.

If you can, it would be best if you copy the folks involved (especially me) since, we are talking a team effort but the team members are in very different locations, and I am the closest to the water plant.

I am getting excited, that you have come up with such a quick idea, way to go!

Thanks,

Mike O'Malley

Benton Harbor Water Superintendent

(269) 363-0575

momalley@cityofbentonharbormi.gov

see our web page and follow the prompts to Public Works (lead stuff is at the bottom of the HOme Page) at *BHcity.us*

On Mon, Dec 3, 2018 at 9:55 AM Mike Enlow <mike@michonline.net> wrote:

> Hi Mike, Hear is the information that I received from DEQ. If you get a chance take a

quick picture of your corp stop. Thanks much, Mike Enlow, Elhorn Eng Co

Sent from my Verizon Motorola Smartphone

---------- Forwarded message ----------
From: "Onan, Brandon (DEQ)" <OnanB@michigan.gov>
Date: Nov 30, 2018 4:29 PM
Subject: Benton Harbor Equipment
To: mike@michonline.net
Cc:

Hey Mike,

Sorry for the delay, I think I've found a solution to my flow sensor issues so all I'm going to need from Elhorn now (support wise) is for a peristaltic pump that accepts a 4-20 mA signal for pumping variability (approximately 30 gpd), a scale, an injection quill for a 1" corporation stop and the necessary tubing and chemicals. I'm anticipating pumping right out of a 50 gallon drum sitting on a scale less than 75 feet from the injection point.

If you could get me a ballpark quote for these items by maybe noonish on Monday I would appreciate it.

Thanks,

Brandon Onan, P.E.

Corrosion Control Engineer

Drinking Water & Municipal Assistance Division

Michigan Department of Environmental Quality

525 West Allegan St.

P.O. Box 30817

Lansing, MI 48909

(p) 616.307.6736

onanb@michigan.gov

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE)
Cc:	Onan, Brandon (EGLE); Jim and Todd Luks Elhorn Engineerint; Mike OMalley
Subject:	Re: Conference Call 03 06 2020 Water Plant Data Table and SDS New Treatment
Date:	Saturday, March 7, 2020 10:58:22 AM
Attachments:	Table for confrence call 03 06 2020 Benton Harbor Water Plant rev.xlsx

Here you go.

I busted my butt to get this table built for the phone call as requested.
YOu did not notice I also had the wrong Start date.

Thanks for you input, I really needed that.

See revised Attached: *Table for confrence call 03 06 2020 Benton Harbor Water Plant rev.xlsx*

Mike O'Malley
Benton Harbor Water Operator IN Charge

On Fri, Mar 6, 2020 at 3:47 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Thank you Mike. Looks like the distribution residuals are climbing. Were you able to do any flushing to get some turnover since starting the new treatment?
>
> Also, there are two questions we had on the spreadsheet data:
>
> -"Tap Res as P" column D: If this data was collected with the Hach DR300, it should be "Tap Res as PO4", which would be close to the 3.0 mg/L orthophosphate as PO4 that we are asking the city to add.
>
> -"OPP Feed mg/L" column E: If this is really "as product", the formula would be ppm = (lbs chemical) / (million pounds water), for example ppm = (90 lbs chemical) / (8 million pounds water) = 11.25 mg/L as product. The reason this is very important is the NSF max dose for this product is 15 mg/L, and we need you to stay under that number.
>
> Thanks again,
>
> Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, March 6, 2020 2:16 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>; emitchell <emitchell@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Conference Call 03 06 2020 Water Plant Data Table and SDS New Treatment

Everyone,

Attached please find the new OPP use table nearly up to date.

Attached: *Table for confrence call 03 06 2020 Benton Harbor Water Plant.xlsx*

And the SDS provided for

Attached: *Aquadene SK 7661 Carus SDS.pdf*

Thank you,

Mike O'Malley

Benton Harbor Water Operator IN Charge

Benton Harbor Water Plant Table for confrence call 03 06 2020 rev
New Orthopolyphosphate Feed
Starts 02/21/2020 in the morning rev

Date	opp use lbs Neat	Tap Water Hach DR300 Residual as PO4	OPP Feed mg/L
2/21/2020	90	3.13	37.15
2/22/2020	90.4	3.3	32.99
2/23/2020	81.4	2.49	29.40
2/24/2020	76.8	2.65	27.29
2/25/2020	78.8	2.8	23.69
2/26/2020	92.1	2.94	36.38
2/27/2020	95.9	2.77	34.22
2/28/2020	96.3	2.62	32.28
2/29/2020	80.3	2.95	28.94
3/1/2020	82.5	2.95	29.80
3/2/2020	87.4	2.95	31.47
3/3/2020	45.8	2.47	
3/4/2020		3.06	
3/5/2020		2.99	
3/6/2020		3.01	

March 4, Distribution	
Site	Hach DR300 Residual as PO4
1	2.06
3	1.29
4	1.58
5	272
7	2.46

WQP		
Chloride	Sulfate	Ratio
30.5	27	1.130
28.5	30	0.950
28	29	0.966
33	35	0.943
28.5	35	0.814

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; Vincent, Courtney (EGLE); Onan, Brandon (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE)
Cc:	emitchell@cityofbentonharbormi.gov; dharlan@fv-operations.com; nbritten@bchdmi.org; elhorneng@aol.com; Mike O"Malley
Subject:	Re: Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)
Date:	Tuesday, February 18, 2020 8:04:18 AM

Brandon mentioned to me he was intending to send you the EPA's manual on corrosion treatment. I believe you may find that here-

https://www.epa.gov/dwreginfo/optimal-corrosion-control-treatment-evaluation-technical-recommendations

Ernie

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Thursday, February 13, 2020 5:29:12 PM
To: Vincent, Courtney (EGLE) <VincentC4@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: emitchell@cityofbentonharbormi.gov <emitchell@cityofbentonharbormi.gov>; dharlan@fv-operations.com <dharlan@fv-operations.com>; nbritten@bchdmi.org <nbritten@bchdmi.org>; Mike OMalley <momalley@cityofbentonharbormi.gov>; elhorneng@aol.com <elhorneng@aol.com>
Subject: Re: Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)

Brandon,

You have put the City of Benton Harbor in a bad place.
I just placed the order, yesterday with Elhorn Engineering for 70/30 OPP because as I told you Tuesday, we are running out.

Todd,
I need this order called back. I cannot make the EGLE Deadline of 2/28/2020 because if I receive 4 more barrels I will not use it all up in less than a month. If we run out this week or early next week and we do not have a new load of OPP 90/10, our treatment process will end until the new load arrives. Do you have the 90/10 OPP from Caurs available to deliver instead?

As you know the City abided by all of the requirements put out as a means to protect our residents from potential Lead contamination.
The City greatly appreciates the work you did and the efforts to allow us to use MDEQ Pilot Grant Funding to be reimbursed. The submittal for that reimbursement has just yesterday been submitted to Clarence at the DWRLF Division.
At that time, EGLE seemed quite comfortable with Elhorn Engineering's treatment scheme. And at that time, it was made clear that this scheme would not achieve full and expected results for at least 18 months. Under EGLE's insistence, treatment started on March 26, 2019. In order to get the treatment started that quickly we had an electrician set up controls for only

when the High Lift Pumps were in operation.

Also at that time, I was relying on EGLE and Elhorn Engineering to set up a corrosion treatment scheme for Benton Harbor. I had reservations about not fully understanding what we were doing and what impact the treatment scheme might have other than good quality corrosion reduction. I've tried to find any kind of Corrosion protection information I could, but have had little success finding anything that would help me understand what we are doing. I relayed that sentiment to you at your Lead Conference just 2 days ago. You replied that you could link me up with a fairly good corrosion study. I really want that NOW.

I have stated many times to EGLE that the present OPP must be working based upon the Water Quality Parameters we have taken that indicate our distribution is well on its way to being NON Corrosive! The EGLE reply to that was, anagolous to saying that the OPP did not change the corrosion characteristics from our tap water being very corrosive to being less and less corrosive as the treatment began to circulate around the distribution system. More like "*must have been something else*"

Instead we receive a sequence of demands starting in **BOLD** print in paragraph 4. That also implies that the OPP 90/10 will have to be purchased at someplace, like Elhorn Engineering, but more likely from a chemical vendor, such as Carus, as long as it has the NSF 60 Certification for drinking water. The letter goes on to site Regulations to the Safe Drinking Water Act, which implies some one (me) needs to read and understand this portion of the regulation.

Soon after in paragraph 5, the EGLE is attempting to relieve itself from any worry that this scheme (**the one in bold type)** may or may not work "fingers crossed";thus transferring responsibility to the City under another set of the Regulations to the Safe Drinking Water Act, which appears to demand THE CITY have a study done by a 3rd party Corrosion Specialist and will not allow other water plant successes be used. As if Lake Michigan changes by the mile. And we all treat the water our own way.

This not news, just a little "horse after the cart"difference from the Federal regulations published by the EPA's Lead/Copper Legislation back in 1991. The language seems to imply that Elhorn Engineering will not be accepted as the Corrosion Engineer specialist any more.

Then in the 6th you help enforce the Administration Consent Order Metering requirement by demanding that we again manipulate a 70 year old valve, which I have frequently stated my fears that we have already damaged that valve. Which was a critical piece of equipment for Benton Harbor's water staff desperately needed to use during the numereous occassions in the past where the room was completely flooded and the plant could NOT deliver water to its consumers.
A risk I am little by little refusing to take. I saw it flood 4 out of the 6 times, and marveled at the effort taken to close several valves in order to stop it.

You close out your letter fully anticipating our cooperation. You will have as much of it as possible, but maybe not in 11 days. You go on to say, "if you have any questions" feel free to accept this reply as one of my many questions.
Sincerely,
Mike O'Malley
Benton Harbor Water Operator IN (but seemingly not completely in) Charge.

On Thu, Feb 13, 2020 at 1:37 PM Vincent, Courtney (EGLE) <VincentC4@michigan.gov> wrote:

> Hi Mr. Mitchell,
>
> Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding water system corrosion treatment for the city of Benton Harbor (WSSN: 00600). A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, Drinking Water and Environmental Health Division, by email at OnanB@Michigan.gov or by phone at 616-307-6736.
>
> Thank you,
>
> Courtney Vincent, Secretary
>
> Technical Support Unit
>
> Community Water Supply Section
>
> Drinking Water and Environmental Health Division
>
> Michigan Department of Environment, Great Lakes, and Energy
>
> 517-284-5424 | VincentC4@Michigan.gov
>
> **Follow Us** | **Michigan.gov/EGLE**

From:	Mike O"Malley
To:	Vincent, Courtney (EGLE); Onan, Brandon (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE); Sarkipato, Ernest (EGLE)
Cc:	emitchell@cityofbentonharbormi.gov; dharlan@fv-operations.com; nbritten@bchdmi.org; Mike OMalley; elhorneng@aol.com
Subject:	Re: Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)
Date:	Thursday, February 13, 2020 5:29:28 PM

Brandon,

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Todd,
I need this order called back. I cannot make the EGLE Deadline of 2/28/2020 because if I receive 4 more barrels I will not use it all up in less than a month. If we run out this week or early next week and we do not have a new load of OPP 90/10, our treatment process will end until the new load arrives. Do you have the 90/10 OPP from Caurs available to deliver instead?

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Technical Support Unit

Community Water Supply Section

Drinking Water and Environmental Health Division

Michigan Department of Environment, Great Lakes, and Energy

517-284-5424 | VincentC4@Michigan.gov

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From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; Vincent, Courtney (EGLE); Onan, Brandon (EGLE); Oswald, Eric (EGLE); Bolf, Michael (EGLE)
Cc:	emitchell@cityofbentonharbormi.gov; dharlan@fv-operations.com; nbritten@bchdmi.org; elhorneng@aol.com; Mike O"Malley
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Cc: emitchell@cityofbentonharbormi.gov <emitchell@cityofbentonharbormi.gov>; dharlan@fv-operations.com <dharlan@fv-operations.com>; nbritten@bchdmi.org <nbritten@bchdmi.org>; Mike OMalley <momalley@cityofbentonharbormi.gov>; elhorneng@aol.com <elhorneng@aol.com>
Subject: Re: Copy of Water System Corrosion Treatment Letter for Benton Harbor (WSSN: 00600)

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Also at that time, I was relying on EGLE and Elhorn Engineering to set up a corrosion treatment scheme for Benton Harbor. I had reservations about not fully understanding what we were doing and what impact the treatment scheme might have other than good quality corrosion reduction. I've tried to find any kind of Corrosion protection information I could, but have had little success finding anything that would help me understand what we are doing. I relayed that sentiment to you at your Lead Conference just 2 days ago. You replied that you could link me up with a fairly good corrosion study. I really want that NOW.

I have stated many times to EGLE that the present OPP must be working based upon the Water Quality Parameters we have taken that indicate our distribution is well on its way to being NON Corrosive! The EGLE reply to that was, anagolous to saying that the OPP did not change the corrosion characteristics from our tap water being very corrosive to being less and less corrosive as the treatment began to circulate around the distribution system. More like "*must have been something else*"

Instead we receive a sequence of demands starting in **BOLD** print in paragraph 4. That also implies that the OPP 90/10 will have to be purchased at someplace, like Elhorn Engineering, but more likely from a chemical vendor, such as Carus, as long as it has the NSF 60 Certification for drinking water. The letter goes on to site Regulations to the Safe Drinking Water Act, which implies some one (me) needs to read and understand this portion of the regulation.

Soon after in paragraph 5, the EGLE is attempting to relieve itself from any worry that this scheme (**the one in bold type)** may or may not work "fingers crossed";thus transferring responsibility to the City under another set of the Regulations to the Safe Drinking Water Act, which appears to demand THE CITY have a study done by a 3rd party Corrosion Specialist and will not allow other water plant successes be used. As if Lake Michigan changes by the mile. And we all treat the water our own way.

This not news, just a little "horse after the cart"difference from the Federal regulations published by the EPA's Lead/Copper Legislation back in 1991. The language seems to imply that Elhorn Engineering will not be accepted as the Corrosion Engineer specialist any more.

Then in the 6th you help enforce the Administration Consent Order Metering requirement by demanding that we again manipulate a 70 year old valve, which I have frequently stated my fears that we have already damaged that valve. Which was a critical piece of equipment for Benton Harbor's water staff desperately needed to use during the numereous occassions in the past where the room was completely flooded and the plant could NOT deliver water to its consumers.
A risk I am little by little refusing to take. I saw it flood 4 out of the 6 times, and marveled at the effort taken to close several valves in order to stop it.

You close out your letter fully anticipating our cooperation. You will have as much of it as possible, but maybe not in 11 days. You go on to say, "if you have any questions" feel free to accept this reply as one of my many questions.
Sincerely,
Mike O'Malley
Benton Harbor Water Operator IN (but seemingly not completely in) Charge.

On Thu, Feb 13, 2020 at 1:37 PM Vincent, Courtney (EGLE) <VincentC4@michigan.gov> wrote:

> Hi Mr. Mitchell,
>
> Please see attached for a copy of a letter from the Michigan Department of Environment, Great Lakes, and Energy regarding water system corrosion treatment for the city of Benton Harbor (WSSN: 00600). A hard copy of this letter has also been sent to you via U.S. Mail. If you have any questions regarding this correspondence, please contact Mr. Brandon Onan, Supervisor, Lead and Copper Unit, Community Water Supply Section, Drinking Water and Environmental Health Division, by email at OnanB@Michigan.gov or by phone at 616-307-6736.
>
> Thank you,
>
> Courtney Vincent, Secretary
>
> Technical Support Unit
>
> Community Water Supply Section
>
> Drinking Water and Environmental Health Division
>
> Michigan Department of Environment, Great Lakes, and Energy
>
> 517-284-5424 | VincentC4@Michigan.gov
>
> **Follow Us** | **Michigan.gov/EGLE**

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE)
Cc:	emitchell@bhcity.us; elhorneng@aol.com; rrice@bhcity.us; Darold Harlan; Lesia Osler; Mike O"Malley
Subject:	Re: Corrosion Study Plan Discussion
Date:	Monday, September 14, 2020 4:11:51 PM

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

I spoke with Todd this morning and agreed to try this again. I am looking forward to his comments. And If I can figure out a way to share my screen I have a great deal of evidence of the OPPs performance in the year 2019.
Much different than the evidence you and Brandon provided with the February 20, 2020 Demand. I never really knew that much but, I believe I am learning that the present treatment is detrimental to the City Water system and the residents of our City.

Ellis please forgive, but the previous sentences are now on the record, and I feel better.

Mike O'Malley
Benton Harbor's Community Water Supply's Operator IN Charge

On Mon, Sep 14, 2020 at 3:52 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Ms. Rice, please confirm this new date and time works for the City Manager.
>
> ---
>
> Join Microsoft Teams Meeting
>
> +1 248-509-0316 United States, Pontiac (Toll)
>
> Conference ID: 536 789 180#
>
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>
> ---

From:	Sarkipato, Ernest (EGLE)
To:	Thurston, Brian (EGLE)
Cc:	Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Subject:	Re: Corrosion Study Plan Discussion
Date:	Friday, September 11, 2020 4:38:34 PM

I can't speak for Mike O'Malley; it seems he's frustrated about something. We should work through the city manager.

From: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Sent: Friday, September 11, 2020 4:24:14 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: FW: Corrosion Study Plan Discussion

Hey Ernie,

What am I missing here, the meeting was for today and Ellis could not attend? So why will Monday not work? This is not a new meeting. You have been trying to schedule this for a while. We need to meet to review our concerns with the information provided and get feedback and clarifications from their consultant on the proposed study. Mike's comments below accent the importance of Ellis attending this meeting.

If you should have any questions with this e-mail please contact me to discuss.

Sincerely,
Brian E. Thurston, P.E.
Field Operations Section Manager
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
231-590-3430 | thurstonb@michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: Mike O'Malley <momalley@bhcity.us>
Sent: Friday, September 11, 2020 3:45 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; emitchell@bhcity.us; elhorneng@aol.com; Darold Harlan <dharlan@fv-operations.com>; Lesia Osler <losler@bhcity.us>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; rrice@bhcity.us; Mike O'Malley <momalley@bhcity.us>
Subject: Re: Corrosion Study Plan Discussion

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Roena (and Ellis)

No. I cannot be ready with only a weekend.

Ellis, as a In house water team, we have NOT had any discussion regarding the Corrossion Study.

We as a City (you and me) have agreed to pay the fee to Elhorn Engineering.

Keep in mind. This was an ORDER sent to the City from EGLE as an additional requirement to change treatment and double the dose.
We changed on February 20, 2020 with only help from Todd at Elhorn Engineering.
The State provided 1 confrence call in Mid March 2020 when I insisted that I did not know what this aggressive dose of OPP at this doubling of the rate would do to our system.
They had David Cromwell PHD chime in that I had no worries. And of of course, he was many "Who Saved Flint".

Since then, EGLE has denied that I have seen dramatic changes in the lead results but more importantly a more significant rise in Copper results that I had never seen before in the past.
Literally a 90% increase in COPPER RESULTS in the 1st half of 2020's 63 lead and copper tests.
Thaw was entirely rejected by EGLE to have nothing to do with corrosion.
I also thouroughly disproved their EGLE study that prompted the Meeting with Ernie, Brandon, you and I about questioning the corrosion protection in the 2019 series of Lead and Copper testing
A paper which I easily showed the the Lead levels at various houses were falling down

On Fri, Sep 11, 2020 at 1:32 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Per the City's request, we agree to cancel this meeting to ensure the city manager can attend.
>
> **Roena, please confirm new date of Monday, September 14 at 1:00PM works for the City Manager and water team?**
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater

From: Ellis Mitchell
To: Sarkipato, Ernest (EGLE)
Cc: Darel Rice; Jim and Todd Luks Elhorn Engineerint; Darold Harlan; Lesia Osler
Subject: Re: Corrosion Study Plan Discussion
Date: Friday, August 28, 2020 4:44:50 PM

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Ernie;

Mike has been busy with emergencies this week and is requesting that the meeting be postponed until another date. I am asking that we honor that request, and meet at a time and date that is best for him. Thanks in advance.

Ellis

Ellis

On Fri, Aug 28, 2020 at 3:07 PM Mike O'Malley <momalley@bhcity.us> wrote:

> Hey team.
>
> I sent him what he asked for.
> I do not like the idea of EGLE learning the details of our Corrosion Control Plan before we do.
>
> The corrosion treatment they crammed down our throats back in February.
> Came to us from EGLE with no background or evidence of its use (other than Flint)
> I have told you this before: "BENTON HARBOR IS NOT FLINT"
> We've done all the things Right!
>
> I am seeing changes in the Lead and Copper testing that I have never seen,
> They do not know what they are doing and do not care!
> Todd Lucks and his company have done great things for Benton Harbor.
> And he told me what I am seeing.
> Something I could tell A nice woman on Water Street who is afraid to drink her hot tea; that it will be okay!
>
> Please reply **NO** to Ernie's invite.
> Not till we know what we are getting and going to do.
>
> Sincerely
> Mike O'Malley
>
> On Fri, Aug 28, 2020 at 1:33 PM Ellis Mitchell <emitchell@bhcity.us> wrote:
>
>> Darel;
>> FYI and continued participation. As you can see, I am coping Ernie and the rest of the EGLE Team to make sure you are added to the In-House Water Team.
>> Ellis

---------- Forwarded message ---------
From: **Sarkipato, Ernest (EGLE)** <SARKIPATOE@michigan.gov>
Date: Fri, Aug 28, 2020 at 11:36 AM
Subject: Corrosion Study Plan Discussion
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>, Onan, Brandon (EGLE) <OnanB@michigan.gov>, emitchell@bhcity.us <emitchell@bhcity.us>, Mike O'Malley <momalley@bhcity.us>, elhorneng@aol.com <elhorneng@aol.com>, Darold Harlan <dharlan@fv-operations.com>, Lesia Osler <losler@bhcity.us>
Cc: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>

We would like to request a discussion with the City and Mr. Luks with Elhorn, regarding the detailed corrosion study plan (attached).

Join Microsoft Teams Meeting

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Conference ID: 536 789 180#

Local numbers | Reset PIN | Learn more about Teams | Meeting options

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From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Thurston, Brian (EGLE); Onan, Brandon (EGLE)
Cc:	emitchell@bhcity.us; elhorneng@aol.com; rrice@bhcity.us; Darold Harlan; Lesia Osler; Mike O"Malley
Subject:	Re: Corrosion Study Plan Discussion
Date:	Monday, September 14, 2020 4:11:51 PM

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I spoke with Todd this morning and agreed to try this again. I am looking forward to his comments. And If I can figure out a way to share my screen I have a great deal of evidence of the OPPs performance in the year 2019.
Much different than the evidence you and Brandon provided with the February 20, 2020 Demand. I never really knew that much but, I believe I am learning that the present treatment is detrimental to the City Water system and the residents of our City.

Ellis please forgive, but the previous sentences are now on the record, and I feel better.

Mike O'Malley
Benton Harbor's Community Water Supply's Operator IN Charge

On Mon, Sep 14, 2020 at 3:52 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Ms. Rice, please confirm this new date and time works for the City Manager.
>
> ---
>
> Join Microsoft Teams Meeting
>
> +1 248-509-0316 United States, Pontiac (Toll)
>
> Conference ID: 536 789 180#
>
> Local numbers | Reset PIN | Learn more about Teams | Meeting options
>
> ---

From:	elhorneng@aol.com
To:	momalley@cityofbentonharbormi.gov; Sarkipato, Ernest (EGLE)
Cc:	Onan, Brandon (EGLE)
Subject:	Re: Coupon Test Report
Date:	Thursday, October 17, 2019 11:01:01 AM

Mike,

On the second page you will see the "Corrosion Rate Scale". The Copper scale is basically the same as for Lead. Anything below 0.2 mpy has minimal corrosion. Your results for Lead has nothing over 0.05 mpy.

Todd

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

-----Original Message-----
From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: elhorneng@aol.com <elhorneng@aol.com>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Sent: Thu, Oct 17, 2019 10:42 am
Subject: Re: Coupon Test Report

Ernie:
FYI: New material replaced when the existing were removed. Study appears to be on-going at the Water Plant and City Hall.

And, as we discussed before, the attempt for a baseline corrosion study was un-successful and removed.

I do not quite understand what the results mean? What is the rating for corrosion severity for Lead?

Thanks,

Mike O'Malley
Benton Harbor Water Operator IN Charge.

On Thu, Oct 17, 2019 at 10:24 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Thanks Todd.
>
> I assume there are new coupons back in these two racks?
>
> And, did you get a pre-phosphate rack installed?
>
> Ernie
>
> **From:** elhorneng@aol.com <elhorneng@aol.com>
> **Sent:** Thursday, October 17, 2019 9:41 AM

To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; momalley@cityofbentonharbormi.gov
Subject: Coupon Test Report

Guys,

Please see attached coupon results.

Todd

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

From:	Curtis Brzyski
To:	Onan, Brandon (EGLE); jmommersmmiinc@gmail.com
Subject:	Re: DEQ - Flowmeter - Insertion Style
Date:	Monday, December 3, 2018 10:18:31 AM
Attachments:	LT-65650131r3.2-20170503-EX100-200-Specdeq.pdf LT-65650318r1.7-20180223-FT430-440-450-Specdeq.pdf

---

Brandon,

Enclosed are the specification data sheets for the insertion meter we discussed
I highlighted the options you may need.
James please work up a quote for
sensor EX250-08-15 (hot tap and reverse flow)
remote transmitter with 30 feet of cable FT440W-139 (120 VAC power)

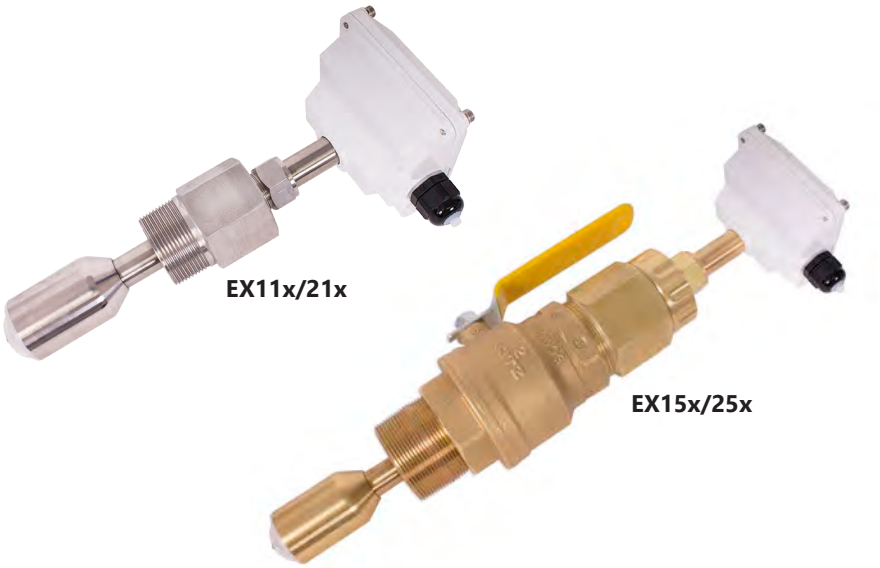
Thank you,

Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

> ----- Original Message -----
> **From:** James Mommers
> **To:** curtis brzyski ; onanb@mich.gov
> **Sent:** Friday, November 30, 2018 1:09 PM
> **Subject:** DEQ - Flowmeter - Insertion Style
>
> Brandon Onan at 616-307-6736, needs application suggestion for flowmetering system.
>
> James L. Mommers
> Midwest Municipal Instrumentation, Inc.
> 517-764-4736 - Office
> 517-250-1650 - Cell

EX100/200-SERIES
INSERTION ELECTROMAGNETIC FLOW SENSOR

Seametrics
Precision Flow Measurement
An ONICON Brand



APPLICATIONS

3" - 48" pipe (up to 72" optional)
Clean or "dirty" liquids
Conductive liquids
Municipal
Industrial
Irrigation

Features

- No moving parts
- Durable
- Adjustable depth
- Hot-tap available
- Brass or stainless steel
- Immersibility available
- Reverse flow output available

Contact Your Supplier

The **EX100/200-Series** are adjustable depth insertion magmeters that fit 3" to 48" pipe (up to 72" optional). The complete lack of moving parts of the EX100/200-Series is the source of its reliability. Brass and stainless steel models withstand a variety of temperature, pressure, and chemical conditions. The EX-Series has no rotor to stop turning in dirty water and there are no bearings to wear out. Like all magmeters, when used in chemical injection applications, these meters should be installed upstream of the chemical line (or far enough downstream to allow complete mixing of fluids before the meter). Adapters mate with standard 1-1/2" (11x/21x) or 2" (15x/25x) FNPT threaded fittings such as saddles and weldolets which may be purchased either locally or from Seametrics.

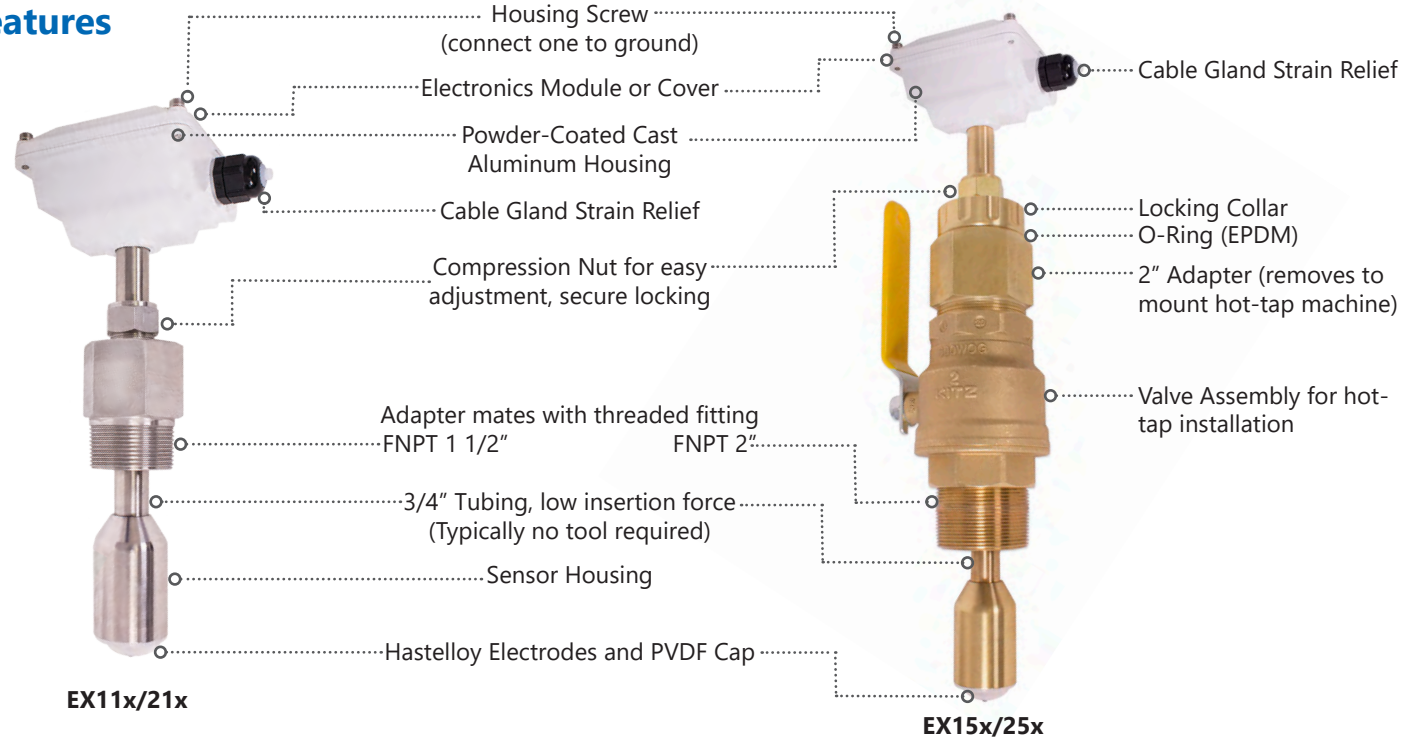
A rapidly reversing magnetic field is produced in the lower housing. As the fluid moves through this field, a voltage is generated that is measured and translated into a frequency signal proportional to flow rate. This square wave signal can be sent directly to a PLC or other control or can be converted using any of the Seametrics family of indicators and converters. A modular system of electronics can be installed directly on the flow sensor or mounted remotely. The FT430 (externally powered with pulse) and the FT440 (loop powered), both provide digital rate and total displays, as well as a programmable pulse; the FT440 also provides a 4-20 mA analog output. The AO55 is a blind analog (4-20 mA) transmitter. Programmable pulse for pump pacing is available with the PD10 (available as wall-mounted unit only).

The "hot-tap" models (EX15x/25x) can be installed or serviced without shutting down the line by means of a 2" full-port isolation valve that comes with a nipple for installation on the pipe fitting; a bronze ball valve is standard, with a 316 stainless steel valve option if needed. In most circumstances, no special tool is required.

Reverse flow output and immersibility are optional.

ISO 9001:2008 Certified Company
PROUDLY MADE IN THE USA

Features

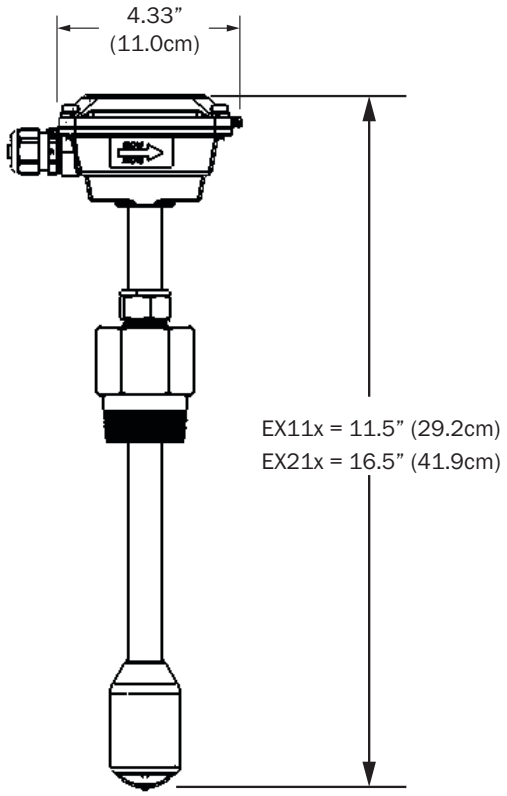


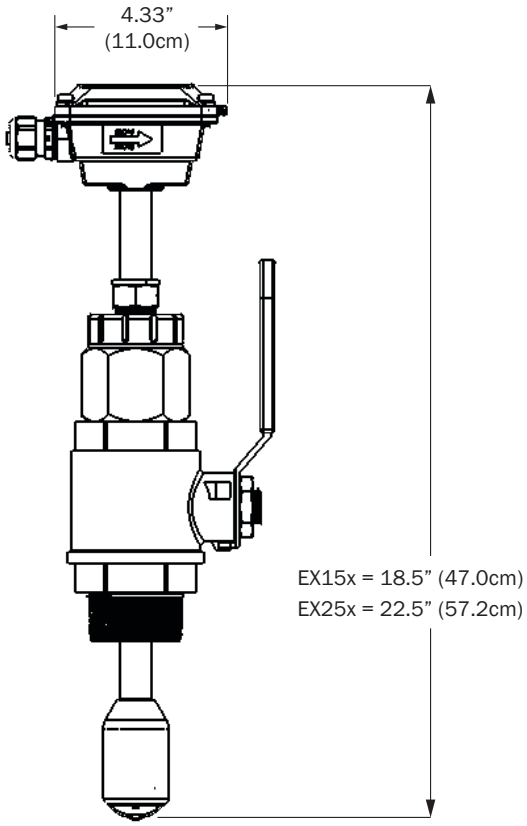
Specifications*

Pipe Size		3" to 48" (up to 72" optional)
Power		**Full Power:** 12 - 24 Vdc, 250mA **Low Power:** 12 - 24 Vdc, 40mA average with 250mA peaks
Materials	**Housing**	Powder-coated cast aluminum
	Tubing/Fitting/Sensor Housing	Brass or 316 Stainless Steel
	Electrodes	Hastelloy
	Electrode Cap	PVDF
	O-Ring *(15x/25x only)*	EPDM
	Valve Assembly *(15x/25x only)*	Bronze (stainless optional) with bronze ball valve
Fitting Size Required		**11x/21x:** 1.5" FNPT **15x/25x:** 2" FNPT
Maximum Pressure		200 psi (14 bar)
Temperature	**Ambient**	0˚ to 160˚ F (-17˚ to 72˚ C)
	Fluid	32˚ to 200˚ F (0˚ to 93˚ C)
Minimum Conductivity		20 microSiemens/cm
Flow Velocity		0.28 - 20 ft/sec (0.08 - 6.09 m/sec)
Accuracy		± 1% of full scale
Output		Square wave pulse, opto-isolated, 500 Hz @ 20 ft/sec 6 mA max, 30Vdc forward flow standard; reverse flow optional
Empty Pipe Detection		Software, defaults to zero flow
Cable		Standard 18' (6m), #22 shielded twisted pair, 4-conn. Max. cable run at 24 Vdc = 1000' (300m); at 12 Vdc = 500' (150m). For other circumstances, contact the factory.
Environmental		See meter mounted electronic specification for rating.

**Specifications subject to change • Please consult our website for current data (www.seametrics.com).*

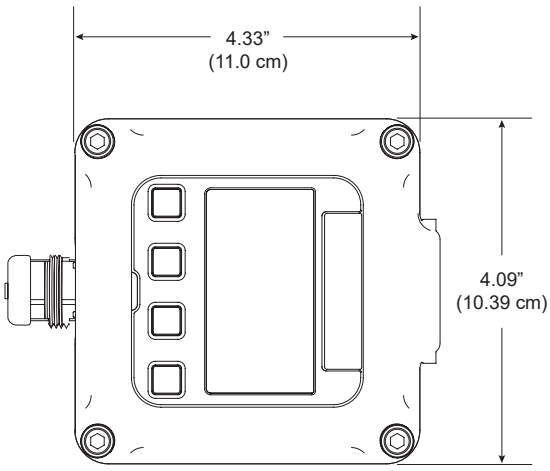
Dimensions





Flow Range

Flow Range (GPM)		
Nominal Pipe Size	**Minimum Flow**	**Maximum Flow**
3	6	440
4	11	783
6	25	1,762
8	44	3,133
10	69	4,895
12	99	7,050
14	134	9,596
16	175	12,533
18	222	15,863
20	274	19,584
24	395	28,200
30	617	44,064
36	888	63,452
48	1,580	112,804



How to Order

	Description	Size	Sensor Material	Options (110/210)	Options (150/250)
Sensor Only	Externally powered (12 - 24Vdc) sensor only.	3" – 10" pipe = EX110 10" – 48" pipe = EX210 Hot Tap 3" – 10" pipe = EX150 10" – 48" pipe = EX250	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Old Style Adapter 1 ½" NPT = -35 *Immersible = -40 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 316 SS Valve Assembly = -08 Reverse Flow Output = -15 *Immersible = -40 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (112/212)	Options (152/252)
AO55 Mounted on Sensor	Externally powered (12 - 24Vdc) sensor with AO55 blind 4-20mA analog transmitter mounted on the sensor.	3" – 10" pipe = EX112 10" – 48" pipe = EX212 Hot Tap 3" – 10" pipe = EX152 10" – 48" pipe = EX252	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (113/213)	Options (153/253)
FT430 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with FT430 rate and total indicator (with pulse outputs) mounted on the sensor.	3" – 10" pipe = EX113 10" – 48" pipe = EX213 Hot Tap 3" – 10" pipe = EX153 10" – 48" pipe = EX253	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Hinged Display Cover = -126	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Dual Relay Output = -98 Hinged Display Cover = -126 Data Logger = -127

	Description	Size	Sensor Material	Options (116/216)	Options (156/256)
DL76 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with self powered DL76 data logger mounted on the sensor.	3" – 10" pipe = EX116 10" – 48" pipe = EX216 Hot Tap 3" – 10" pipe = EX156 10" – 48" pipe = EX256	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (119/219)	Options (159/259)
FT440 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with FT440 rate and total indicator (with pulse and 4-20mA outputs) mounted on the sensor.	3" – 10" pipe = EX119 10" – 48" pipe = EX219 Hot Tap 3" – 10" pipe = EX159 10" – 48" pipe = EX259	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Hinged Display Cover = -126	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Dual Relay Output = -98 Hinged Display Cover = -126 Data Logger = -127

** Immersible to maximum of 3 ft (1m), up to 2 weeks • Roytronic is a registered trademark of Milton Roy Company.*

FT430/440/450
RATE/TOTAL INDICATOR

Seametrics
Precision Flow Measurement
An ONICON Brand

Optional Protective Cover Closed

THE RIGHT INDICATOR FOR

Water Treatment

Water Utility

Industrial Chemical Handling

Features

- Simple Setup
- DC Powered (FT430)
- Loop Powered (FT440)
- Battery Powered (FT450)
- Remote or Flow Sensor Mounted Indicator
- Rugged Plastic Housing
- Non-volatile Memory

Contact Your Supplier

The **FT430/440/450** flow computers are microcontroller-based indicator/transmitters that interface with pulse output flow sensors to compute and display flow rate, flow total, and also generate output signals representing flow. The FT430 and FT450 have one scaled pulse output and one pulse pass through. The FT440 has two scaled pulse outputs. Galvanic isolation is provided for most pulse outputs.

The FT450 is battery powered while the FT430 may be powered by an external DC power source or an optional internal AC power supply*. The FT440 is a "two-wire" or "loop powered" device, meaning that it is powered by the 4-20 mA loop circuit itself. An optional internal AC power supply* is available for the FT440 with dual 24 and 12VDC outputs to power both the loop and sensors requiring more power than the loop can supply.

Pulse and 4-20mA analog outputs can be used to signal external devices, e.g. certain metering pumps and water treatment controls. Alternatively, one or more pulse outputs can be configured as alarm outputs. These flow computers can be password protected to prevent resetting the total or changing configuration settings.

The FT430/440/450 meters are available in wall and meter mount configurations. The FT430 and FT440 models can also be panel mounted. Some configurations can be converted from wall to meter or meter to wall after installation if needed. Consult factory for details.

Order the FT440 only if a 4-20mA output signal is a requirement and the FT450 if internal battery power is needed. Otherwise the FT430 offers the most flexibility.

**Internal power supply is available for the wall mount option only.*

ISO 9001:2008 Certified Company

PROUDLY MADE IN THE USA

Specifications*

		FT430	FT440	FT450
Power		7-30Vdc, 4mA	9-30Vdc, 4mA (4-20 mA when loop-powered)	Lithium "C", 3.6Vdc, replaceable. Life is ~5 years depending on usage.
Display	**Rate**	5-digit autorange	5-digit autorange	5-digit autorange
	Total	8-digit	8-digit	8-digit
Units	**Rate Units**	Gallons/Second/Minute/Hour/Day, Liter/Second/Minute/Hour/Day, Cubic Feet/Second/Minute/Hour/Day, Cubic Meters/Second/Minute/Hour/Day, Mega Liters/Day, Million Gallons/Day, Fluid Oz/Second/Minute/Hour/Day, Barrels/Second/Minute/Hour/Day		
	Total Units	Gallon, Gallon x 1000, Liters, Mega Liter, Cubic Meter, Acre Feet, Cubic Feet, Cubic Feet x 1000, Million Gallon, Acre Inch, Fluid Ounce, Barrels		
Outputs	**Pulse Output 1**	Scaled pulse output, high alarm output or low alarm output. Optoisolated on FT430 and FT440.[1]		
	Pulse Output 2	Pulse pass through	Scaled pulse output, high alarm output or low alarm output.[1]	Pulse pass through
	Loop Power Output	N/A	4-20mA Loop	N/A
Set P Range		0.1 - 99999.9 units/pulse	0.1 - 99999.9 units/pulse	0.1 - 99999.9 units/pulse
Input		5V pulse or contact closure	5V pulse or contact closure	Micropower GMR Sensor (square wave)
Input Range		0.75[2] - 2000Hz	0.75[2] - 2000Hz	0.75[2] - 550Hz
K-Factor Range		.001 - 999999.999	.001 - 999999.999	.001 - 999999.999
Flow Alarm Output Range		0.1 - 99999.9	0.1 - 99999.9	0.1 - 99999.9
Operating Temperature		-5˚ to 55˚ C (23˚ to 131˚ F)	-5˚ to 55˚ C (23˚ to 131˚ F)	-5˚ to 55˚ C (23˚ to 131˚ F)
Non-Operating Temperature		-40˚ to 75˚ C (-40˚ to 158˚ F)	-40˚ to 75˚ C (-40˚ to 158˚ F)	-40˚ to 75˚ C (-40˚ to 158˚ F)
Environmental		NEMA 4X, IP67	NEMA 4X, IP67	NEMA 4X, IP67
Regulatory		CE Mark	CE Mark	CE Mark

** Specifications subject to change • Please consult our website for current data (www.seametrics.com).*
1 Scaled output pulses have a fixed width of 100ms. Maximum pulses per second is 6.5Hz
2 For pulse frequencies <1 Hz, increase setting in SET F menu to 3 or higher.

Features

***Includes password protection for tamper prevention when needed*

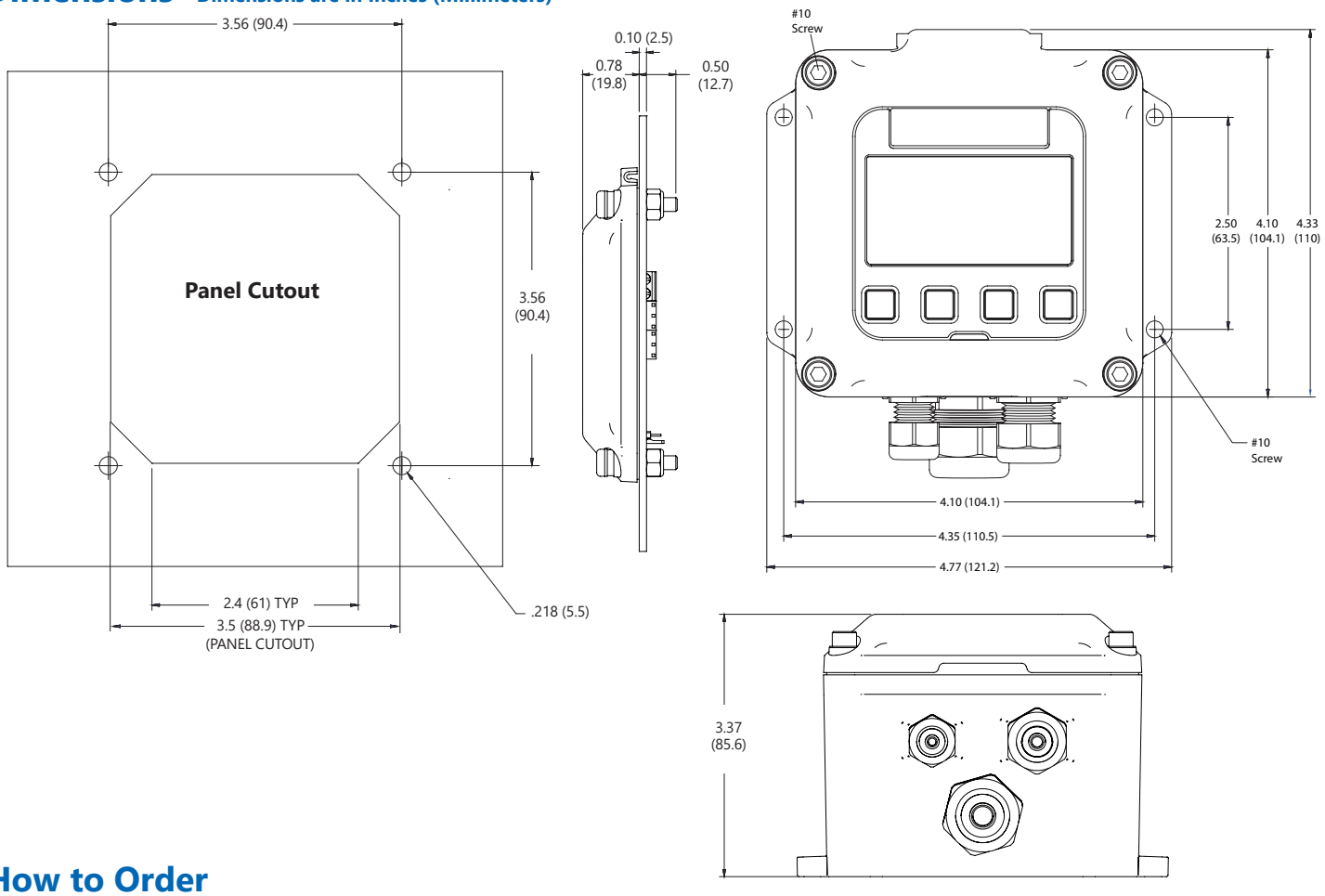
Pulse Output Function Table

PULSE OUTPUT 1 (SCALED)	FT430	FT440	FT450
TYPE	Current sinking	Current sinking	Current sinking
MAX. VOLTAGE	36 Vdc	36 Vdc	36 Vdc
MAX. CURRENT	100 mA	100 mA	100 mA
MAX. FREQUENCY	6.5 Hz	6.5 Hz	6.5 Hz
PULSE WIDTH	100 ms	100 ms	100 ms
ISOLATION	300 V	300 V	NOTE 1
CONFIGURABLE AS ALARM	YES (High or Low)	YES (High or Low)	YES (High or Low)
PULSE OUTPUT 2 (SCALED)	FT430	FT440 (Note 2)	FT450
TYPE	Not Available	Current sinking	Not Available
MAX. VOLTAGE		36 Vdc	
MAX. CURRENT		100 mA	
MAX. FREQUENCY		6.5 Hz	
PULSE WIDTH		100 ms	
ISOLATION		300 V	
CONFIGURABLE AS ALARM		YES (High or Low)	
PULSE OUTPUT 2 (PASS-THROUGH)	FT430	FT440	FT450
TYPE	Current sinking	Not Available	Current sinking
MAX. VOLTAGE	36 Vdc		36 Vdc
MAX. CURRENT	10 mA		100 mA
MAX. FREQUENCY	2000 Hz NOTE 2		550 Hz
PULSE WIDTH	SAME AS SENSOR INPUT		SAME AS SENSOR INPUT
ISOLATION	300 V		NOTE 1
CONFIGURABLE AS ALARM	NO		NO

NOTE 1: 150 V effective isolation when using Seametrics micropower sensors. • NOTE 2: With 2000 ohm or lower pull-up resistance.

Dimensions

Dimensions are in Inches (Millimeters)



How to Order

MODEL

DC-powered indicator = **FT430**

Loop-powered indicator/transmitter = **FT440**

Battery-powered indicator = **FT450**

MOUNTING

Wall mount = **-W**

Panel mount = **-P**

(FT430/FT440 only)

Meter mount = **See appropriate meter specification to order meter mounted units.**

OPTIONS

Tamper-evident = **-32**

Non-resettable total = **-64**

Dual Relay Output (FT430/440 only) = **-98**

Display Cover = **-126**

Built-in 120/240 Vac/12/24 Vdc dual power supply (FT430W/FT440W only) = **-139**

Built-in 120/240 Vac/12 Vdc single power supply (FT430W for use with mechanical or magmeters, FT440W for use with mechanical meters) = **-140**

ACCESSORIES

Display Cover = **102021**
Dual power supply, plug-in, 115 Vac, 12/24 Vdc = **PC42**
LMI pump power cable = **100013**
LMI pulse out cable = **100039**
Power converter, plug-in, 115 Vac, 24 Vdc = **PC3**
FT430 Module = **103591-01**
FT440 Module = **103591-02**
FT450 Module = **103591-03**
FT430/440 Dual Relay Option w/wire adapter = **100557**

ADAPTER KITS

	Part #	Electronics module	Lower wall housing	Lower meter housing
Convert wall to meter mount (MK10)	102632	Blue	Blue	Blue
Convert wall to meter mount (MK15)	103594	White	White	White
Convert meter to wall mount (MK20)	102633	Blue	Blue	Blue
Convert meter to wall mount (MK25)	103396	White	White	White
Adapter kit to mount white electronics to blue housing	103391	White	Blue	Blue
Adapter kit to mount white electronics to blue housing/ Tamper evident	103392	White	Blue	Blue

Seametrics • 19026 72nd Avenue South • Kent, Washington 98032 • USA
(P) 253.872.0284 • (F) 253.872.0285 • 1.800.975.8153 • seametrics.com

LT-65650318r2.1 20180726
7/26/2018

From:	James Mommers
To:	curtis brzyski
Cc:	Onan, Brandon (EGLE)
Subject:	Re: DEQ - Flowmeter - Insertion Style
Date:	Monday, December 3, 2018 10:40:15 AM
Attachments:	1218DEQEX250.pdf

Attached, thanks.

James L. Mommers
Midwest Municipal Instrumentation, Inc.
517-764-4736 - Office
517-250-1650 - Cell

On Mon, Dec 3, 2018 at 10:17 AM Curtis Brzyski <cbrzyskimmi@msn.com> wrote:

> Brandon,
>
> Enclosed are the specification data sheets for the insertion meter we discussed
> I highlighted the options you may need.
> James please work up a quote for
> sensor EX250-08-15 (hot tap and reverse flow)
> remote transmitter with 30 feet of cable FT440W-139 (120 VAC power)
>
> Thank you,
>
> Curtis Brzyski
> Midwest Municipal Instrumentation Inc.
> (O) 517 764 4736, (F) 517 764 4739
> (C) 517 250 3063
> www.midwestmunicipalinc.com
>
> > ----- Original Message -----
> > **From:** James Mommers
> > **To:** curtis brzyski ; onanb@mich.gov
> > **Sent:** Friday, November 30, 2018 1:09 PM
> > **Subject:** DEQ - Flowmeter - Insertion Style
> >
> > Brandon Onan at 616-307-6736, needs application suggestion for flowmetering system.
> >
> > James L. Mommers
> > Midwest Municipal Instrumentation, Inc.
> > 517-764-4736 - Office
> > 517-250-1650 - Cell

PROPOSAL

FOR: DEQ
onanb@mich.gov

ATTN: Brandon Onan - 616-307-6736
REF:

Please make Purchase Orders out to the below, thank you.
MMI, INC.

QUOTE NO: 1118DEQEQ250
REGION: B.R. - .6X
DATE: 12/3/2018
TERMS: 100% Net 30 Days
F.O.B.: Factory
VALIDITY: 90 Days
DELIVERY: 5 Weeks ARO
2592.838/2058

ITEM	MODEL	DESCRIPTION	QTY	UNIT PRICE	TOTAL COST
1.1	EX250-S-08-15	**Hot Tap - Adjustable Dept. Insertion Mag Meter - 36"**	1	$ 2,675.00	$ 2,675.00
		316 SSTL, 10"-48", (**Sensor Only**)			
		Valve Assembly, 316 SS	1		
		Reverse Flow			
1.2	FT440W-139	**WALL DISPLAY**	1		$ -
		12-24 Vdc, Loop Power, Dual Scaled Pulse Output			
		& 4-20 mA Outputs			
		120 VAC - Built in Dual Power	1		
		Tags: FE/FIT: **Advise**			
		TOTAL			$ 2,675.00

We are pleased to offer this proposal for furnishing and delivering the above referenced product. Equipment is specifically listed, items required but not listed are to be furnished by others.

Freight and Handling Charges and Taxes
o Prepay and add freight charges - the amount charged will include all freight and handling expenses
o Taxes Excluded and are the responsibility of the buyer

James L. Mommers Midwest Municipal Instrumentation, Inc.

Midwest Municipal Instrumentation Inc.
4391 Bonnymede Ct
Jackson, MI 49201

Providing: Seametrics
Your helping hand in all your Municipal Water & Wastewater Needs

Telephone: 517-764-4736
Fax: 517-764-4739
Cell: 517-250-1650
E-mail: jmommersmmi@msn.com
http://www.midwestmunicipalinstr.com

Per Factory Terms & Conditions - see website
http://www2.emersonprocess.com;

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	momalley@cityofbentonharbormi.gov; Kasischke, Kevin (DHHS-Contractor); emitchell; Bolf, Michael (EGLE); Onan, Brandon (EGLE); Sylvester, Matthew (EGLE); Crider, Steven (DHHS); Nshimyimana, Jean Pierre (DHHS); nbritten@bchdmi.org; Mike O"Malley
Subject:	Re: DHHS investigatory sampling
Date:	Thursday, July 9, 2020 8:57:37 AM

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Something strange is happening to the Benton Harbor customers water service.
It started in 2020 after the City was forced into adding a much more Lead Corrosion Chemical without any documented basis.
DR whoever assured me that the more powerful OPP was not going to have any health effects.
But he did not mention what might be expected from this overly aggressive treatment.

Now, Copper has a significantly high MCL 1300 ppb.
But I have seen a change and I am again nervous regarding a trend.

In 2018, we sampled 293 locations and 150 of them had some result for Copper about 52%
Our sampling for 1st half of 2020 there was something like 96% of 1st draw samples had Copper results.

I sent a message to the City's Corrosion specialist and I am hoping he will help me.
And I am anxious for his firm to find the right balance of Corrosion treatment.

I am worried we are giving up customer water service in order to get the lead.
We do not test, but what do you suppose is happening to the thousands of galvanized pipes in the system?

Mike O'Malley
Benton Harbor Water Operator IN Charge

On Wed, Jul 8, 2020 at 4:39 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike & Kevin,
>
> Upon review of the latest round of lead and copper data collected with the help of Rev. Pinkney, Steve Crider with DHHS Drinking Water has agreed to dedicate some of his staff time by conducting integrated lead sampling at various locations in the City. This effort provides a lot of information not just for those homes selected, but also can help identify corrosion trends in the system and also guides flushing recommendations. DHHS sanitarians sample multiple taps, assess particulate lead, and calculate plumbing volumes in order to assess the amount and nature of lead in the water for a particular home.

Please begin planning this important work in the City of Benton Harbor as soon as time permits. The first step is to identify locations that would be willing to participate, may have high lead results previously, and have previously had sequential sampling.

We appreciate your efforts to minimize exposure to lead in drinking water!

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	momalley@cityofbentonharbormi.gov; Kasischke, Kevin (DHHS-Contractor); emitchell; Bolf, Michael (EGLE); Onan, Brandon (EGLE); Sylvester, Matthew (EGLE); Crider, Steven (DHHS); Nshimyimana, Jean Pierre (DHHS); nbritten@bchdmi.org; Mike O"Malley
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Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Darold L. Harlan; DARWIN WATSON; Mike OMalley
Subject:	Re: EGLE at Benton Harbor
Date:	Wednesday, August 7, 2019 12:07:39 PM

Ernie,

In lieu Darold not being here for much time believe it best to postpone a meeting.
And, Darwin on vacation coming up.

Save yourself a trip and see who else you may want to meet with.

PS: you sent an email to the Corrosion Control Group. I have not seen a reply from anyone. Just so you know there would only be 2 racks to test and the baseline rack is essentially worthless!

PS2: There is a serious problems with flow paced OPP feed.

1. Carus 8600 is very expensive. I will not pay for the use into the backwash waste stream to the lagoon.
2. The metering pump does NOT have an internal memory, so we are back to manual control. I caught it fairly soon, couple of days, and switched it back to the receptacle that is energized ONLY when a High lift pump is on!

Mike O'Malley
Benton Harbor Water Superintendent

On Wed, Aug 7, 2019 at 11:42 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Thanks Darold – next week is bad for Darwin, and myself. When will you be swinging through? I can try to be there, if not too early, for a 5-minute meet and greet.
>
> ---
>
> **From:** Darold L. Harlan <dharlan@fv-operations.com>
> **Sent:** Wednesday, August 7, 2019 11:21 AM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; 'DARWIN WATSON' <dwatson@cityofbentonharbormi.gov>; momalley@cityofbentonharbormi.gov
> **Subject:** RE: EGLE at Benton Harbor
>
> Ernie,
>
> I look forward to meeting you. However, on Friday I will only be in Benton Harbor long enough to give the distribution crew work assignments. I will then be taking samples to south bend for Mike. One day early next week would work best for me.
>
> Thanks,
>
> Darold
>
> -----Original Appointment-----

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, August 7, 2019 10:55 AM
To: 'DARWIN WATSON'; momalley@cityofbentonharbormi.gov; Darold L. Harlan
Subject: EGLE at Benton Harbor
When: Friday, August 9, 2019 9:00 AM-11:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: Water plant and ?

Hi guys, I've been hoping to drive down and spend a bit of time chatting and seeing progress at the plant. I also hoped to meet Darold and get a feel for how things are going on his end. I'd like to do that this Friday, if you will be around.

The information contained in this message and any attachment may be proprietary, confidential, and privileged or subject to the work product doctrine and thus protected from disclosure. If the reader of this message is not the intended recipient, or an employee or agent responsible for delivering this message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify me immediately by replying to this message and deleting it and all copies and backups thereof. Thank you.

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Mike OMalley
Subject:	Re: FW: Benton Harbor job
Date:	Thursday, February 14, 2019 11:47:26 AM

Ii will get Darwin a PR today.

Now, was there other things I need to arrange for a PO for.

- Oudbier Instruments Start up
- Tap the Suction line?
- Pay Elhorn Engineering?
- A digital read out for flow, pump variable, and scale?
- The Orthopolyphosphate injector?

Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Feb 14, 2019 at 10:36 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Can you give me an update on where you are at with moving the phosphate project forward?
>
> ---
>
> **From:** Sarkipato, Ernest (DEQ)
> **Sent:** Tuesday, February 5, 2019 10:19 AM
> **To:** momalley@cityofbentonharbormi.gov; 'DARWIN WATSON' <dwatson@cityofbentonharbormi.gov>
> **Cc:** jmommersmmiinc@gmail.com; 'Ron Oudbier' <ron@oudbierinst.com>; 'Curtis Brzyski' <cbrzyskimmi@msn.com>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net
> **Subject:** FW: Benton Harbor job
>
> Mike: here's a bump on this email quote from Curtis at MMI. All they need is an indication from you to get the meter on order. I spoke with Darwin who understands the need for a more expensive model (accuracy, NSF approval).
>
> Also, they confirmed this would also include the processing unit to send the signal to the Stenner phosphate pump.
>
> Ernie
>
> ---
>
> **From:** Curtis Brzyski <cbrzyskimmi@msn.com>
> **Sent:** Monday, February 4, 2019 12:46 PM
> **To:** jmommersmmiinc@gmail.com; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
> **Cc:** momalley@cityofbentonharbormi.gov; roudbier@fnwusers.com; ron@oudbierinst.com
> **Subject:** Re: Benton Harbor job

Mr. Sarkipato,

Enclosed is the quotation you requested.

The quotation has been addressed to Mr. O'Malley.

Enclosed is an order entry form that will need to be filled out prior to flowmeter production.

If available please send drawings so we can assist with the ideal meter location before tapping the line.

Once the line is taped and insertion tool will be utilized to measure precise inside diameter dimensions.

Once the attached order form is filled out a custom 395L will be built to your specifications.

Once installed this meter will provide outstanding accuracy , repeatability and reliability for many years to come

Thank you,

Curtis Brzyski
Midwest Municipal Instrumentation Inc.
(O) 517 764 4736, (F) 517 764 4739
(C) 517 250 3063
www.midwestmunicipalinc.com

----- Original Message -----

From: Sarkipato, Ernest (DEQ)

To: Curtis Brzyski ; James Mommers

Cc: momalley@cityofbentonharbormi.gov

Sent: Monday, February 4, 2019 10:29 AM

Subject: RE: Benton Harbor job

City is going to have a local contractor tap the main and install the meter.

Startup is by Oudbier, who is contacting Mike O. Oudbier can also run the cable.

We probably need 40' of cable.

Can you guys do up a quote for the City for the McCrometer multi-mag, and send to Mike O'Malley (copied)?

Ernie

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Tuesday, January 29, 2019 9:36 AM

To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job

Its included in the cost of the flowmeter

$13,500.00 is the cost of the insertion meter, 316 SS ball valve and converter with 20 feet of cable.

Freight , installation and startup are not included

Freight around $300.00

Installation ??

Startup by Oudbier ??

Curtis

Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>
Sent: Tuesday, January 29, 2019 9:09:43 AM
To: Curtis Brzyski; James Mommers
Subject: RE: Benton Harbor job

Something I missed here.how much is the M Series Converter, which I assume is necessary to process the signal?

From: Curtis Brzyski <cbrzyskimmi@msn.com>
Sent: Friday, January 25, 2019 3:30 PM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; James Mommers <jmommersmmiinc@gmail.com>
Subject: RE: Benton Harbor job

Ernie

Enclosed Powerpoint on insertion meter accuracy

This just goes over what I discussed

The single point meter costs about 4K but it can be profiled

The SPI or single point does not have a NSF liner

The FPI with a NSF 61 coating will cost $13,500.00 plus freight and startup

This should be your most stable signal from this flowmeter.

Curtis Brzyski

MMI Inc.

517 764 4736

www.midwestmunicipalinc.com

Sent from Mail for Windows 10

From: Sarkipato, Ernest (DEQ)
Sent: Friday, January 25, 2019 2:01 PM
Subject: RE: Benton Harbor job

Is this pretty much the only option we have for insertion mag meters? Do you guys suppy the mccrometer FPI mag insertion meter? Would that work just as well? Guessing it's higher cost.

Ernie

From: James Mommers <jmommersmmiinc@gmail.com>
Sent: Friday, January 25, 2019 11:00 AM
To: Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Oudbier Inst <ron@oudbierinst.com>
Cc: curtis brzyski <cbrzyskimmi@msn.com>
Subject: Re: Benton Harbor job

Current ETA is 1-2 weeks ARO (after receipt of PO). See attached equipment quoted

James L. Mommers

Midwest Municipal Instrumentation, Inc.

517-764-4736 - Office

517-250-1650 - Cell

On Fri, Jan 25, 2019 at 10:40 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thanks for speaking with met his morning Ron. I called on behalf of Mike O'Malley (269-927-8471) and the City of Benton Harbor, and at the recommendation of James at MMI.
>
> Here's the situation - we are working with the City of BH and Elhorn Engineering to add a corrosion inhibitor (phosphate based), as the city recently exceeded the action level for lead. Todd is going to be working on the project in the next couple weeks, getting the chemical feed lines run and pump mounted. We are looking at tying the Stenner S Series pump to a Seametrics EX250-S-08-15 insertion meter paired with a Seametrics FT440W-139, through MMI. This flow meter can be inserted into a 2" tap in the 30" water line in the basement of the water plant (not yet made). The phosphate

feed system would be stand-alone from the SCADA, so it's a nice and simple install. **What we'd like help with is installing the meter and controller, and integrating them with the Stenner S Series Pump.** I attached a couple photos of the area the tap can be made.

Ron mentioned one of you might be able to visit the plant and take a look at the project in the next couple weeks. I think that would be a great first step, and hope you can coordinate that with Mr. O'Malley and possibly even Elhorn.

Thanks for the consideration - we have high hopes this project can go smoothly and as quickly as possible.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Municipal Assistance Division

Department of Environmental Quality

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Sarkipato, Ernest (DEQ)
To: Mike O"Malley
Subject: Re: Getting Closer to feeding OPP at BH Water Plant
Date: Wednesday, March 6, 2019 12:49:21 PM

Thank you! For The test kit, it would be helpful if you send an actual manufacturer and model number.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Mar 6, 2019, at 8:28 AM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:

Ernie,

Thanks for sending the approved Permit No. FEB 25 '199015.

Everything attached to the Permit are here except the McCrometer. That is going to take awhile.

I have an order in for a local contractor to put in my 1 inch live tap for the OPP injector, thinking Thursday.
I will soon have an order in to Elhorn Engineering for 4 Barrels of Carus 8600 and a 30 inch tapping saddle for a 2 inch tap.
My same contractor is confident that he can make that tap as well.

I pulled my contractor Mead and White off of the New Alum Supply project and on to a High Service Pump only Activated 110V Recepticle

They did it today. See attached Pump On Light On: *Req S332682 Mead and White HS Pump on Lights are on.jpeg*
I can start feeding soon but only when the pump is in manual with the proper settings.

I checked and I was told, that even when the power goes off, the Pump will resume where it left off when power returns.
That was a big concern of my electrician this morning.

Now, I still need to find the right testing apparatus for Orthopolyphosphate. The price is not that much.
Now the catalog says "Reactive Phosphate Residual" or some so much, is this what I want?

Tell them in Lansing, that this is soon to be running,

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent
<Req S332682 Mead and White HS Pump on Lights are on.jpg>

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; Ellis Mitchell
Cc:	Marcus Muhammed; Darold Harlan; Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Thurston, Brian (EGLE); Bolt, Jennifer (EGLE); Onan, Brandon (EGLE)
Subject:	Re: I updated the Administrative Consent Order (ACO) table for Information for Ellis Mitchell and Update to you and Mayor Marcus Muhammed
Date:	Tuesday, September 3, 2019 9:03:10 AM
Attachments:	MO Response to Compliance from ES and Interum City Manager Ellis Mitchell 08 28 2019.xlsx REVISED - City of Benton Harbor ACO Ltr.pdf City of Benton Harbor Signed ACO and Transmittal Letter.pdf

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Thank you for the detailed update on your actions relative to the ACO and lead and copper in the City of Benton Harbor. Please note the dates on this document have since been revised (twice), according to the attached letter (on which you were copied). By the way, it is customary for our letters to be addressed to a water system manager rather than the operator-in-charge for items related to escalated enforcement such as an ACO. I'll leave any discussion of the lead and copper items for another email/chain. Below is my response to the various items in the ACO you commented on.

-The alum feed system is now past due as of 9/1/2019, unless it is now feeding (though I haven't issued the permit yet, still waiting on items from O'Malley).

-For Darold's reference and clarification on hydrants and valves, the original requirement in the ACO is to "Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants". I think we both agree there is a need here, and an extension may be warranted given everything you are working on. Note, all we are looking for is a ***plan*** for inventory and maintenance.

-I need to highlight the need for finished water metering. The city is commended for installing a meter in the finished water, but is unsuccessful at maintaining it, similar to the other three finished water meters that no longer work. This is probably a job for an instrumentation tech. Please get this working and in SCADA asap.

-Rate collections process still needs to be fixed, and I'm glad to hear Darold is working diligently on that. Without consistent revenue the water system will not sustain itself.

-The elevated tower is concerning. We need to figure out a way to do that work by the end of the year, which is the currently established deadline. Consider the use of interconnects instead of expensive VFD projects that will take a long time. If you need more time, please submit a plan for doing the work.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, August 28, 2019 4:00:19 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Marcus Muhammed <mmuhammad@cityofbentonharbormi.gov>
Subject: I updated the Administrative Consent Order (ACO) table for Information for Ellis Mitchell and Update to you and Mayor Marcus Muhammed

Mr. Sarkipato,

I have been busy working with our new interim City Manager to help him see what we have been doing and have to finish.

The 2 big issues to start with were the DWRLF and SRF Loan applications by Benton Harbor through Abonmarche.
We dealt with many more Items that Darwin had arranged for as additional projects underway but not completed with Abonmarce.
Mostly things, that Darwin did not necessarily share with staff.

And, since you chose to place other items I note in the table as: not in the ACO; and then recently chose to reference many of those items in the 8/23/2019 Notice Of Violation (NOV) including stiff penalties; as evidence for those penalties.

So, I thought he should be up on our progress and lack of some progress in our ACO, using a revised time-line table from previous correspondence between you and I.

Attached: *MO Response to Compliance from ES and Interim City Manager Ellis Mitchell 08 28 2019.pdf*

MI 0600 Benton Harbor ACO Reply 08 28 2019 Added the New Interim City Manager Mr. Ellis Mitchell to help get him up to speed.

	DEQ Project	DEQ Due Dates	DEQ Notes Mike Comment; those NOT in ACO!	Mike Date	Mike Notes as of 8/28/2019
Completed?	Project Details	Due By	Notes	MO date	MO Notes 04 12 2019
	Propose optimal corrosion control treatment, or a corrosion study	**3/31/19**	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	3/25/2019 and 08/28/2019	Not in ACO completed in fast rated even without meter but added HS Pump On control as requested by MDEQ. Metering continues to be a failure, works very well in Manual ONLY.
	Submit rate study to DEQ with implementation plan	4/1/19	Still need a plan to implement rate increases as recommended by the study		Do not know if Darwin Watson, former City Manager did this. If he did, and like I believe he did, he did not document it with me. I have seen copies of the Funding Plan written by experts and shared with Abonmarche and probably MDEQ.
	Obtain licensed operator in charge of water distribution system	5/1/19		5/1/19	Darold Harlan Licensed Water operator of F & V Contract Operators is under a signed contract and comes week days.
	Submit plan to streamline the rate collection process	5/1/19		6/1/19	Darold Harlan worked out a plan and it has some good effect. I am not entirely sure as we are not informed of any increase of Collections from the Water Payment Center.
	Upgrade existing SCADA system to have historian and alarm capabilities	5/15/19		5/15/19	Historian Computer and software arrive mid March. Technician in and set up 4/1/2019 & 4/2/2019
	Fix continuous chlorine analyzer	5/15/19		5/15/19	Replaced it in the Laboratory where it should have gone in the DWRLF; Up and Running, pretty excellent.
	Data store continuous chlorine analyzer Mike Adds to line 7	5/15/19	MO Added to go along with Above SCADA	5/15/19	Done and working like a charm.
	Submit updated cross connection control program, staffing support	6/1/19		6/1/19	I've started and I sent the necessary report on time for last year. Darold will take an active role in this.
	Submit plan to inventory valves, and plan for ongoing maintenance	6/1/19			This item was never part of the Sanitary Survey. I had advised you long ago that there are many records, both paper and digital. The digital was done by Abonmarche. The paper was done eon's ago. I have updated those paper and some digital records extensivly in 2008 to 2012 and again in 2016 to on-going. Well into 2019. Moving along easier with Darold around. Benton Harbor will need an extention.
	Install coagulant feed to rapid mix	6/1/19		8/27/2019	Alum supply to repurposed Polymer Day tank completed with pump control, piping and check for proper operation. All plumbing and electrical work completed. Need to get operators trainned and put it ON-Line 1st week of September.
	Install metering capabilities	6/15/19		as of 8/28/2019	2" meter tap is in. It worked well for about 10 days. We were thinkng that this flow meter can be used for Distrbution flow. When we tried, the meter and the Wonderware counter part no longer works as intended. And, as you know, I had already begun calculatculating flow as of 1/1/2019. Several days of flows were actually part of the July MOR but no longer, I will have to return to calculating flows. As for your language in determining CT calculations, THE FINISHED WATER is very reliable as calculated based upon Metering: 1) Raw; 2) minus House water; 3) minus Backwash; 4) minus waste water. = Water Produced, which is Always in the Daily Records and subsequent MORs.
	Collect 60 samples for lead and copper, remembering 1st/5th liter	6/30/19	**Action Level Exceedance (ALE) Requirement: Not in ACO!**	6/30/2019	Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.

MI 0600 Benton Harbor ACO Reply 08 28 2019 Added the New Interim City Manager Mr. Ellis Mitchell to help get him up to speed.

	DEQ Project	DEQ Due Dates	DEQ Notes Mike Comment; those NOT in ACO!	Mike Date	Mike Notes as of 8/28/2019
	Collect WQP as required by ALE letter	6/30/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	6/30/2019	Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.
	Conduct professional inspection of water tower	6/30/19		Early Fall 2020 or 2021	Stopped working on that with contractor. Please note, that the Benton Harbor Water Distribution System CANNOT function with direct pressure. I am looking for ways to take the water tower out of service and not run the system without it (direct pressure). The City applied for a DWRLF to meet this requirement. It is in the EGLE possible funding program. We expect to hear about the Award some time soon. We request that the Deadline be extended until auch time that the project can be completed with those DWRLF monies.
	Install working mussel feed control system at the raw water intake	6/30/19		Hopefully before it gets too cold on the Lake.	Trying my best. Even you told me to hold off as other more pressing needs required my attention. The Diver has a Purchase Order. We need them to clean off the Halo again in the riser. It is plugged and our attempts to blow it clear have not worked. Benton Harbor will need an extention to such time the diver clears it and treatment can begin again.
	Report 2018 ALE in the consumer confidence Report	7/1/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	5/31/2019	Done and even though you did not like the way I wrote it.
	For first round of 2019, this is the due date for reporting to DEQ	9/28/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	6/30/2019	Not in ACO. 1st round was done. We had 60 households that agreed to sample and only 47 actually did. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: and this also was mentioned in the EGLE NOV 08/23/2019. It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.
	Collect 60 samples for lead and copper, remembering 1st/5th liter	12/31/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**		Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.
	Collect WQP as required by ALE letter	12/31/19	**Action Level Exceedance (ALE) Requirement NOT in ACO!**		Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened: It should also change the Water Quality Parameter monitoring requirements to reflect the NEW LEAD AND COPPER RULES; released to Michigan Water supplies in late spring of 2019! As was mentioned in the EGLE NOV 08/23/2019.

MI 0600 Benton Harbor ACO Reply 08 28 2019 Added the New Interim City Manager Mr. Ellis Mitchell to help get him up to speed.

	DEQ Project	DEQ Due Dates	DEQ Notes Mike Comment; those NOT in ACO!	Mike Date	Mike Notes as of 8/28/2019
	Repair filter to waste valves	1/1/20		Going to need an extention based on the massive volume of work.	This will be a massive undertaking. We 1st have to determine why the 2011 DWRLF Installation project failed so very completely. Then figure out what to do to get both systems operating: Filters 5,6,7,& 8 are hydraulic and Filters 9,10,11 & 12 are electric. None of these valves work. How can that be! I believe that common practice after I was thrown out to be; If it is broken and we don't need it; then turn it off. I've been working really hard to correct all of those types of mistakes. And probably the MOST EXPENSIVE TASK TO RESOLVE THE FAILURES OF THE 2011 DWRLF.
	For second round of 2019, this is the due date for reporting to DEQ	3/31/20	**Action Level Exceedance (ALE) Requirement NOT in ACO!**		Not in ACO. I still am asking for Benton Harbor to go to Monitoring requirements of a system with less than 10,000 people. This should have happened as did every other requirement was reduced in 2012 (Stage 2; DMR). All of my requests to MDEQ are going un-answered. This needs to be rectified by the MDEQ without question.
	Collect one LCR sample from entry point to distribution	3/31/2022	**Action Level Exceedance (ALE) Requirement NOT in ACO!**	8/28/2019	Stupid test, as it will never be positive for Lead. But DONE Your new Lead and Copper Rules have changed this. Thus it was ADDED to the EGLE NOV 08/23/2019.

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

LIESL EICHLER CLARK
DIRECTOR

July 2, 2019

Mr. Darwin Watson, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

WSSN: **00600**

Dear Mr. Watson:

SUBJECT: **REVISED**: Administrative Consent Order: Progress Update and Revised Schedule

This letter is in response to a discussions with Benton Harbor staff regarding the compliance schedule established in the Administrative Consent Order (ACO) effective March 5, 2019. Extensions for Section II - Compliance Schedule (Compliance Schedule) of the ACO were granted on April 1, 2019 and on May 16, 2019. On June 20, 2019, the Department of Environment, Great Lakes, and Energy (EGLE) received another request for extensions of additional items in the Compliance Schedule. EGLE staff would like to acknowledge the competing timelines in the Compliance Schedule by spreading out the deadlines, and also reiterating the terms of the ACO.

Allowing sufficient time to complete tasks in the Compliance Schedule is necessary; however, timely implementation of items that will directly result in greater protection of public health must be prioritized. The table below includes an updated Compliance Schedule that satisfies the recent extension request from the City of Benton Harbor and sets interim deadlines for items requiring permitting.

Item	Initial Deadline	Extended Deadline	Status/Comment
Submit a rate study	4/1/2019	(completed)	
Submit plan to implement rate increases	4/1/2019	9/30/2019	
Upgrade SCADA system for data access and storage	4/1/2019	5/15/2019	(completed)
Install flow meter on finished water	4/1/2019	9/30/2019	Permit issued, waiting for manufacturer
Install continuous chlorine analyzer on WTP tap	4/1/2019	5/15/2019	(completed)
Distribution Operator in charge	4/1/2019	5/22/2019	(completed, need contract)
Corrosion Treatment Study	4/1/2019	(completed)	
Submit updated rate collections plan	5/1/2019	9/30/2019	
Updated cross connection program including residential accounts	6/1/2019	12/31/2019	
Permit and Construct coagulant feed to existing rapid mix	6/1/2019	8/30/2019	Submit permit application by 7/31/2019

Item	Initial Deadline	Extended Deadline	Status/Comment
Submit maintenance plan for valves and hydrants	6/1/2019	9/30/2019	
Conduct professional inspection of water tower	6/30/2019	12/31/2019	Not necessary if repainting is planned
Install/repair mussel control system at intake	6/30/2019	12/31/2019	Submit permit application by 11/29/2019
Repair filter to waste valves	1/31/2020		

Be advised that, per Paragraph 1.3 of the ACO, the City of Benton Harbor remains obligated to pay stipulated penalties of $500 per violation per day for failure to comply with a specific deadline set forth in the Compliance Program, including the extended deadlines set forth above.

It is our intention to work with you on resolving these issues in a timely manner. We anticipate and appreciate your cooperation in working together to resolve these matters. Additionally, if you have any questions regarding this Violation Notice, please contact me below or at sarkipatoe@michigan.gov.

Sincerely,

Erhie Sarkipato, Surface Water Treatment Specialist
Grand Rapids District Office
Drinking Water and Municipal Assistance Division
616-307-0261

cc: Mr. Mike O'Malley, Water Superintendent, Benton Harbor
Mr. Mike Bolf, P.E., Engineering Unit Supervisor, DEQ (via email)
Ms. Maureen Nelson, Enforcement Specialist, DEQ (via email)

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

March 8, 2019

CERTIFIED MAIL

The Honorable Marcus Muhammad
Mayor of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mayor Muhammad:

SUBJECT: Administrative Consent Order (ACO); City of Benton Harbor; WSSN: 00600

Enclosed please find a fully executed ACO between the City of Benton Harbor and the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), regarding the water supply at the City of Benton Harbor. The compliance schedule in this ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. The effective date of the ACO is March 5, 2019.

If you have any questions regarding the ACO, please contact me at 616-490-9590; lachancea1@michigan.gov; or DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Amy Lachance
Assistant Division Director
Drinking Water and Municipal Assistance Division

Enclosure
cc: Mr. Darwin Watson, City of Benton Harbor
Mr. Eric J. Oswald, DEQ
Mr. Brian Thurston, DEQ
Mr. Mike Bolf, DEQ
Mr. Ernie Sarkipato, DEQ
Mr. Dave Willard, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION

ADMINISTRATIVE CONSENT ORDER

In the matter of: DWMAD Order No. ACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME	OWNER☒	OPERATOR☐
City of Benton Harbor		
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
CONTACT NAME/TITLE: Darwin Watson, City Manager	PHONE #: 269-927-8408	

FACILITY NAME AND LOCATION

FACILITY NAME: Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER: 00600
FACILITY OWNER IF NOT IDENTIFIED ABOVE: City of Benton Harbor		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
COUNTY: Berrien		
CONTACT NAME: Darwin Watson	PHONE #: 269-927-8408	

1.1 This document results from allegations by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ alleges that the City of Benton Harbor, owner/operator of the city's public water supply, is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder.

1.2 Specific violations are referenced in the DEQ Significant Deficiency Violation Notice (SDVN) attached to this Administrative Consent Order (Consent Order) as Exhibit A. The Owner/Operator and the DEQ agree to resolve the violations set forth therein through entry of this Consent Order. The Owner/Operator agrees to resolve all compliance issues set forth in Exhibit A in accordance with the requirements contained in this Consent Order. This Consent Order, in its entirety, shall consist of Section I, the attached Sections II, III, and IV, Exhibit A, and any other referenced attachments, exhibits, or appendices. This Consent Order shall be considered null and void if it does not include, at a minimum, Sections I, II, III, and IV and Exhibit A. The Owner/Operator further agrees that this Consent Order shall become effective on the date it is signed by the DWMAD Director, designee of the DEQ Director.

1.3 The Owner/Operator agrees to pay a civil fine of $500 per day for failure to complete corrective actions as specified in Section II, Compliance Schedule, unless an extension has been approved under Section 4.14. Failure to make a timely payment constitutes a violation of this Consent Order.

1.4 The Owner/Operator agrees to make payment of all funds due pursuant to this agreement by certified check made payable to the "State of Michigan" and mailed to the Accounting Services Division, Cashier's Office for the DEQ, P.O. Box 30657, Lansing, Michigan 48909-8157. To ensure proper credit, all payments made pursuant to this Consent Order must include "Payment Identification Number RMD90044" on the check. The Owner/Operator agrees not to contest the legality of the civil fine.

Signatories

DEPARTMENT OF ENVIRONMENTAL QUALITY

Eric Oswald, Director
Drinking Water and Municipal Assistance Division

5-Mar-19
Date

I undersigned CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

2/25/2019
Date

SECTION II - COMPLIANCE SCHEDULE

IT IS THEREFORE AGREED AND ORDERED THAT the Owner/Operator shall take the following actions to prevent further violations of Act 399 and the administrative rules promulgated thereunder and/or to correct the significant deficiencies identified in the SDVN attached to this Consent Order as Exhibit A.

2.1 Submit to the DWMAD a completed rate study from a qualified professional consultant, along with a plan to implement rate increases as recommended by the study, no later than April 1, 2019.

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water no later than April 1, 2019.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

2.7 Submit to the DWMAD an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process, no later than May 1, 2019.

2.8 Submit an updated cross connection program for DWMAD approval, incorporating the City's plan for implementing control of residential accounts, and for obtaining adequate personnel to implement the City's cross connection control program, no later than June 1, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

2.10 Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants, no later than June 1, 2019.

2.11 Conduct professional inspection of the elevated tank interior and exterior no later than June 30, 2019.

2.12 Install working mussel control system at the intake no later than June 30, 2019.

2.13 Repair filter to waste valves no later than January 1, 2020.

Sections III and IV of this Consent Order shall not be altered in any way, including adding or eliminating any language, striking terms or parts of terms, retyping in whole or in part, or using a different format. Any changes to this document without written approval from the DEQ renders the Consent Order null and void.

SECTION III - STIPULATIONS

The Owner/Operator and the DEQ stipulate as follows:

3.1 The DEQ is authorized to enter this Consent Order requiring the Owner/Operator to comply with state law under Section 15 of Act 399.

3.2 The Owner/Operator consents to the issuance and entry of this Consent Order and stipulates that the entry of this Consent Order constitutes a final order of the DEQ and is enforceable as such under the appropriate provisions of state law identified in this Consent Order. The Owner/Operator agrees not to contest the issuance of this Consent Order and that the resolution of this matter by the entry of this Consent Order is appropriate and acceptable.

3.3 The Owner/Operator and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Owner/Operator that the law has been violated.

3.4 The Signatory to this Consent Order on behalf of the Owner/Operator agrees and attests that he/she is fully authorized to ensure that the Owner/Operator will comply with all requirements under this Consent Order.

3.5 The Owner/Operator shall achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section II of this Consent Order.

SECTION IV - GENERAL PROVISIONS

The Owner/Operator and the DEQ further stipulate as follows:

4.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Owner/Operator to comply with the requirements of Act 399 and the administrative rules promulgated thereunder.

4.2 The DEQ and the Owner/Operator consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to the provisions of Act 399.

4.3 This Consent Order in no way affects the Owner/Operator's responsibility to comply with any other applicable local, state, or federal laws or regulations.

4.4 The DEQ reserves its right to pursue appropriate action, including injunctive relief to enforce the provisions of this Consent Order, and applicable statutory fines for any violation of this Consent Order.

4.5 Nothing in this Consent Order is or shall be considered to affect any liability the Owner/Operator may have for natural resource damages caused by the

Owner/Operator's acts or omissions at the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

4.6 In the event the Owner/Operator sells or transfers the facility, he/she shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the Owner/Operator shall also notify the DWMAD Engineering Unit, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be submitted to the DWMAD Engineering Unit within 30 days of assuming the obligations of this Consent Order.

4.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their successors and assigns.

4.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

Reporting

4.9 The Owner/Operator shall make all submittals and written notifications required by this Consent Order, to the DWMAD Engineering Unit, DEQ, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503. The cover letter with each submittal or notification shall identify the specific paragraph and requirement of this Consent Order that the submittal or notification is intended to satisfy.

4.10 The Owner/Operator shall verbally report any violation(s) of the terms and conditions of this Consent Order to the DWMAD Engineering Unit Supervisor at 231-590-3430 by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with submittal of a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The Owner/Operator shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

Retention of Records

4.11 Upon request by an authorized representative of the DEQ, the Owner/Operator shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to applicable laws or rules. All such documents shall be retained by the Owner/Operator for at least a period of three years from the date of generation of the record unless a longer period of record retention is required by the applicable law or its rules.

Right of Entry

4.12 The Owner/Operator shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all

reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to Act 399 and the administrative rules promulgated thereunder or any other applicable statutory provision.

DEQ Approval of Submittals

4.13 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Owner/Operator, the following process and terms of approval shall apply:

a. All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

b. In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the reasons for such disapproval. The Owner/Operator shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

c. In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Owner/Operator to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

d. Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

e. Failure by the Owner/Operator to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the Owner/Operator to the enforcement provisions of this Consent Order.

f. Any delays caused by the Owner/Operator's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Owner/Operator's responsibility to comply with any other deadline(s) specified in this Consent Order.

g. No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted

by the Owner/Operator will be construed as relieving the Owner/Operator of his/her obligation to obtain written approval, if and when required by this Consent Order.

Extensions

4.14 The Owner/Operator and the DEQ agree that the DEQ may grant the Owner/Operator a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request to the DWMAD Engineering Unit no later than ten business days prior to the pertinent deadline and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the Owner/Operator from meeting the deadline(s).

c. A description of the measures the Owner/Operator has taken and/or intends to take to meet the required deadline(s).

d. The length of the extension requested and the specific date on which the obligation will be met.

No change or modification to this Consent Order shall be valid unless in writing from the DEQ and, if applicable, signed by both parties.

Termination

4.15 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the Owner/Operator shall submit a request consisting of a written certification that the Owner/Operator has fully complied with the requirements of this Consent Order and has made payment of any fines required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section II of this Consent Order, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the DWMAD Engineering Unit.

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Exhibit A
Administrative Consent Order

Enforcement Type	Issue Date
Significant Deficiency Violation Notice	October 3, 2018

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
GRAND RAPIDS DISTRICT OFFICE

C. HEIDI GRETHER
DIRECTOR

October 3, 2018

CERTIFIED MAIL

Mr. Marcus Muhammad, Mayor
Mr. Darwin Watson, City Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, MI 49022

SIGNIFICANT DEFICIENCY VIOLATION NOTICE
WSSN: 00600

Dear Sirs:

SUBJECT: City of Benton Harbor (City) - Water System Sanitary Survey and Significant Deficiency Violation Notice – Financial and Managerial Capacity

This letter will confirm meetings with Benton Harbor staff on multiple dates in 2017 and 2018; representing the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), and summarize the subsequent review and discussion of the water supply facilities serving the City of Benton Harbor (City). The purpose of these meetings and subsequent review is to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). **Findings from the survey, listed below, have led to the determination the water supply currently lacks the financial and managerial capacity to meet all the requirements of Act 399.** Findings of significant deficiency have been identified as having the potential to introduce contamination to the public water supply and must be addressed within 120 days or be outlined in a corrective action plan and schedule approved by this office.

Since the previous sanitary survey in 2015, staff at the City of Benton Harbor have made significant efforts to maintain and improve the historically neglected water system. The distribution pipe network alone represents $124 million in replacement value, according to the 2017 asset management program by Abonmarche. Along with the City's complex treatment plant, this represents a significant challenge for the City in terms of maintenance costs. Proper care and maintenance of the system is necessary to protect the health of all customers.

The major findings below indicate a number of areas needing immediate attention by the City, many of which have the potential to impact public health by allowing or introducing contamination to the water supply. Of utmost importance, a review of financial information finds the City presently lacks an adequate financial mechanism to conduct necessary improvements or hire necessary staff to properly maintain and operate the water system. **We strongly advise the City to work with a qualified financial consultant to identify the revenue necessary to support operation and maintenance and to implement effective revenue collection methodologies.** Investment from the City's rate payers is essential for resolving the below (significant) deficiencies and for ensuring the long term vitality of the water system assets.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	**Deficiencies Identified**
Treatment	**Significant Deficiencies Identified**
Distribution System	**Significant Deficiencies Identified**
Finished Water Storage	**Deficiencies Identified**
Pumps	Recommendations made
Monitoring & Reporting	**Significant Deficiencies Identified**
Management & Operations	**Significant Deficiencies Identified**
Operator Compliance	Recommendations made
Security	No Deficiencies or Recommendations
Financial	**Significant Deficiencies Identified**
Other	**Significant Deficiencies Identified**

The following significant deficiencies are violations of Act 399 with the potential to allow or introduce contamination to the public water supply, and must either be resolved within 120 days or be included in an approved corrective action plan.

D1. Our review included the City's asset management program, submitted in December 2017, as well as the bill payment and collections process. Current revenues are not sufficient to cover capital improvement costs, and necessary improvements identified in this survey are likely to increase operations and maintenance costs beyond the current revenues. In addition, the current water bill collection process is inadequate and creates a significant drain on staff resources and time, which would be better spent towards resolution of significant deficiencies and performance of routine maintenance activities. **In order to maintain the required financial capacity to operate a public water supply, the City must:**

a. Conduct a rate study with a qualified professional consultant, and implement findings to generate sufficient revenue to cover costs.
b. Implement a consistent and equitable program to minimize the number of unpaid bills, and streamline the collections process.

D2. An increasing trend in the number of violations of Act 399 in the past year indicates the need for increased managerial oversight of the water supply. In addition, maintenance of the water plant and distribution system components is severely lacking. The lack of separate designated distribution and plant managers prevents staff from spending adequate time and energy on managing the water system. **In order to maintain the managerial capacity to operate the public water supply and meet the requirements of Act 399, the City must hire separate certified operators to oversee the distribution system and the water treatment facility.**

D3. R 325.11008 (2) requires a sufficient primary coagulant dose shall be added to create a settleable or filterable floc at all times. Currently the City adds coagulant to an injection point in the raw water influent pipe rather than the engineered rapid mix basins in the new plate settler building. It has become apparent, through a near violation of turbidity standards in February of 2018, as well as an ongoing treatment technique violation of R 325.10610c, this coagulation practice is not acceptable to meet the requirements of Act 399. Lack of proper mixing also impacts the pathogen removal credit awarded to properly operated conventional treatment facilities. **Adequate rapid mix for the primary coagulant must be installed.**

The current raw water pH of Lake Michigan is above the optimum operating range of the City's current coagulant, aluminum sulfate. At these elevated pH ranges, iron based coagulants, such as ferric sulfate or ferrous sulfate may be more suited for creating a settleable or filterable floc. The City should hire a consultant to explore the steps necessary to explore a switch of the primary coagulant.

D4. R 325.10720 (3) requires continuous monitoring for residual disinfectant at an entry point to the distribution system (EPTD) on a continual basis, and requires the minimum to be recorded for each day. The chlorine analyzer at the City's EPTD was reading less than 0.2 mg/L, the minimum required residual under R325.10611a(2)(b). The readings were identified as unreliable by the operator, and are not recorded as required above. Moreover, plant staff were not familiar with the operational setpoints necessary to achieve sufficient disinfection. **Accurate chlorine analyzer must be in place, minimum levels recorded daily and reported to the DEQ, and connected to SCADA with callout alarms in the event of low residual.**

D5. R 325.11404 requires a water supply to develop a comprehensive control program for the elimination and prevention of all cross connections. The program must include education, inspection, preventer testing in all customer sectors including residential. In addition, an annual report summarizing activities must be submitted to the DEQ. The City has insufficient staff to conduct any activities for the last few years, as evidenced by the lack of annual reporting. **The City must dedicate a trained staff person to implement this program or obtain a contract with a qualified professional company to implement the program.**

D6. R325.11108 requires a water supply to have sufficient valves in the distribution system to minimize interruptions in service and minimize sanitary hazards during construction or repairs. In addition, R 325.11111 requires adequate records be maintained on the distribution system components including hydrants and valves. The City has struggled to conduct necessary inventory and maintenance on valves in the system. **A plan for valve inventory and maintenance must be submitted, approved and implemented consistently.**

D7. R 325.11105 requires a water supply distribution system to maintain a minimum pressure of 20psi throughout the system during emergencies such as firefighting, and allows the department to prohibit installation of fire hydrants in areas where fire flow is not sufficient. From our discussion with staff and through the hydrant flow testing activities conducted during the reliability study, a number of hydrants in town have no flow or zero flow. This may be related to closed valves in the system, which significantly impacts public safety should an emergency occur. **A plan for hydrant inventory and maintenance must be submitted,**

approved and implemented consistently.

D8. The water plant's supervisory control and data acquisition (SCADA) system is in need of upgrades to achieve the following requirements:

a. Storage and access to regulatory data such as EPTD chlorine residuals (R 325.10720), plant flow, and individual filter turbidity profiles (R10720a).
b. Alarming capabilities to call out during unstaffed hours for low chlorine residual, low tower level, high turbidity at the filter confluence point and other undesirable conditions.
c. Automation of water plant operations may be enhanced to allow staff to focus on maintenance activities.

The following deficiencies are also violations of Act 399, and must be resolved to return to compliance with Act 399.

D9. Install finished water meters at the water plant to facilitate accurate calculations and reporting of chemical treatment, calculation of non-revenue water, and more accurate calculation of CT.

D10. Significant amounts of unlined cast iron water main are in need of replacement. With funding in place, the City must prioritize replacement of old water main that is unreliable and undersized.

D11. The monthly operating report must accurately reflect the data collected at the water plant. For example, treated water has been estimated using raw water meters, and chlorine at the plant tap should be the minimum recorded for the day from the EPTD continuous analyzer as opposed to bench top analysis.

D12. Conduct a professional inspection on the elevated tank, including necessary maintenance and cleaning. This may be facilitated by installing variable frequency drive(s) on high service pumps, which would allow operating on pressure rather than on tower level.

If you have any information you would like us to consider regarding the significant deficiencies identified in this Significant Deficiency Violation Notice, please provide it in a written response by November 2, 2018.

Representatives from the City and DEQ met on September 14, 2018 to discuss preliminary findings of the sanitary survey, and to begin discussion of a corrective action plan such as an administrative consent order (ACO), to return to compliance. It is understood that a significant amount of time will be required to address many of these issues. Therefore, we recognize that this ACO contains a schedule, which is both systematic and flexible, to bring the City back into compliance with the SDWA and providing a safe and reliable source of drinking water to its residents. Upon hearing from the City of its desire to move forward with an ACO, we will forward a draft ACO for the City's review and comment. At that time, DEQ staff will be available to meet with City officials to discuss the ACO in an attempt to execute it prior to the 120 day deadline.

A reliable supply of quality drinking water is critical to the growth and strength of any community. We are committed to working with the City to improve the water distribution system and treatment plant. With a strong commitment and swift effort from the City, we believe these deficiencies can be resolved and lead to long term water system sustainability.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this Significant Deficiency Violation Notice, please contact me by telephone at 616-307-0261; by e-mail at sarkipatoe@michigan.gov; or DEQ-DWMAD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato, P.E.,
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division

Enclosure

cc: Berrien County Health Department
cc/enc: Mr. Mike O'Malley, Operator in Charge, City of Benton Harbor
Mr. Eric Oswald, Director, DEQ (via email)
Ms. Sue Maul, Enforcement Specialist, DEQ (via email)
Mr. Jon Bloemker, Engineering Unit Supervisor, DEQ (via email)

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; EGLE-DWEH-Grand-Rapids; Onan, Brandon (EGLE); Thurston, Brian (EGLE); Bolf, Michael (EGLE)
Cc:	Jim and Todd Luks Elhorn Engineerint; emitchell; Mike OMalley; Darold Harlan
Subject:	Re: MI 0600 Benton Harbor ACO Required Corrosion Study Packet
Date:	Tuesday, July 28, 2020 12:29:16 PM

Thank you for the submittal. We will discuss and provide feedback, hopefully later this week.

From: Mike O'Malley <momalley@bhcity.us>
Sent: Tuesday, July 28, 2020 11:36:36 AM
To: EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Jim and Todd Luks Elhorn Engineerint <elhorneng@aol.com>; emitchell <emitchell@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Darold Harlan <dharlan@fv-operations.com>
Subject: MI 0600 Benton Harbor ACO Required Corrosion Study Packet

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

See attached for your information:

Attached: *MI 0600 Benton Harbor Water Corrosion Plan for ACO.pdf*

Mike O'Malley
Benton Harbor Community Water Operator IN Charge

From:	elhorneng@aol.com
To:	Sarkipato, Ernest (EGLE); momalley@cityofbentonharbormi.gov; Onan, Brandon (EGLE); mike@michonline.net
Cc:	dwatson@cityofbentonharbormi.gov; Bolt, Jennifer (EGLE)
Subject:	Re: MI 0600 Benton Harbor Corrosion Treatment Plan
Date:	Friday, April 26, 2019 2:20:12 PM

Guys,

I'm in Kalamazoo Monday morning, will be returning to my office around 2-3 pm. Tuesday in Oakland County doing sanitary surveys and do not know when I will return?
I will be in office Wednesday AM and gone PM.

Todd Luks

Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854
ph: 517-676-3786
fax: 517-676-3788

-----Original Message-----
From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
To: momalley@cityofbentonharbormi.gov <momalley@cityofbentonharbormi.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>; 'Todd Luks' <elhorneng@aol.com>; mike@michonline.net <mike@michonline.net>
Cc: dwatson@cityofbentonharbormi.gov <dwatson@cityofbentonharbormi.gov>; Bolt, Jennifer (EGLE) <BOLTJ@michigan.gov>
Sent: Fri, Apr 26, 2019 1:30 pm
Subject: FW: MI 0600 Benton Harbor Corrosion Treatment Plan

Hello Gentlemen,

Brandon and I would appreciate a chance to chat with you to discuss the corrosion treatment plan (attached).

Can you reply with your availability next week Monday afternoon or Tuesday afternoon?

I can set up a call-in number, so we can avoid a coordinated trip out to the water plant.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment Great Lakes and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, April 23, 2019 8:28 AM
To: EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
Cc: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: MI 0600 Benton Harbor Corrosion Treatment Plan

Please see attached: *MI 0600 Benton Harbor Corrosion Treatment Plan.pdf*

Thank you,

Mike O'Malley

Benton Harbor Water Superintendent

From: Sarkipato, Ernest (DEQ)
To: Mike O"Malley
Subject: Re: MI 0600 Benton Harbor MOR January 2019
Date: Monday, February 11, 2019 6:56:24 AM

Thanks. And - another friendly reminder to take a look at the McCrometer insertion meter for the phosphate feed. This is something I spoke with Darwin about and he was okay with it. It's a standard meter used by other water systems like Grand Rapids.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 9, 2019, at 12:27 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:

See Attached: *MI 0600 Benton Harbor MOR January 2019.pdf*

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent
<MI 0600 Benton Harbor MOR January 2019.pdf>

From: Sarkipato, Ernest (DEQ)
To: Mike O"Malley
Subject: Re: MI 0600 Benton Harbor MOR January 2019
Date: Monday, February 11, 2019 6:56:24 AM

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Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
DEQ-Drinking Water and Municipal Assistance Division
616-307-0261

On Feb 9, 2019, at 12:27 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:

See Attached: *MI 0600 Benton Harbor MOR January 2019.pdf*

Thanks,

Mike O'Malley
Benton Harbor Water Superintendent
<MI 0600 Benton Harbor MOR January 2019.pdf>

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE); Klein, Jeremy (EGLE); Jackson, Heather (EGLE)
Cc:	DARWIN WATSON; Darold Harlan; Mike OMalley
Subject:	Re: MI 0600 Benton Harbor MOR June 2019
Date:	Thursday, July 11, 2019 12:26:23 PM

---

you do not really want my questions, do you!

We are all busy, with not enough help.

Please, how about some timely heads up about coming testing and reporting. The day before is terrible timing.
And, who keeps changing their mind and comes up with additions, revisions, ect.

You got a bunch of problems with your web sites.
Any word of excel document I try to get gives me a Certificate Error, and it does or does not come.
The only Water Quality Parameter table on the web site does not include all the necessary parameters to calculate the LSI, only the silly CSMR.

Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Jul 11, 2019 at 8:08 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike and crew,
>
> In discussing water quality parameters and the 2019 monitoring schedule, it was noted there were a few things missing on Benton Harbor's.
>
> The attached revised 2019 schedule includes all the required WQP's for a system with newly installed corrosion control.
>
> As Mike points out below, the monitoring requirements continue to stack up to keep track of the corrosion control system. I tend to agree with Mike, it takes reliable/dependable staff to maintain compliance, as well as excellent organization to keep all this stuff straight.
>
> Let us know if you have any questions.
>
> Ernie
>
> **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> **Sent:** Wednesday, July 10, 2019 1:19 PM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike OMalley <momalley@cityofbentonharbormi.gov>
> **Subject:** Re: MI 0600 Benton Harbor MOR June 2019
>
> Thanks for the info.
>
> I'll need a crew hired by me and not just someone who shows up and says they work at the water plant, because of a MDEQ ACO & MIOSHA Visitor

On Wed, Jul 10, 2019 at 1:14 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Ok for now - eventually there will be upper and lower limits in place for po4, pH, alkalinity, and you'll only be allowed 9 excursions in a 6 month window! It's a tough row to hoe.
>
> R 604f (3) (g)
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> EGLE-Drinking Water and Environmental Health
>
> 616-307-0261
>
> On Jul 10, 2019, at 1:11 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:
>
> 2 things:
>
> 1. Sometimes, the operators may take a sample when the HS is off, mostly though they take it when the HS is on, this impacts residuals
> 2. But mostly, the impact of changing out empty for full barrels.
>
> For some reason, they always seem to get low before weekends.
>
> It takes 2 people to put a barrel on and my crack staff does not bother to change them before Friday afternoon.
>
> Usually, if I know it is low or Doug or Denny calls, I get there Saturday morning and the 2 of us change the barrels.
>
> How does that sound.
>
> On Wed, Jul 10, 2019 at 1:05 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:
>
> > Thanks, good data. Why is the plant tap ortho so low on the 23/24th? Were the HSP's not running during sampling?
> >
> > **From:** Mike O'Malley <momalley@cityofbentonharbormi.gov>
> > **Sent:** Wednesday, July 10, 2019 1:02 PM
> > **To:** EGLE-DWMA-Kalamazoo <EGLE-DWMA-Kalamazoo@michigan.gov>; EGLE-DWMA-Grand-Rapids <EGLE-DWMA-Grand-Rapids@michigan.gov>
> > **Cc:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
> > **Subject:** MI 0600 Benton Harbor MOR June 2019

Please See attached: *MI 0600 Benton Harbor MOR June 2019.pdf*

Ernie,

During June, I finally got the operators to sample OPP at routine bacti sites.

I added them to the 1st 2 columns of the Bacti/Meter/OPP page

Residuals found and locations.

You will notice open spaces between results, The Sample date is the 1st through 5th Location (heard of that before, but we use all 5)

Thanks,

Mike O'Malley

Benton Harbor Water Superintendent

From: Sarkipato, Ernest (EGLE)
To: Bolf, Michael (EGLE); Henderson, Shannon (EGLE)
Subject: Re: MI 0600 Benton Harbor MOR November 2019
Date: Thursday, December 19, 2019 2:32:23 PM
Attachments: Re Phosphate tests.msg

O'Malley confirmed via email (attached) the following:

1. DR300 w/ Orthophosphate reagent is being used.
2. His understanding appears to be the target is 1.5 mg/L as "OPP", which is ortho/polyphosphate to him. Though, I guess he doesn't really answer my question in the attached.

Ernie

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Thursday, December 19, 2019 10:01:08 AM
To: Henderson, Shannon (EGLE) <HendersonS8@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: RE: MI 0600 Benton Harbor MOR November 2019

If you're not already certain, can you guys confirm what analysis Benton Harbor is using for their phosphate concentration measurements? Preferably info on the test kit and reagents.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Henderson, Shannon (EGLE) <HendersonS8@michigan.gov>
Sent: Thursday, December 19, 2019 9:20 AM
To: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: FW: MI 0600 Benton Harbor MOR November 2019

Shannon Henderson
Environmental Engineer
Drinking Water and Environmental Health Division - Engineering Unit
Michigan Department of Environment, Great Lakes, and Energy
Grand Rapids District Office
517-539-1687 | HendersonS8@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>
Sent: Tuesday, December 10, 2019 8:47 AM
To: Henderson, Shannon (EGLE) <HendersonS8@michigan.gov>
Subject: FW: MI 0600 Benton Harbor MOR November 2019

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Tuesday, December 10, 2019 8:45 AM
To: EGLE-DWEH-Grand-Rapids <EGLE-DWEH-Grand-Rapids@michigan.gov>; EGLE-DWEH-Kalamazoo <EGLE-DWEH-Kalamazoo@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>; Denny Edwards <dedwards@cityofbentonharbormi.gov>
Subject: MI 0600 Benton Harbor MOR November 2019

Please see Attached: *MI 0600 Benton Harbor MOR Nov 2019.pdf*

Thanks,

Mike O'Malley
Benton Harbor Water Operator IN Charge

From: Mike O'Malley [momalley@cityofbentonharbormi.gov]
To: Sarkipato, Ernest (EGLE) [SARKIPATOE@michigan.gov]
CC: Ellis Mitchell [emitchell@cityofbentonharbormi.gov]
Subject: Re: Phosphate tests
Sent: Thursday, December 19, 2019 14:15:57
Attachment 1: image001.jpg

Yes, that is correct.

We do exactly what we were told to do.

Closing off the suction line valves was a big mistake. And I am at wits end to figure it out.
So, I have chosen to ignore it until I get all the 1/10/2020 work done.

The Chloride/Sulfate ratio is consistently less than 1.0 also known "small value of non-corrosive"
Opp results in plant tap and system vary from 1.2 to 1.8 mg/L with the DR300.

As far as lead and copper go, we will be out of compliance. I have even had to work with a Residential Water Quality Committee.
And so far I have a couple of sites that have tested from the list given to us by Edward Pinkney.

Enjoy your holidays, for they are interrupting my tasks something furious.

Mike O'Malley
Benton Harbor Water Operator IN Charge

On Thu, Dec 19, 2019 at 11:57 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov<mailto:SARKIPATOE@michigan.gov>> wrote:

Good morning Mike,

I hope you are doing well this sunny winter day. We have discussions with some outside groups regarding BH's corrosion treatment, and want to confirm a couple things.

Can you confirm your phosphate tests are being done with a newly purchased Hach DR300 with orthophosphate reagent, similar to here: https://www.hach.com/dr300-pocket-colorimeter-phosphate-with-box/product-downloads?id=55321383866<https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.hach.com%2Fdr300-pocket-colorimeter-phosphate-with-box%2Fproduct-downloads%3Fid%3D55321383866&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C066836e7f36d4095b5a208d784af8803%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637123761742936774&sdata=8NQgWg0GqvaaKACAbKgcbP6V6q6PCMifDZTEEkTMSu0%3D&reserved=0>

I recall you had purchased a colorwheel at the start, but also recall seeing a handheld spec at the lab.

Also, can you confirm whether your target dosage is 1.5 mg/L as PO4 (measured as orthophosphate), or

1.5 mg/L as PO4 (measured as total phosphate)?

Thank you and hope you are well,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater<https://gcc01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.michigan.gov%2Fdrinkingwater&data=02%7C01%7CSARKIPATOE%40michigan.gov%7C066836e7f36d4095b5a208d784af8803%7Cd5fb7087377742ad966a892ef47225d1%7C0%7C0%7C637123761742946767&sdata=1Ab4pok%2F1lFNeZaiBv5hKt3CshmwXW24zC935p57%2FlU%3D&reserved=0>

From:	Sarkipato, Ernest (EGLE)
To:	Onan, Brandon (EGLE)
Cc:	Bolf, Michael (EGLE); Thurston, Brian (EGLE)
Subject:	Re: PO4 data - Benton Harbor
Date:	Wednesday, December 18, 2019 5:09:53 PM
Attachments:	image001.png image003.png

This is monthly average data for long term trending purposes, not daily data.

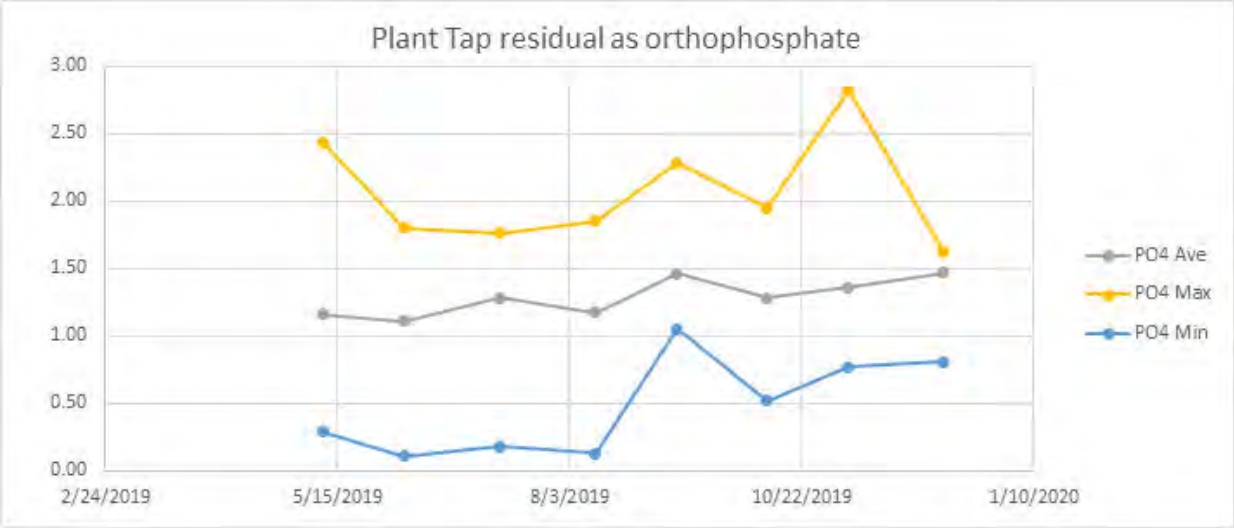
From: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Sent: Wednesday, December 18, 2019 4:50:52 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: PO4 data - Benton Harbor

Ernie, I can't tell what is going on from the graph in terms of why there are max and min data points on what looks like specific days and not just daily readings? Give me a call if my question doesn't make sense

Brandon Onan, P.E.
Lead and Copper Unit Supervisor
Drinking Water & Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
(p) 616.307.6736
onanb@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, December 18, 2019 11:28 AM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: RE: PO4 data - Benton Harbor

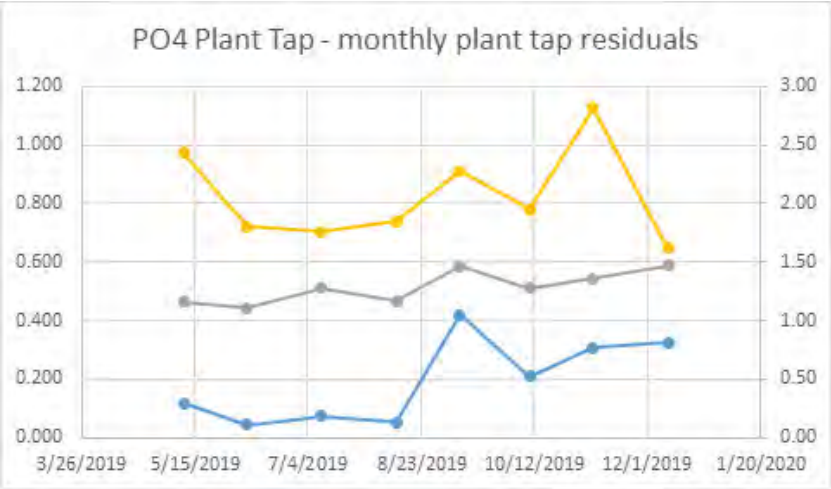
Better graph, sorry. Target is 1.5 mg/L as total phosphate per attached, although ***I don't see where we have directly communicated this treatment target to the city.*** Based on Mike O's email upon starting up the system, he references 1.5 mg/L but doesn't specify total PO4 or just the orthophosphate portion.



From: Sarkipato, Ernest (EGLE)
Sent: Wednesday, December 18, 2019 11:09 AM

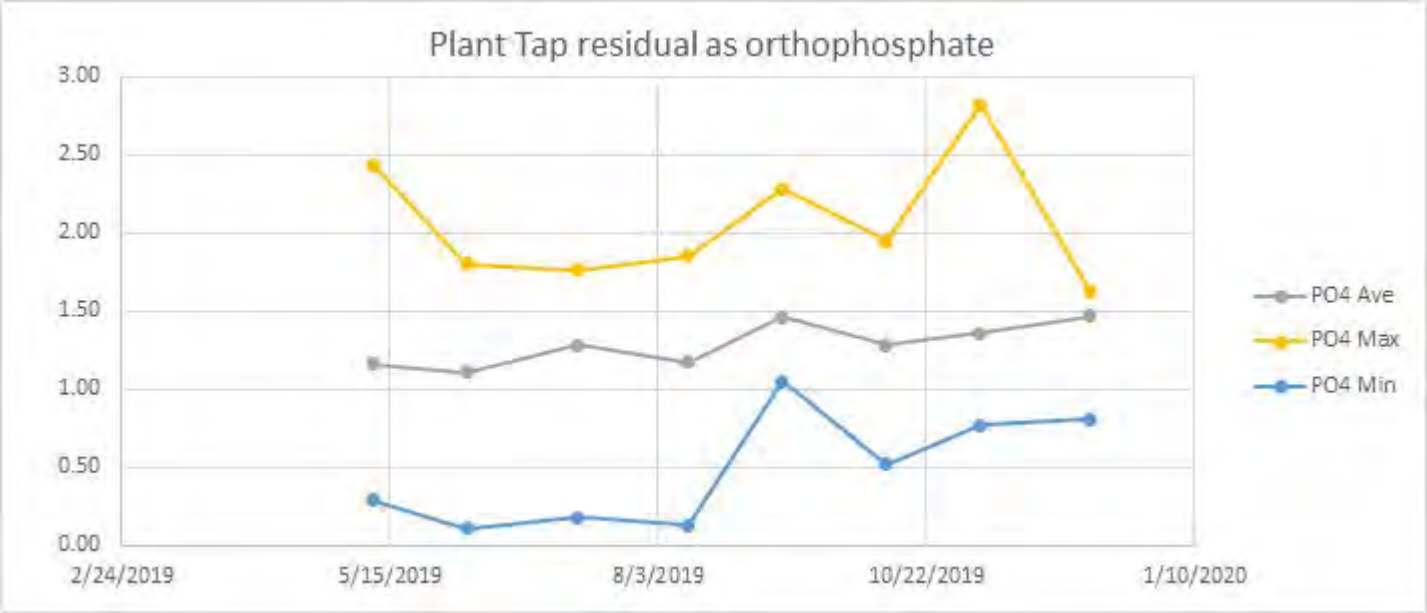
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>
Subject: PO4 data - Benton Harbor

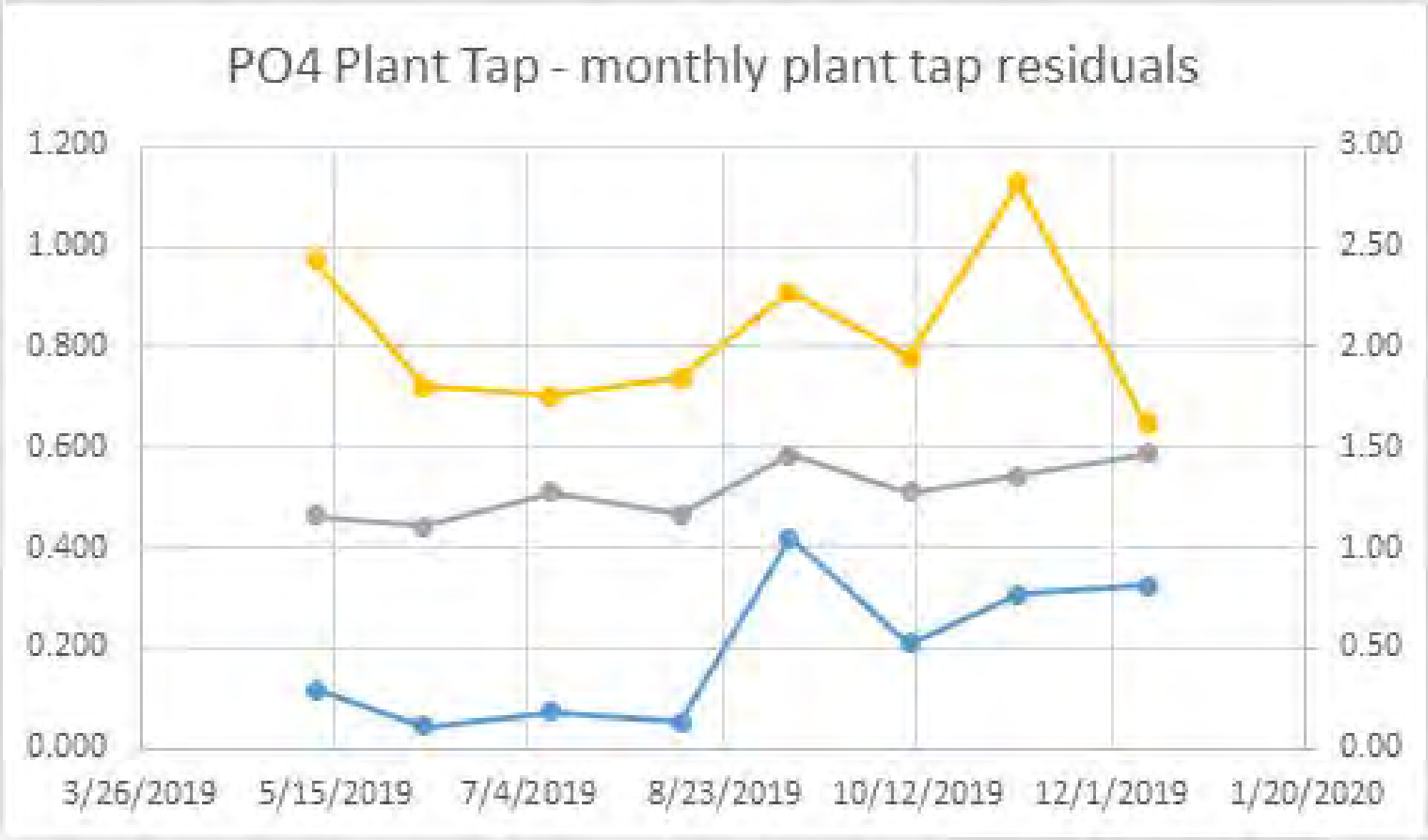
FYI:



Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater


Plant Tap residual as orthophosphate
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/24/2019
5/15/2019
8/3/2019
10/22/2019
1/10/2020
PO4 Ave
PO4 Max
PO4 Min


PO4 Plant Tap - monthly plant tap residuals
1.200
1.000
0.800
0.600
0.400
0.200
0.000
3.00
2.50
2.00
1.50
1.00
0.50
0.00
3/26/2019
5/15/2019
7/4/2019
8/23/2019
10/12/2019
12/1/2019
1/20/2020

From: Charlotte Jameson
To: Oswald, Eric (EGLE)
Subject: Re: Re-Group on LCR
Date: Wednesday, June 24, 2020 12:52:59 PM

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hey- Below is what we have. Also in terms of participants I have: Elin Betanzo, myself, Cyndi Roper, Nick Leonard, Jeremy Orr, and Slyvia Orduno.

1. Preliminary DSMI results:
    1. Is EGLE treating "unknown- likely lead" as lead service lines for replacement rates?
    2. How is EGLE handling "Unknown - no information" for sampling pools and replacement rates, especially for systems that have no other probable lead service line locations?
2. What enforcement is EGLE doing around service line notifications? Have water systems completed this?
3. How many LSLR schedule extensions has EGLE received?
4. Is EGLE providing any guidance on how to prioritize LSLR in an asset management plan?
5. Can EGLE publish a list of water supplies that submitted the 2018 asset management plan like EGLE published the list of EO 2020-28 water supply reports? Is it also possible to get access to the actual plans themselves?
6. Update on 2020 compliance sampling. A lot of water supplies with lead service lines submitted first liter only samples last year; are we expecting changes this year now that the sampling pools have been updated and DSMI turned in?
7. Update on Benton Harbor corrosion control study
8. Update on Michigan corrosion control guidance
9. Michigan's definition and implementation of Disadvantaged Community for the SRF program
10. How is the partnership between MDHHS and EGLE going in LALE communities? How has MDHHS been using sequential sampling data?

On Wed, Jun 24, 2020 at 10:32 AM Oswald, Eric (EGLE) <OswaldE1@michigan.gov> wrote:

> Do we have a proposed agenda for this meeting?
>
> Eric
>
> ---
>
> **From:** Charlotte Jameson <charlotte@environmentalcouncil.org>
> **Sent:** Wednesday, 10 June, 2020 12:05
> **To:** Ruch, Suzann (EGLE) <RuchS@michigan.gov>

Cc: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
Subject: Re: Re-Group on LCR

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Sounds good

On Wed, Jun 10, 2020 at 11:52 AM Ruch, Suzann (EGLE) <RuchS@michigan.gov> wrote:

> Hi Charlotte –
>
> June 25 at 8:00 a.m. is confirmed.
>
> I will send out a Microsoft Teams meeting to EGLE staff and to you, and then if you could forward it to your other participants, that would be great.
>
> Will do ASAP, and thanks!
>
> **Suzann J. Ruch**
> Senior Executive Management Assistant to Eric Oswald
>
> Drinking Water and Environmental Health Division
>
> Michigan Department of Environment, Great Lakes, and Energy
> P.O. Box 30817
>
> Lansing, Michigan 48909-8311
>
> 517-284-6544 | RuchS@Michigan.gov
>
> **Follow Us** | **Michigan.gov/EGLE**
>
> ---
>
> **From:** Charlotte Jameson <charlotte@environmentalcouncil.org>
> **Sent:** Wednesday, June 10, 2020 10:20 AM
> **To:** Ruch, Suzann (EGLE) <RuchS@michigan.gov>
> **Cc:** Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
> **Subject:** Re: Re-Group on LCR
>
> **CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov**

The 25th at 8 AM is the winner. Suzann will you set up a teams meeting? Otherwise I can share a link to zoom.

Charlotte

On Tue, Jun 9, 2020 at 4:00 PM Ruch, Suzann (EGLE) <RuchS@michigan.gov> wrote:

> Sounds good. Thanks!
>
> **Suzann J. Ruch**
> Senior Executive Management Assistant to Eric Oswald
>
> Drinking Water and Environmental Health Division
>
> Michigan Department of Environment, Great Lakes, and Energy
> P.O. Box 30817
>
> Lansing, Michigan 48909-8311
>
> 517-284-6544 | RuchS@Michigan.gov
>
> **Follow Us** | **Michigan.gov/EGLE**
>
> ---
>
> **From:** Charlotte Jameson <charlotte@environmentalcouncil.org>
> **Sent:** Tuesday, June 09, 2020 3:58 PM
> **To:** Ruch, Suzann (EGLE) <RuchS@michigan.gov>
> **Cc:** Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>; Onan, Brandon (EGLE) <OnanB@michigan.gov>
> **Subject:** Re: Re-Group on LCR
>
> **CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov**
>
> Great thanks- I'll circulate those times to folk on my end and let you know soon what might work.
>
> Charlotte
>
> On Tue, Jun 9, 2020 at 3:52 PM Ruch, Suzann (EGLE) <RuchS@michigan.gov> wrote:
>
> > Good Afternoon Charlotte:
> >
> > We are fairly time-limited those weeks, and with lay-off days on Mondays or Fridays, that really leaves only three days a week in which to schedule a meeting.

Week of 6/15: Appropriate EGLE staff are not available

Week of 6/22: Here are some available times EGLE-DWEHD staff are available for a conference call:

- Wednesday, June 24: 8:00 a.m. – 9:00 a.m.
- Wednesday, June 24: 2:30 p.m. - 3:30 p.m.
- Thursday, June 25: 8:00 a.m. – 9:00 a.m.
- Thursday, June 25: 4:00 p.m. – 5:00 p.m.

Please let me know which of these times work best for your attendees' calendars. If nothing works, I can go back to the drawing board, but if that happens, I may have to look into the week of June 29, but we run into the alternate lay-off day of July 2 and the July 3 holiday – so only two days that week to work with.

Thanks, and look forward to hearing from you.

Suzann J. Ruch
Senior Executive Management Assistant to Eric Oswald

Drinking Water and Environmental Health Division

Michigan Department of Environment, Great Lakes, and Energy
P.O. Box 30817

Lansing, Michigan 48909-8311

517-284-6544 | RuchS@Michigan.gov

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From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Tuesday, June 09, 2020 2:46 PM
To: Ruch, Suzann (EGLE) <RuchS@michigan.gov>
Subject: FW: Re-Group on LCR

Can you see if there is an hour that will work the week of 22 June?

Eric

From: Charlotte Jameson <charlotte@environmentalcouncil.org>
Sent: Tuesday, 9 June, 2020 14:44
To: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>; Philip, Kris (EGLE) <PHILIPK@michigan.gov>
Subject: Re-Group on LCR

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Hey Eric and Kris,

I hope you are both doing OK. I know all of us, the advocacy community included, have been slammed by work on water restorations and affordability. We are still devoting a lot of time to those topics, but recently have been finding a little more head space to devote again to the LCR and water utility compliance with the rule.

I know you all are probably drowning, especially with furloughs cutting into staff work time, but I am hoping we can find some time to do a touch-base primarily on LCR although we might have one or two questions related to the DWSRF. I'll be sure to provide a complete list of agenda topics prior to any call. I'll also pull in some partner groups (likely NRDC, Elin, GLELC, etc) and will give a list of those folks prior to the call as well.

Do you all have some dates and times the week of June 15th or June 22nd that would work on your end? If you give me a few options I can coordinate calendars on my end.

Thanks,

Charlotte

--

Charlotte Jameson

Program Director Legislative Affairs, Energy, and Drinking Water Policy

Michigan Environmental Council

charlotte@environmentalcouncil.org

(c) 919-215-7133; (o) 517-999-0427

environmentalcouncil.org
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facebook.com/MichiganEnvironmentalCouncil

Join Us!

--

Charlotte Jameson

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facebook.com/MichiganEnvironmentalCouncil

Join Us!

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Darwin Watson; Bolf, Michael (EGLE); Mike OMalley; Darold Harlan
Subject:	Re: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad
Date:	Friday, May 17, 2019 9:43:59 AM

Seriously,

See response copied and pasted in black; responded in blue:

Mike's detailed reply brings in a couple follow-up questions/comments:

-Individual Filter turbidities should also be available on the historian (maybe when the meter gets integrated) Completely done on 1st set up of Historian. Nothing changed in the SCADA, but now it is kept in Historian along with typical data storage of the original Wonderware InTouch, about 1 year only.

-Who is Darold Harlan …. Is this person from F&V? Yes he is from F&V, I told you that it was straight from City Commission meeting minutes. (that I do not have a copy of, but went to all 3 meetings) He is on the copy line.

-When will F&V be onsite, and what is the contractual arrangement for being onsite (i.e. frequency, on-call, etc)? He started May 7 and has put in 8 hours every day since, except today. And understands "on call" but I will likely not use that function as I am in town and he is not.

-You asked for a legal reference for metering finished water. Finished water is required to be measured (not calculated) by R325.11008 (9), see attached excerpt. Hopefully this satisfies your request for a reference. Thank you, but the reference does not satisfy Metering of Water distributed as you see it. And, obviously understood by all Former MDPH; MDEQ; MDNR; back to MDEQ; and EGLE, since Water Distributed (or Produced) has never been included on the MOR Template. And frankly, wishing it would be there, is just that and not an enforceable regulation as a MOR requirement.

However, since there is a post OPP treatment on the Suction Line of the HS pumps, I intend to add an amendment to the MI0600 MOR as soon as I can. And of course the new OPP Control Meter is in place, that will be simpler than it is now.

-With respect to the DEQ's format on the MOR, I tend to agree with you we need to have a space for both raw and finished water pumping. For the BH plant, the finished water number would be used to calculate approximate phosphate dosage, but the raw water number is needed for the alum. Depending on chlorine application points, you might use either/both. Attached is our current DRAFT template, which I will make a note to add finished water. Regardless, the above legal reference should be sufficient to justify the ACO finding and the project you are

currently undertaking I do not see the attached template. Most likely because I am forced to use GOOGLE email and it piles every response together, making it very hard to navigate.

But if I had such a template, it would make it quicker and easier to add to my Spread Sheets and Daily Operator Forms.

Send it under a separate cover, in Excel. Understand that I may taylor it to Benton Harbor's needs.

Thank you

Mike O'Malley

Benton Harbor Water Superintendent

On Fri, May 17, 2019 at 9:01 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Thank you, please also provide his contact information so I can set up a meeting.
>
> **From:** Darwin Watson <dwatson@cityofbentonharbormi.gov>
> **Sent:** Thursday, May 16, 2019 3:53 PM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike O'Malley <momalley@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
> **Subject:** Re: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad
>
> Good Afternoon Ernie,
>
> Please find below the answers to questions posed in your email:
>
> Darold Harlan is the person from F&V who has been on site since May 7, 2019. I will provide a copy of the contract no later than Monday, May 20, 2019.
>
> Thanks
>
> On Thu, May 16, 2019 at 8:37 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:
>
> > Mike –
> >
> > Thank you for the thorough response**.** *Your extension for the meter installation is granted.* Attached is an updated workflow with new due dates. Please note: **DARWIN we need to talk about rate adjustments based on the rate study, as well as your plan for revamping the rate collection process.**

Mike's detailed reply brings in a couple follow-up questions/comments:

-Individual Filter turbidities should also be available on the historian (maybe when the meter gets integrated)

-Who is Darold Harlan …. Is this person from F&V?

-When will F&V be onsite, and what is the contractual arrangement for being onsite (i.e. frequency, on-call, etc)?

-You asked for a legal reference for metering finished water. Finished water is required to be measured (not calculated) by R325.11008 (9), see attached excerpt. Hopefully this satisfies your request for a reference.

-With respect to the DEQ's format on the MOR, I tend to agree with you we need to have a space for both raw and finished water pumping. For the BH plant, the finished water number would be used to calculate approximate phosphate dosage, but the raw water number is needed for the alum. Depending on chlorine application points, you might use either/both. Attached is our current DRAFT template, which I will make a note to add finished water. Regardless, the above legal reference should be sufficient to justify the ACO finding and the project you are currently undertaking.

Thank you, and take care.

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, May 15, 2019 4:09 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Marcus Muhammad <mmuhammad@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad

Ernie,

I did not particularly know just who to follow up this email to.

I literally do not know a few of the EGLE people on the copy line.

And for some foolish reason, I thought not even the Director of EGLE DW and MAD.

The letter came from Michael Bolff? so he is included. to Mayor Mhhammad, so he is included. And emailed to Darwin and I , so included.

Since the letter is stating pretty much all plant stuff and S2, I felt compelled to respond.

And, frankly this was your best bet to get it today.

The dates are not dead on, but the activities described are what I believe you needed.

And, forgive me, but I made a brief exception to the ACO Metered Distribution Requirement, as I asked you about this morning.

I plan to continue with my calculated metering for OPP addition; until such time as we have an actual Suction line meter.

Note though:

Benton Harbor will need an extention for the metering requirement as it will take > 8 weeks for the actual meter to be built. and a little time to get a SCADA technician in to add the values.

Add to notes:

The Chlorine injection pump to raw water has been installed but the plugging problem at the intake has returned.

The Alum Supply Line is in and works very well to the re-purposed Polymer Tank.

The 1st Alum pump is here. I need a plumber to install it and the 2nd to arrive.

See Attached:*Reply to letter dated April 1_ 2019 City of Benton Harbor ACO Compliance Schedule.pdf*

Thanks,

Mike O'Malley

Benton Harbor Water Superintendent

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Darwin Watson; Bolf, Michael (EGLE); Mike OMalley; Darold Harlan
Subject:	Re: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad
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Mike O'Malley

Benton Harbor Water Superintendent

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>
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> **Sent:** Thursday, May 16, 2019 3:53 PM
> **To:** Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
> **Cc:** Mike O'Malley <momalley@cityofbentonharbormi.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
> **Subject:** Re: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad
>
> -
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> Good Afternoon Ernie,
>
> -
>
> Please find below the answers to questions posed in your email:
>
> -
>
> Darold Harlan is the person from F&V who has been on site since May 7, 2019. I will provide a copy of the contract no later than Monday, May 20, 2019.
>
> -

Thanks

On Thu, May 16, 2019 at 8:37 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Mike –
>
> Thank you for the thorough response**.** *Your extension for the meter installation is granted*. Attached is an updated workflow with new due dates. Please note: **DARWIN we need to talk about rate adjustments based on the rate study, as well as your plan for revamping the rate collection process.**
>
> Mike's detailed reply brings in a couple follow-up questions/comments:
>
> -Individual Filter turbidities should also be available on the historian (maybe when the meter gets integrated)
>
> -Who is Darold Harlan …. Is this person from F&V?
>
> -When will F&V be onsite, and what is the contractual arrangement for being onsite (i.e. frequency, on-call, etc)?
>
> -You asked for a legal reference for metering finished water. Finished water is required to be measured (not calculated) by R325.11008 (9), see attached excerpt. Hopefully this satisfies your request for a reference.
>
> -With respect to the DEQ's format on the MOR, I tend to agree with you we need to have a space for both raw and finished water pumping. For the BH plant, the finished water number would be used to calculate approximate phosphate dosage, but the raw water number is needed for the alum. Depending on chlorine application points, you might use either/both. Attached is our current DRAFT template, which I will make a note to add finished water. Regardless, the above legal reference should be sufficient to justify the ACO finding and the project you are currently undertaking.
>
> Thank you, and take care.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

-

-

www.michigan.gov/drinkingwater

-

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, May 15, 2019 4:09 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Cc: Marcus Muhammad <mmuhammad@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: Reply demanded to be made Close of business today to Michael Bolf letter dated 04 01 2019 and addressed to Mayor Marcus Muhammad

-

Ernie,

-

I did not particularly know just who to follow up this email to.

I literally do not know a few of the EGLE people on the copy line.

And for some foolish reason, I thought not even the Director of EGLE DW and MAD.

-

The letter came from Michael Bolff? so he is included. to Mayor Mhhammad, so he is included. And emailed to Darwin and I , so included.

-

Since the letter is stating pretty much all plant stuff and S2, I felt compelled to respond.

And, frankly this was your best bet to get it today.

The dates are not dead on, but the activities described are what I believe you needed.

-

And, forgive me, but I made a brief exception to the ACO Metered Distribution Requirement, as I asked you about this morning.

I plan to continue with my calculated metering for OPP addition; until such time as we have an actual Suction line meter.

Note though:

-

Benton Harbor will need an extention for the metering requirement as it will take > 8 weeks for the actual meter to be built. and a little time to get a SCADA technician in to add the values.

-

Add to notes:

The Chlorine injection pump to raw water has been installed but the plugging problem at the intake has returned.

The Alum Supply Line is in and works very well to the re-purposed Polymer Tank.

The 1st Alum pump is here. I need a plumber to install it and the 2nd to arrive.

-

See Attached:*Reply to letter dated April 1_ 2019 City of Benton Harbor ACO Compliance Schedule.pdf*

-

Thanks,

-

Mike O'Malley

Benton Harbor Water Superintendent

From:	Mike O"Malley
To:	Darwin Watson; Sarkipato, Ernest (EGLE); Thurston, Brian (EGLE); Bolf, Michael (EGLE); Nelson, Maureen (EGLE)
Cc:	Darold Harlan; Mike OMalley
Subject:	Re: Request for update: ACO deadlines
Date:	Thursday, June 20, 2019 1:07:26 PM

Ernie and the rest of you.

I am sorry, but II have NO Time to respond to this email.
but quickly:
I need to find 7 participants That I am short of the 60 demanded.
Thankfully, the MI DHHS gave us a day and helped knock on doors.

And all the other stuff Due June 30.

End of discussion.

Mike O'Malley
Benton Harbor Water Superintendent

On Thu, Jun 20, 2019 at 10:55 AM Darwin Watson <dwatson@cityofbentonharbormi.gov> wrote:

> Good Morning Ernie,
> I would request that the city be given the following considerations:
>
> **Outstanding**:
>
> -Distribution Operator: still need to see a contract for F&V and Mr. Harlan, or a plan for oversight of the system. *I will have this information to you by June 27, 2019.*
>
> -Still waiting to see a plan for revamping the water bill collections process. *I will have this information to you no later than July 15, 2019.*
>
> **Timeline**:
>
> 6/1/19: submit a cross connection control program, adequate staffing support for the program (or a contracted firm). *New proposed date of completion: August 16, 2019*
>
> 6/1/19: submit a plan to inventory distribution isolation valves and a maintenance plan for valves. *New proposed date of completion: September 30, 2019*
>
> 6/1/19: install coagulant feed to rapid mix. *New proposed date of completion: July 31, 2019*
>
> 6/30/19: conduct inspection of elevated tank (I suggest you refer to the plan to paint the tank). *New proposed date of completion: September 30, 2019*
>
> 6/30/19: install working mussel feed control system. *New proposed date of completion: August 16, 2019*
>
> 7/15/19: install finished water meter (previously extended to allow for manufacture time). *New proposed date of completion: August 16, 2019*

Thank you for your consideration and I look forward to hearing from you.

On Thu, Jun 20, 2019 at 10:30 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Good morning Darwin,
>
> It appears a couple due dates in the ACO have passed without our communicating as to the city's progress. Attached is some correspondence to date, and below are what I'm seeing for due dates and outstanding items. At this point, I'm proposing the city consider the progress so far and propose a more realistic (and perhaps less optimistic) time frame for the remaining items. Given the extenuating circumstances of the Action Level Exceedance, significant sampling requirements, etc., I would like to entertain such a request. *However, please note the installation of the **coagulant feed** to the rapid mix is a matter of public health protection in a direct sense, and should receive priority when considering alternative compliance schedules.*
>
> **Outstanding**:
>
> -Distribution Operator: still need to see a contract for F&V and Mr. Harlan, or a plan for oversight of the system.
>
> -Still waiting to see a plan for revamping the water bill collections process.
>
> **Timeline**:
>
> 6/1/19: submit a cross connection control program, adequate staffing support for the program (or a contracted firm)
>
> 6/1/19: submit a plan to inventory distribution isolation valves and a maintenance plan for valves
>
> 6/1/19: install coagulant feed to rapid mix
>
> 6/30/19: conduct inspection of elevated tank (I suggest you refer to the plan to paint the tank)
>
> 6/30/19: install working mussel feed control system
>
> 7/15/19: install finished water meter (previously extended to allow for manufacture time)
>
> Thank you for your expeditious response.
>
> Ernie Sarkipato, P.E.
>
> Surface Water Treatment Specialist
>
> Drinking Water and Environmental Health Division
>
> MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Sarkipato, Ernest (EGLE)
To:	Oswald, Eric (EGLE); Thurston, Brian (EGLE); Krisztian, George (EGLE)
Cc:	Onan, Brandon (EGLE); Nelson, Maureen (EGLE); Bolf, Michael (EGLE)
Subject:	Re: Review of draft letter: Benton Harbor ACO
Date:	Thursday, January 23, 2020 4:44:10 PM

Two things; first, this would actually be the third recorded action level exceedance. Second, the meter installation receives specific attention in the letter and as such it bears mentioning: the meter is installed and appears to be somewhat functional as of our visit. Per Mike O'Malley it simply requires further integration into the controls system. We did confirm on site there are some flow numbers that appear to be accurate coming from the meter on the computer screen...perhaps it's a matter of not totalizing the flow into a volume.

The item that remains intangible is the repeated inability to meet monitoring requirements, as well as compliance timeline items. I am not sure of the best approach to help the city build this managerial capacity.

Last, in a related note, there was also discussion of possible changes to the corrosion treatment at the city. I don't think that falls under the purview of this letter, but it bears mentioning for context.

From: Oswald, Eric (EGLE) <OswaldE1@michigan.gov>
Sent: Thursday, January 23, 2020 3:27:42 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Krisztian, George (EGLE) <krisztiang@michigan.gov>
Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO

I am ready to move forward with the notification but wanted to see if anything came out of the onsite meeting last week. I would like to roll up all issues into a new ACO, close out those items that are completed and add any new issues – that is reflected in my modifications to the letter. I believe we will need to visit the city again to go over the new ACO and agree to a schedule to get city commission approval.

I am working with the executive division on a plan B should the city not approve the new ACO.

Please review the memo and let me know if you have any changes. I tried to keep it simple. I will need to run it by Aaron after we finish with it. Thanks to all for the hard work on this – let me know if we need to have a call to discuss.

Eric

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Wednesday, January 8, 2020 8:56 AM
To: Thurston, Brian (EGLE) <THURSTONB@michigan.gov>; Oswald, Eric (EGLE) <OswaldE1@michigan.gov>

Cc: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>; Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO

Eric & Brian - Please find attached a draft letter w/ attachment for your review, to address ongoing extensions and two past-due items on the ACO compliance schedule for Benton Harbor. As you share/discuss with the front office for coordination with other actions in BH, consider also Regina, Ninah, and Emily Finnell as follow-up to our meeting in December.

Brandon – FYI, as I am sure you will have communications with the city shortly as well regarding monitoring for lead copper and possibly a continued ALE.

Ernie

From: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Sent: Tuesday, January 7, 2020 4:51 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>; Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO

OK. I didn't have much time to focus on this today, but my changes have been made.

I also told Eric and Brian that we will be sending it their way.

Michael Bolf, P.E.
Engineering Unit Supervisor
Drinking Water and Environmental Health Division
Michigan Department of Environment, Great Lakes, and Energy
906-630-4107 (mobile) | bolfm@michigan.gov

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, January 06, 2020 1:55 PM
To: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO

Good comments. Mike, you're next!!

From: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Sent: Monday, January 6, 2020 11:52 AM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: RE: Review of draft letter: Benton Harbor ACO

Happy new year to you too!

Thanks for the opportunity to review the letter. I think the general approach is appropriate for the situation. My revisions are mostly for clarification and to emphasize a couple points. I saved it back in the same location with my comments in track changes.

One thought for the Exhibit, is to include another column that indicates which paragraph in the ACO each item is associated. My reasoning is that this letter is addressed to the mayor who may not be as versed as the operator and other individuals with whom you have been working.

Let me know if you have any questions.

Thanks again,
Maureen

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Monday, January 6, 2020 10:46 AM
To: Nelson, Maureen (EGLE) <NelsonM2@michigan.gov>
Cc: Bolf, Michael (EGLE) <BOLFM@michigan.gov>
Subject: Review of draft letter: Benton Harbor ACO

Hi Maureen, and happy new year!

Could you review the draft letter below, focusing on our proposed strategy regarding compliance with the ACO? This was my off-the-cuff take on next steps to help ensure timely completion of these items…if you have other ideas we'd love to hear them!

Attached is the extension summary sheet referenced in the letter.

\\Hct084vsnbpf011\egle\DWMAD\SHARED\Drinking Water and Environmental Health\Community Drinking Water\Engineering Unit\District 93\Benton Harbor\Communication\es benton harbor ACO extensions.docx

Thanks in advance,

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE); Onan, Brandon (EGLE)
Cc:	Mike OMalley; Darold Harlan; Ellis Mitchell; Daniel McGinnis; Michael Clark; Jim and Todd Luks Elhorn Engineerint; Dr R. Johansen; Nicki Britten
Subject:	Re: What constitutes "Gentle Flushing"
Date:	Monday, February 24, 2020 6:02:54 PM

Thanks for the info.

Some of you may wonder why you are on the copy line. I believe if I reference someone or something done by someone, I add them to the copy line.
If you read through this, you will see where you fit in to this email.
Dr. Johanson, Nicki Britten, Chief McGinnis, and Deputy Police Chief Michael Clark.

Unfortunately this email is from Mike O'Malley, Operator IN Charge and not by the City Manager, Mr. Ellis Mitchell.
This is my take on the situation, and may not be Ellis Mitchell's opinion, but he is copied (as agreed) on this email.

The switch over from 70/30 OPP to 90/10 OPP was Friday 02 21 2020 in the morning.
It took Darold all day Thursday and me all day Friday to get the West Suction Line closed nearly 100%
Proof for this valve being closed; was a flow through the new meter of 2,604 gpm which is roughly equal to 3.75 MGD, which is very close to what the High Service pump is expected to deliver.
Unfortunately, the new demanded feed rate of 3.0 mg/L as P requires the pump to function at Top Speed, (100%) speed the original Pump is designed for.

The Permit Change is something different and will take me awhile to properly fill out. I propose the permit that exists is still in force and has only been altered by the type of Chemical Make Up percentages "ORTHO"
I am working on it today. Maybe, you can send me a blank form of the one you used and I can copy/paste the appropriate existing conditions and basically only to add the new chemical treatment.

As you know the Orthopolyphosphate treatment scheme was decided upon by the EGLE staff with the recommendation of Elhorn Engineering.
The State also agreed to allow Benton Harbor to use the MDEQ Pilot Grant Funding to reimburse the expenditures that were incurred, Thank You.
EGLE pushed to have the OPP treatment in place before the proposed Suction Line Meter was installed, due to its long lead time.
Elhorn Engineering delivered the 1st set of 55-gallon barrels; set up the pump and injection point, and put in a Rack of various metals to determine the rate of decay.
This all started to take effect 3/26/2019.
A short time later, EGLE staff asked for a background Corrosion Rack as well. This attempt could not be made by any means that would adequately provide data of Metal loss, because there was no point available for this rack on the tap water line. An attempt was made, but failed terribly. The 1st set of results from the metal coupon rack was sent from The Carus Group on 10/1/2019 and was shared with EGLE.
With no background data, the results are not really worth noticing, just yet. But the Mild Steel decay was most troublesome at the Outside location. The lead result was pretty small, as well

as the copper at both locations.

Hence, your letter drove us to remove the 2nd Rack on 2/17/2020 and send the coupons in for analysis.
If, you had requested, or If you had waited a bit longer with the NOTICE; we may have seen results that indicated that the original corrosion treatment program was working enough to wait out the 18-Month time frame that we were told would be when a relatively full exchange would be evident.
Instead of jumping to conclusions based upon Lead Action Levels only. Those things that our former governor called "Stupid USEPA Lead and Copper Program."

To Benton Harbor, your order left us quite anxious about what was required and it felt like, you want us to begin running scared. To us seems not to be good science.
Do you not remember that the Chief Doctor R. Johansen for Berrien County's Health Department stated at our October 2018 Public Announcement " *The Blood Lead Levels in Berrien County's children have been dropping for the last 10 years*". And of course, the City has received Outstanding assistance from Nicki Britten and the wonderful BCHD staff. A HUGE Thank you from Benton Harbor!!!

As for the Corrosion Study, I will need a great deal of Help.
The USEPA Guide is helpful, but does not match up with a full 90/10 Ortho to Polyphosphate Ratio. *It was probably written before EPA knew about this chemical blend.
And, before the Dramatic Change in the Lead Rules.

I tried, but I could barely understand the Michigan Administration Rules you referenced in your order.
Clearly, We are not as well versed in all the Legal Information regarding anything about Lead & Copper and Corrosion Protection.
We are water operators, with very little Legal Background.
Without help we cannot easily see how this applies to Benton Harbor (or anywhere).

And I believe Benton Harbor Water Plant may be venturing into this world of treatment blind to its potential or detriment; **and should not be**, just yet.
Thus Stated from THE OPERATOR IN CHARGE of the Benton Harbor Water System.

As for a 3rd party corrosion specialist to conduct a Corrosion Study, I would prefer our original specialist, but Elhorn believes that they cannot be that 3rd party as they provide the product.
However either one of the treatment chemicals they supply is the same price but different results. Unfortunately, some would see this as a conflict of interest.

And, If I am reading the regulations correctly, particularly the USEPA, I noticed that we can conduct our own study, or better yet Elhorn can do that for us.

If you had waited a bit longer, Elhorn just removed the coupons from the 2 racks and they are going to be examined. We may have found that the corrosion rate for Lead coupons has diminished with the treatment we already had in place.
I am going to the Borchart Confrence tomorrow and I hope to be better educated about Corrosion Studies.
And, hopefully even find out who else to call for a corrosion study. It appears that Elhorn

Engineering may no longer be a good vendor for Corrosion Studies in Benton Harbor, but we think they would be.

It appeared in your letter, that other systems have been involved in this type of corrosion treatment. Can you give us some contact information regarding them?
It would be very comforting to know others in the same situation as Benton Harbor.

Dan and MIke, if you could respond on this portion of my email;
Finally, flushing hydrants adjacent to roads in Benton Harbor in late February, has nothing to do with high water levels, the residential portions of Benton Harbor are on top of the hills. However flushing water does impact Traffic Safety greatly! Particularly in terms of Icy conditions.,
And that will be a difficult thing to do and convince the residents and Public Safety Department of leaving water that will quickly turn to ice on winter days in roadway intersections.

At this point, the new Orthopolyphosphate mixed as 90/10; a Carus Product known as Aquadene SK-7661 is in place and working.
We started Friday, February 21 in the morning when our last 70/30 tank ran out.
After several days of hard work, we have gotten the west valve closed so treatment will go to whatever pump the operators choose to use.
The rapid release treatment is on its way to the residents and perhaps we will see a vast improvement in Lead Levels during our Jan to June sampling. Or if not,maybe our July to Dec sampling program.

Sincerely,

Mike O'Malley
Benton Harbor Water Operator IN Charge.

On Mon, Feb 24, 2020 at 9:21 AM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Hi Mike,
>
> Brandon and I talked about this. In truth, we should have a more formal SOP developed for this type of treatment change, but it seems we do not have that just yet. Here are a couple observations:
>
> -The goal is to bring the newly treated water throughout the distribution system
>
> -The flushing should avoid scouring velocities of >3 feet per second. The concern is the scouring action would disturb any coating that has been built up.
>
> -It's best to start at the water plant and move to the ends of the system
>
> -For example, on a 6" pipe, a 1-2 fps flush is only 75-300 gpm, depending on if it's a dead end run. As you can see, it can be easy to get into the scouring velocity range.
>
> -At this lower flow rate the amount of time necessary is quite long. My recommendation is to bleed a hydrant or two all day, checking the phosphate residual for the increased dosing

level. Then, next day, move further into the system.

I realize with high water levels and flooding in town, the extra water might be an issue and where to put it all! I guess try to choose hydrants that have a good place to dump, since you really don't need to flush all of them for this purpose.

Hopefully that is helpful information,

Ernie Sarkipato, P.E.

Surface Water Treatment Specialist

Drinking Water and Environmental Health Division

MI Department of Environment, Great Lakes, and Energy

616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, February 21, 2020 4:56 PM
To: Onan, Brandon (EGLE) <OnanB@michigan.gov>; Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Cc: Mike OMalley <momalley@cityofbentonharbormi.gov>
Subject: What constitutes "Gentle Flushing"

From:	Sarkipato, Ernest (EGLE)
To:	Kimberly Thompson; Marcus Muhammad; emitchell@bhcity.us; Darold Harlan; Mike O"Malley; rrice@bhcity.us
Cc:	Bolf, Michael (EGLE); Nelson, Maureen (EGLE); Thurston, Brian (EGLE); Oswald, Eric (EGLE); EGLE-DWEH-Grand-Rapids
Subject:	Signed amended ACO
Date:	Monday, August 10, 2020 1:01:22 PM
Attachments:	00600 City of Benton Harbor Fully Executed Amended ACO - AACO-399-07-2019 Transmittal Letter.pdf 00600 City of Benton Harbor Fully Executed Amended ACO - AACO-399-07-2019.pdf

We appreciate the Benton Harbor water team's effort to work with us on this Amended ACO along with a realistic, negotiated time frame for compliance items. Thank you!!

Please note the first deadline, to submit the current cross connection program by August 15, 2020.

Also, we are interested in beginning discussions on the Capacity ("TMF") Study, to help ensure a successful outcome. This is a pivotal study for the water system and will have cumulative effect.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From: Kimberly Thompson <kthompson@bhcity.us>
Sent: Wednesday, August 5, 2020 4:37 PM
To: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Subject: Re: Amended ACO Signature

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Ernest,

I've attached the copy with Mayor Muhammad's signature. Please forward me a fully executed copy of the agreement after all signatures are affixed.

Thanks

Kimberly Thompson, City Clerk
City of Benton Harbor

200 E. Wall Street
Benton Harbor, MI 49022

Phone: (269) 927-8408
Fax: (269) 927-0480

On Wed, Jul 29, 2020 at 1:09 PM Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov> wrote:

> Dear representatives of the City of Benton Harbor,
>
> Please find attached a letter requesting signature of the attached amended ACO pertaining to the city's water system. We are requesting Mayor Muhammad sign the amended ACO and return it to us electronically, for finalization and signature by Director Oswald.
>
> We appreciate your work in developing the compliance timeline, and your idea to create an attachment for completed projects. Please don't hesitate to contact me to discuss!
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> Drinking Water and Environmental Health Division
> MI Department of Environment, Great Lakes, and Energy
> 616-307-0261 mobile
>
> www.michigan.gov/drinkingwater

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

August 11, 2020

VIA EMAIL

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Mitchell:

SUBJECT: First Amended Administrative Consent Order (ACO) AACO-399-07-2019;
City of Benton Harbor; WSSN: 00600

Attached please find a fully executed Amended ACO between the City of Benton Harbor, and the Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division, regarding the City of Benton Harbor's water supply. The compliance schedule in this ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). The effective date of the Amended ACO is August 7, 2020.

If you have any questions regarding the Amended ACO, please contact me at 616-307-0261; or by email at SarkipatoE@Michigan.gov.

Sincerely,

Ernest Sarkipato
Surface Water Treatment Specialist
Drinking Water and Environmental Health
Division

Attachments
cc: Mayor Marcus Muhammad, City of Benton Harbor
Mr. Mike O'Malley, City of Benton Harbor
Ms. Kimberly Thompson, City Clerk, City of Benton Harbor
Mr. Eric J. Oswald, EGLE
Mr. Brian Thurston, EGLE
Mr. Michael Bolf, EGLE
Ms. Maureen Nelson, EGLE

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

In the matter of: DWEHD Order No. AACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME City of Benton Harbor		OWNER☒	OPERATOR☒
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
CONTACT NAME/TITLE Ellis Mitchell, City Manager	PHONE # 269-927-8457		

FACILITY NAME AND LOCATION

FACILITY NAME Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER 00600	
FACILITY OWNER IF NOT IDENTIFIED ABOVE Ellis Mitchell, City Manager			
ADDRESS 200 East Wall Street			
CITY Benton Harbor	STATE Michigan	ZIP CODE 49022	
COUNTY Berrien			
CONTACT NAME Ellis Mitchell, City Manager	PHONE # 269-927-8457		

Executive Order 2019-06, signed by Governor Gretchen Whitmer on February 20, 2019, renamed the Michigan Department of Environmental Quality (MDEQ) as the Department of Environment, Great Lakes, and Energy (EGLE). Effective April 22, 2019, a reference to the MDEQ will be deemed a reference to EGLE. After April 22, 2019, a reference to the Director of the MDEQ will be deemed to be a reference to the Director of EGLE. The Drinking Water and Municipal Assistance Division (DWMAD) was renamed the Drinking Water and Environmental Health Division (DWEHD). A reference to the DWMAD will be deemed a reference to the DWEHD and a reference to the Director of the DWMAD will be deemed to be a reference to the Director of the DWEHD.

Administrative Consent Order (ACO) ACO-399-07-2019, entered on March 5, 2019, between the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Drinking Water and Environmental Health Division (DWEHD), and the City of Benton Harbor (City), is hereby amended, as follows. Upon the consent of the parties and by the authority granted to EGLE by the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder, it is hereby agreed and ordered:

COMPLIANCE SCHEDULE

Paragraphs 2.1(a & b), 2.2, 2.3, 2.4, 2.5, 2.6, 2.9 have been completed and removed from ACO-399-07-2019. Reference Exhibit A, attached.

A number of the items below refer to a "Capacity Study." In this Amended Consent Order, under Paragraph 2.14, a Capacity Study refers to an assessment of a water system owner's technical, managerial, and financial capacity to consistently provide safe water to the public.

Paragraphs 2.7, 2.8, 2.10-2.13 of ACO-399-07-2019 shall be amended as specified below:

2.7 **Not later than September 30, 2020**, the City shall formally adopt a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process.

2.8 **Not later than August 15, 2020,** the City shall submit the current cross connection program to the DWEHD for review. The DWEHD's review and comments on the current program will assist the City in completing the Capacity Study in paragraph 2.14. **No later than three (3) months following the completion of the Capacity Study**, an updated cross connection program must be submitted to the DWEHD for review to address any implementation changes as a result of the study.

2.10 (a) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to the DWEHD for inventorying and ongoing maintenance of distribution fire hydrants. The plan must address fixing known broken hydrants, as well as preventative maintenance, such as hydrant inspections and flushing.

(b) **Not later than six (6) months following the completion of the Capacity Study** in paragraph 2.14, the City shall submit a plan to the DWEHD for inventorying and ongoing maintenance of distribution valves. The plan must address fixing known broken valves, as well as preventative maintenance, such as valve turning.

2.11 **Not later than August 1, 2021**, the City shall conduct professional inspections of the City of Benton Harbor water system's elevated tank, or complete the repairs and upgrades recommended during the 2008 Dixon inspection, as included in the City's asset management program dated December 2017.

2.12 **Not later than November 1, 2020**, the City shall submit to the DWEHD a plan for maintaining the raw water intake system, including mussel control, based on inspection findings of the intake and mussel control system during June of 2020.

2.13 **Not later than December 31, 2020**, the City shall repair filter to waste valves at the water plant, and train operators on their use.

The following paragraphs shall be added to Section II – Compliance Schedule:

2.14 **Not later than September 30, 2020**, The City shall submit to the DWEHD, for review and approval, a project scope for completion of a technical, managerial, and financial capacity study to ensure, at a minimum, that the City has adequate staffing and financial mechanisms to carry out the operation and maintenance of the City of Benton Harbor's

water system, in compliance with Act 399. The City shall contract with a qualified consultant to complete the Capacity Study. The Capacity Study scope shall identify the organizational structure, and the required funding, to operate and manage the system, in compliance with Act 399. The Capacity Study shall also identify current staffing levels, including the number of full- and part-time employees currently dedicated to the water system, the number of employees from other departments within the City who currently provide assistance, the nature of that assistance, and the hours of assistance committed from those departments. Last, the Capacity Study shall identify any technical needs, such as development and storage of water system records to facilitate compliance with Act 399.

Not later than six (6) months following approval of the project scope, the City shall submit a completed Capacity Study for DWEHD approval.

To address any gaps identified by the Capacity Study, the Capacity Study shall include an **implementation plan** to gather sufficient resources and qualified personnel to carry out the authorities and procedures for daily operation, maintenance, and management of the City's water system. **Not later than August 1, 2021 and every six (6) months after the DWEHD approves the Capacity Study, the City shall submit a signed statement describing the City's progress** towards completing the implementation plan to achieve adequate capacity.

Capacity Study Phase	Description	Due Date
1: Project Scope and Outcomes	Submit to the DWEHD for input on the study scope and outcomes	September 30, 2020
2: Study Completion	Complete the Capacity Study based on project scope	Six months after approval of scope
3: Implementation	Progress reports to the DWEHD describing city's progress	August 1, 2021 and every six months thereafter

2.15 (a) **Not later than six (6) months following the completion of the Capacity Study** in Paragraph 2.14, as part of the implementation phase, the City shall submit to the DWEHD, a Staffing Plan to address findings from the Capacity Study. The Staffing Plan must indicate the number of staff, managerial oversight, as well as an outline of each position's duties needed to meet the operational and maintenance needs of the water system.

(b) **Not later than twelve (12) months following the DWEHD approval of the Staffing Plan,** the City shall submit to the DWEHD a certification that the staffing plan has been implemented and adequate staffing and managerial oversight is in place.

2.16 **Not later than December 31, 2020**, the City shall come into compliance with all monitoring and reporting requirements of Act 399, specifically Michigan Compiled Law (MCL) §325.1007, which requires every drinking water supply owner to collect water samples, or have them collected, and have those samples analyzed in the state laboratory or a laboratory certified by the DWEHD, or by the United States Environmental Protection Agency, for contaminants listed in the state drinking water standards. The City shall report the results of the analyses to the DWEHD in a timely manner. MCL §325.1007 also

authorizes the DWEHD to impose administrative fines for each failure to collect and analyze a water sample as required under Act 399.

2.17 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to the DWEHD, for review and approval, a corrosion control optimization study scope and completion schedule, in accordance with the February 13, 2020, letter the DWEHD issued to the City.

Not later than sixty (60) days following DWEHD approval of the corrosion control optimization study scope and completion schedule, the City shall secure a signed contract for the corrosion control optimization study.

GENERAL PROVISIONS

All approved work plans required by this First Amended Administrative Consent Order shall be incorporated by reference into ACO-399-07-2019 and shall be enforceable in accordance with its provisions.

All other terms and conditions of ACO-399-07-2019 shall remain in full force and effect and are not altered by this Amended Consent Order, except as specifically prescribed in this document. The effective date of this Amended Consent Order shall be the date upon which the Division Director of EGLE, DWEHD signs this document.

Signatories

DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Eric J. Oswald, Director
Drinking Water and Environmental Health Division

7-August-2020
Date

I, the undersigned, CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

8/5/2020
Date

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

FIRST AMENDED ADMINISTRATIVE CONSENT ORDER

DWEHD Order No. AACO-399-07-2019

EXHIBIT A

In the matter of the First Amended Administrative Consent Order between the City of Benton Harbor and the State of Michigan Department of Environment, Great Lakes, and Energy, below are listed compliance activities that have been completed and are shown for record of completion.

2.1 (a) Submit to the DWMAD a completed rate study from a qualified professional consultant. (This requirement was completed with the Asset Management Plan, dated December 2017, however, the second portion of 2.1 in the original ACO, requiring the City to submit an implementation rate increase plan, was not completed).

COMPLETION DATE: December 31, 2017

(b) Not later than December 31, 2020, the City shall begin implementation of a rate adjustment plan for the City of Benton Harbor, in accordance with the findings in the City's asset management program and rate study. The rate adjustment plan shall ensure rates are sufficient to operate and maintain the water system, in compliance with Act 399.

COMPLETION DATE: May 18, 2020

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data, including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.3 Install metering capabilities on the finished water (completed as part of corrosion control treatment project).

COMPLETION DATE: August 12, 2019

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap, no later than April 1, 2019.

COMPLETION DATE: August 12, 2019

2.5 Obtain an adequately licensed operator-in-charge, solely dedicated to the water distribution system, no later than April 1, 2019.

COMPLETION DATE: May 7, 2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 30, 2019.

COMPLETION DATE: Treatment installed as of March 25, 2019. Corrosion control study insufficient as of June 2020, see First Amended ACO item 2.17.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

COMPLETION DATE: August 9, 2019

From:	Sarkipato, Ernest (EGLE)
To:	Mike O"Malley; emitchell@bhcity.us; Darold Harlan
Cc:	Bolf, Michael (EGLE); Onan, Brandon (EGLE)
Bcc:	EGLE-DWEH-Grand-Rapids
Subject:	Site Visit summary 9/9/2020
Date:	Thursday, September 10, 2020 8:41:18 AM

Dear City Officials,

This is a summary of my visit with Mr. O'Malley yesterday morning (9/9/2020) at the Benton Harbor water plant. I appreciate Mike (and Doug) spending a few hours with me looking at the sludge disposal and various areas inside the water plant. Below is a summary, for your file and mine.

Sludge Disposal – the recently proposed staging location was observed to be currently in use, and the smaller backwash pond pretty well empty and with standing water. Backwash solids appear quite stable in the new location and in fact should be ready for trucking offsite. However, Mr. O'Malley stated he intends to leave them onsite, grade, and vegetate the area. EGLE will be discussing whether we can approve this as part of the city's plan to manage sludge wastes, but *I expressed to Mike that a complete sludge disposal plan must address the need to remove solids off the property.*

Clarifier Repurposing – Mike stated he recently had a vertical run of perforated 16" PVC pipe installed in the west clarifier, for the purposes of being able to dewater alum within the clarifier. The water would then drain back to the lagoon. I will discuss with my team, but a*gain I expressed to Mike that a complete sludge disposal plan would need to have a provision for proper disposal of the solids, i.e. offsite. Also, changes to the water plant equipment to manage sludge wastes may fall under the need for an Act 399 construction permit.*

Phosphate Feed (*Brandon FYI*) – The corrosion control feed system was observed, though it wasn't running as the high service pumps were not on at the time. Mike and I discussed the upgrades to the feed pump head back in April to allow a higher feed rate, and the pump is now set to less than 50% capacity. We ask the city to reference the required target residual of 3.0 mg/L orthophosphate as PO4 in the distribution system, and *implement small increases to the treatment rate of phosphate chemical to achieve that target in all distribution system samples.*

Chlorine analyzer – I noted the online chlorine analyzer was not working, which continuously monitors chlorine in the plant tap even when the water plant is not staffed (overnight). *Please perform necessary maintenance ASAP to keep this essential piece of equipment functional.* Remember, this was an item required by the first ACO.

Wonderware and computer upgrade – Mike informed me the city has purchased an upgrade to the wonderware SCADA software, as well as a new computer system to run the SCADA. I encourage you to consider how the new system will provide a backup of the data stored on the computer, as well as retaining records stored on the previous system. It will also need to be fully functional with the alarm and callout system.

Intake chlorine – Mike showed me the pressure built up on the intake chlorine line at around 30 psi, which is above the feed pump's rated capacity. I agree with him the line appears to be currently

plugged, *but wonder if there are ways to clean it with a combination of mechanical agitation and acid?* This may save money from repeated inspections and cleanings of the intake in the future (if it works).

Plate Settlers – The south treatment train is now online after cleaning, and the north is offline waiting for maintenance. This is good routine maintenance and we encourage the WTP staff in completing this important but somewhat daunting task.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

From:	Mike O"Malley
To:	Sarkipato, Ernest (EGLE)
Cc:	Mike OMalley
Subject:	So everyone is helping Benton Harbor Water Department but The Superintendent of The Benton Harbor Water Department
Date:	Tuesday, July 23, 2019 4:41:35 PM
Attachments:	TB of Abonmarche Benton Harbor Asset Mgt Plan template.pdf

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Ernie,
This explains why the Mayor asked me this morning at his Director's meeting if I had worked out all the troubles in the recent sampling. He said he heard about it from the press, but unless someone told the press, it was likely because he spent so much time with Darwin since Monday.

Have you ever been not invited in something that has taken up 100s of hours of your time, then find out later others are all over the results you came up with.
If not, you are lucky, if so, you know how I feel! And, you would not like the feeling either!
See italic text below.

Any way, maybe I give you something you and others do not already know fully about.
The City Manager was fired at a Special City Commission Meeting Monday night with a 5 to 3 vote.
Much to the shagrinn of the 5 counsel members, By City Charter: they had to Declare an emergency and the Mayor (not one of the 5) had to be declared the Acting City Manager until such time the commission could hire another.

The mayor knows the Charter VERY WELL. This morning, he had a Director's only staff meeting. At the meeting he explained to everyone what happened the night before. He went on to say that as Acting City manager he could hire staff to help him with his duties. He hired Darwin Watson as 1) Chief of Staff; 2) Director of Public Works; 3) Utility Services Director. He convened a Press Conference at 1:00 pm and explained to the press what he is doing.

At the Monday meeting, the 5 commissioners move to have a Special Personnel and Finance Committee meeting for this Thursday 7/25/2019 to name a new City Manager (presumably, the person they wanted to hire Monday but never gave the name)

Thankfully, I could work with the arrangement, unless it is short lived. If it is short lived, all of the preparations I have made and held on to for the New Fiscal Year (Darwin's request and the FY is 23 days old), will very likely be withheld or re-submitted.
I your world, this means: Chlorine feed to intake; The final piece for the Alum to Rapid Mix piece; High Service Suction line metering to the Wonderware Historian; The re-start of the Filter to Waste Line; Solids handling in the Waste Lagoon; and some I am probably forgetting, maybe even termination of the F and V contract.

So, soon when you have troubles with the items above, you may be dealing with a City Manager who may not liken himself to all the orders. I may be of little help to you, as I am the recent product of Darwin Watson's hiring decision!

But in retrospect, you can start over fresh with the new City Manager, and do not have to worry about copying the ME the Water Superintendent, still trying my best to protect the Water Supply.

God Help us, because no one in charge will! Back to the old days.

On a more pleasant note: The OPP metering pump has been programmed to run based upon the metered flow it sees. But that was not originally part of the ACO.

I am tired of the Asset Management Program for the Water Plant. But I believe you gave me an "ad-hoc" extension in lieu of a Permit Application for Alum. Yes:_____ or No: _____
But I'll need 2 of me, to do that and do all the work that the bunch of you are requiring. You have seen evidence of the help I can get from others!

Gotta go now, just got an email from the GIS Technician at Abonmarche, she wants to see what I've done and thinks she can fill it in.
Unfortunately, Abonmarche has demonstrated that they know NOTHING about the Water Plant!
Her offering to get me started is attached. For reference mine has 5 pages (no picture) and 171 rows of text and I am about 2/3rds done.

I'd like to tell her we have an extension, so if you could answer the question above with a yes or no and a time frame.

Attached: *TB of Abonmarche Benton Harbor Asset Mgt Plan template.pdf*
If it looks familiar, I was wrong, you did read Gary Wozniac's Sanitary Survey.

Thanks loads,

Mike O'Malley
Benton Harbor Water Superintendent

From: Sarkipato, Ernest (EGLE) <SARKIPATOE@michigan.gov>
Sent: Friday, July 19, 2019 10:55 AM
To: Sarkipato, Ernest (EGLE); Bolf, Michael (EGLE); Nick Margaritis; Thurston, Brian (EGLE); Crider, Steven (DHHS); Lachance, Amy (EGLE); Onan, Brandon (EGLE); DARWIN WATSON; Bolt, Jennifer (EGLE)
Cc: de la Rambelje, Laura (DHHS); Ward, Kristin (DHHS); Manente, Susan (DHHS); Che, Xun (DHHS-Contractor); Pavone, Anthony (DHHS); Courtney Davis; Groetsch, Kory J. (DHHS); LyonCallo, Sarah (DHHS); MacKenzie-Taylor, Deb (DHHS)
Subject: Benton Harbor Lead Compliance
When: Monday, July 22, 2019 3:00 PM-4:00 PM Customized Time Zone.
Where: Conference Call

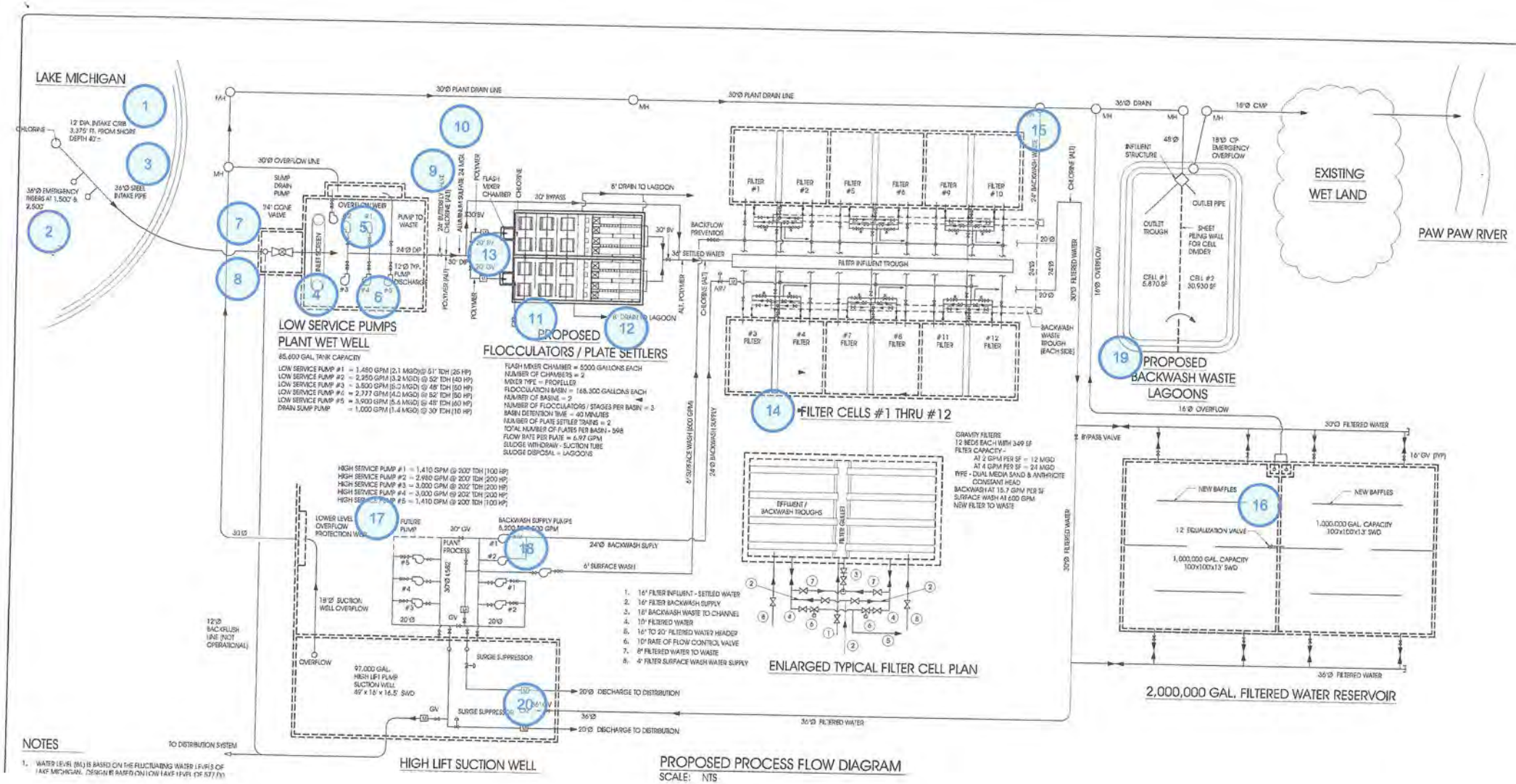
A call with the city, EGLE, and health agencies to discuss the city of Benton Harbor's lead and copper compliance sampling for the first half of 2019.

Call-in Number : 888-273-3658
Access Code: 1348701

Host Pwd: 4683

	Asset	Description	Installation Date	Age	Last Maintenance	Useful Life	Replacement Cost	Schematic Key	
Storage	Clearwell	30,000 gallons							
	Ground Storage	2 MG (two 1 MG abutting reservoirs)	1950?		2004 east half inspected; 2008 west half inspected; 12" isolation valve recently replaced (2018); entry hatches recently replaced (2018)			16	
	Finished Water Suction Well	108,856 gallons storage reservoir for feeding the high service and backwash pumps	1950?					17	
	Elevated Storage Tank at Britain and 8th	0.65 MG capacity	1938					n/a	
Backwash	Backwash Lagoon	unlined cells A & B separated by a wall	2011		Recommend keeping 2' of freeboard and cleaning these out annually to reduce potential of overflow to surface water				
	Backwash Waste Wet Well	83,000 gallons, accepts filter waste and pumps to backwash surge basin	2011					19	
Pumps	Pump Low Service #1	2 MGD turbine			annual preventative maintenance performed by contractor			?	
	Pump Low Service #2	3 MGD turbine			annual preventative maintenance performed by contractor			5	
	Pump Low Service #3	5 MGD turbine			annual preventative maintenance performed by contractor			5	
	Pump Low Service #4	4 MGD turbine			annual preventative maintenance performed by contractor			5	
	Pump Low Service #5	6 MGD turbine			annual preventative maintenance performed by contractor; out of service indefinitely (2018)			5	
	Pump High Service #1	2 MGD turbine			annual preventative maintenance performed by contractor; out of service indefinitely (2018)			5	
	Pump High Service #2	4 MGD turbine			annual preventative maintenance performed by contractor			17	
	Pump High Service #3	4 MGD turbine			annual preventative maintenance performed by contractor			17	
	Pump High Service #4	4 MGD turbine			annual preventative maintenance performed by contractor			17	
	Pump High Service #5	2 MGD turbine			2018 offline; annual preventative maintenance performed by contractor			17	
	Pump Filter Backwash #1	7.5 MGD turbine			annual preventative maintenance performed by contractor			17	
	Pump Filter backwash #2	7.5 MGD turbine	2011 (refurbished)?		annual preventative maintenance performed by contractor			18	
Intake & Treatment	Intake Crib	Located ~3,375 feet offshore, the vertical riser is 10 ft in diameter at the base and cones up to 12 ft in diameter at the top rim	1949					18	
	Inlet Screen	removes debris from raw water intake pipe	1949?					1	
	Wet Well	~120,000 gallons, adjacent to low service pump room	1950?		1997 new traveling screen installed and new spool piece installed on the 36-inch pipe. 1999 motor/gears replaced. 2005 wet well cleaned.			4	
	Rapid Mix	2 units, 8,600 gallons each			2018 condition = new; not being used			6	
	Flocculation Basins	2 units, 168,300 gallons each	2011		2018 one motor out of service and awaiting replacement			n/a	
	Settling Basins	2 units, 134,640 gallons each, stainless steel plate settlers at 55 degree inclination	2011		Constructed to replace old decrepit Accelators. 2018 Maintenance needed as exposed metal is deteriorating.			11	
Filters	Filtration Filter #1	Leopold filter underdrains with a 1" IMS caps	1998		1998 new underdrains			12	constructed with DWRF project
	Filtration Filter #2	Leopold filter underdrains with a 1" IMS caps	1998		1998 new underdrains			14	
	Filtration Filter #3	Leopold filter underdrains with a 1" IMS caps	1995		1995 new media and underdrains			14	
	Filtration Filter #4	Leopold filter underdrains with a 1" IMS caps	1995		1995 new media and underdrains			14	
	Filtration Filter #5	Leopold filter underdrains with a 1" IMS caps	1998		1998 new underdrains. 2002 new media			14	
	Filtration Filter #6	Leopold filter underdrains with a 1" IMS caps	1998		1998 new underdrains. 2002 new media			14	
	Filtration Filter #7	Leopold filter underdrains with a 1" IMS caps	1995		1995 new media and underdrains			14	
	Filtration Filter #8	Leopold filter underdrains with a 1" IMS caps	1997		1997 new media and underdrains			14	
	Filtration Filter #9		1954		2011 new underdrains			14	rebuilt with DWRF
	Filtration Filter #10		1954		2011 new underdrains			14	rebuilt with DWRF
	Filtration Filter #11		1954		2011 new underdrains			14	rebuilt with DWRF

	Asset	Description	Installation Date	Age	Last Maintenance	Useful Life	Replacement Cost	Schematic Key	
	Filtration Filter #12		1954		2011 new underdrains			14	rebuilt with DWRF
Chemicals	Chlorine Chemical Feeders							9	
	Chlorine Chemical Storage	Liquid chlorine feed system consists of three bulk tanks (2,800 gal each) located in the chemical storage building and two day tanks (50 gal and 200 gal).							
	Alum Chemical Feeders	2 units Hydrofio 21.58 gph @ 60 psi max feed rate, 95 ml/min min feed rate						n/a	
	Alum Chemical Storage	2 tanks 3,800 gallon; transfer pumps: 2 Thompson Mag pump, 3/4 Hp, rated 25 gpm @ 20' TDH; 1 day tank (300 gal)						10	
	Fluoride Chemical Feeders	1 LMI, max feed rate: 36 gpd @ 150 psi, min feed rate: 30 ml/min	2018		new sodium fluoride saturator system installed 2018			n/a	
	Fluoride Chemical Storage	5,700 gallon tank; transfer pumps: one 56 gpm @ 56' TDH						8	
Piping	Raw Water Intake Pipe	36" steel pipe draws water 3,375' from shore, under 27' of water	1949					n/a	
	Low Service Discharge Pipe	24"- splits to two 20" pipes						3	
	Settled water effluent pipe	36"							
	Filtered water effluent pipe	30"							
	High service suction header	36"							
	High service discharge	two 20" pipes							
	Backwash Pipe	24"							
	Surface wash pipe	4"						15	
	Wash water drain	24" to 30" sewer							
	Intake backflush line	12"							
	Sludge drain	24"			Removed from Service (2018)				
	Plant service line	6"							
	Plant service to CL2 feeders	2"							
Metering	Raw Water Metering	2 units, one on each settling basin influent line							
	High Service Metering	2 units, one on each 20" line						13	
	Finished Water Metering	two 20" venturi meters, on 12" mag			2018 Not functioning				
	Back Wash Metering	1 turbine meter			2018 None are working			20	
	Plant Water Metering	4" sensus							
Emergency	Emergency Supply Interconnections	one interconnection with St. Joseph City at M-63; interconnections with Benton Twp						n/a	
	Power Supply	backup generator	2011		"dark test" in 2017, generator failed to start properly which resulted in some repairs				
	Standby Emergency Intake	2 36" emergency risers at 1500' and 2500' from shore			Inspected approximately every two years (last inspection completed 2007)			n/a	
Valves	Intake Valves				Regularly exercised			2	
	Intake Backflush Valve				no longer in service			7	
	High Service Isolation Valves				Regularly exercised				
	Clearwell Valves				Regularly exercised				
	Influent/Effluent Pretreatment Basins Valving				Regularly exercised				
	Effluent Flume Valve				Regularly exercised				
	Low Service Pump Discharge Valving				Regularly exercised				



NOTES

1. WATER LEVEL (ML) IS BASED ON THE FLUCTUATING WATER LEVELS OF LAKE MICHIGAN. DESIGN IS BASED ON LOW LAKE LEVEL OF 577.0'.

PROPOSED PROCESS FLOW DIAGRAM

SCALE: NTS

From: Sarkipato, Ernest (EGLE)
To: Bolf, Michael (EGLE); Oswald, Eric (EGLE); Thurston, Brian (EGLE)
Subject: Update Report: Benton Harbor
Date: Wednesday, September 11, 2019 6:53:03 PM

I wanted to send an update on Benton Harbor. Note, we could send a stronger message at the meeting next Friday by having two staff attend!

_____

EGLE field staff will be meeting with the new City Manager of Benton Harbor, Ellis Mitchell, next Friday 9/20/19. The discussion related to the drinking water system will cover the following:

-Compliance status on the Administrative Consent order, and the timeline for water system improvements. One of the items is currently overdue (construction of Alum Feed system), many are due at end of September.
-Status of lead and copper compliance, and corrosion control treatment. Corrosion control treatment continues, yet we have not yet noted a significant decrease in lead levels from June sampling, and the action level for lead continues. Filter distribution continues through the health department.
-Financial status of the water system will be discussed with Mr. Mitchell. There is a local effort pushing back on bill collections, yet the ACO contains deadlines for rate increases and bill collection process. This is necessary to sustainably operate the water system locally.
-2019 CCR release was confusing and ineffective. It was issued without local or state review, and may have further confused residents particularly as there is a lead action level exceedance. Informing water customers about the water is highly important.

Ernie Sarkipato, P.E.
Drinking Water and Environmental Health Division
Michigan Dept. of Great Lakes and Energy
616-307-0261 (cell)

From:	Sarkipato, Ernest (EGLE)
To:	Ellis Mitchell; momalley@cityofbentonharbormi.gov; lgolliday@cityofbentonharbormi.gov
Cc:	Bolf, Michael (EGLE); rrice@cityofbentonharbormi.gov; "Darold Harlan"; awade@cityofbentonharbormi.gov
Subject:	Visit summary - City of Benton Harbor
Date:	Monday, November 4, 2019 10:42:40 AM
Attachments:	visit memo.doc 2019 Monitoring Schedule BH.pdf Benton Harbor Water Asset Management Plan - December 2017.pdf

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Please find attached a summary of Friday's meeting, and some supporting documentation. The 2019 monitoring schedule is attached to give Mr. Mitchell an appreciation of all that Mike is keeping track of. The AMP is attached to show the final two pages which consists of the rate study for the city, with projected rate increases needed.

I especially appreciated the time of Lisa Golliday and Kaye Jenkins, to provide some administrative and financial insight to the city's water system.

Thank you also for the invitation to attend the final day of the BH city commission retreat, on December 13, 2019. We will look forward to getting more details on that, and discussing how to best utilize this opportunity.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

www.michigan.gov/drinkingwater

MICHIGAN DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT

INTEROFFICE COMMUNICATION

TO: Benton Harbor Public Water Supply (WSSN 600)

FROM: Ernie Sarkipato, P.E., District Engineer

DATE: November 1, 2019

SUBJECT: Meeting Summary

Meeting held from 10AM-12PM in City Manager's office, attended by Ernie Sarkipato from EGLE and city representatives included Ellis Mitchell, Mike O'Malley, Lisa Golliday, and Kaye Jenkins

ACO Review: Financial Components

-Rate study was completed by RW Baird, and was incorporated into Asset Management and included in Appendix G. A digital copy of the Asset Management Program will be emailed to all meeting participants. The ACO requirement is to ***Submit a plan to implement rate increases***, which will likely involve the city commission and is likely to be met with opposition from some particularly with an election in a few days. However, our goal is to help the city retain ownership of the water system and manage it sustainably, acknowledging it is a source of community pride. To do this, the water rates must be sufficient to cover all costs.
-Abonmarch has been integrally involved with managing the capital projects with the City and should be included in discussions of asset management, rates, and capital project planning.
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2019 Monitoring Schedule

BENTON HARBOR

WSSN: 00600

Collect samples early in the monitoring period. This schedule reflects expected routine monitoring and is subject to change. To receive credit for monitoring, include the **WSSN, Site Code**, and **County** on your request for analysis form. Collect all samples close to the shipping time and send overnight delivery. Send all sample results to your Department of Environmental Quality (DEQ) district office unless you use the DEQ laboratory. Test codes, sample units, and costs are listed to help you complete the DEQ laboratory form. Prices subject to change without notice. The DEQ laboratory is closed on state holidays.

Location: Second Quarter SOCs

Collect these samples at the entry point to the distribution system (after treatment, if applicable.)

Sample Type	# Samples/ Frequency	Collect Before	Site Code	Fee	Unit Number	Test Code
SOC – Pesticides	1/36 months	**6/30/2019**	TP001	$125.00	36PT	CXPT
SOC – Herbicides	1/36 months	**6/30/2019**	TP001	$120.00	36HB	CXHB
SOC – Carbamates	1/36 months	**6/30/2019**	TP001	$120.00	36LP	CXLP

Location: Treatment Plant Tap

Collect these samples at the entry point to the distribution system (after treatment, if applicable.)

Sample Type	# Samples/ Frequency	Collect Before	Site Code	Fee	Unit Number	Test Code
Automated Partial Chemistry	This DEQ lab scan includes nitrate, nitrite, fluoride, and sodium whose monitoring frequency requirements differ from one another. Before requesting analyses from a laboratory other than the DEQ laboratory, check with your DEQ district staff for the specific monitoring requirements.					
	1/12 months	**9/30/2019**	TP001	$18.00	32	R
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Complete Metals	1/108 months	9/30/2021	TP001	$102.00	36ME	CMET2
Cyanide	1/12 months	**9/30/2019**	TP001	$25.00	36CNa	CCN
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Radium 226 & Radium 228	1/108 months	9/30/2023	TP001			
Water Quality Parameters* pH, alkalinity, calcium, conductivity, temperature, sulfate, chloride	1/3 months	1/3 months	TP001	Various	Various	Various
Total Organic Carbon (TOC)	Pair/Monthly	**Monthly**	TP001	$35.00	36TO	CTOC
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Location: Distribution System

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Lead and Copper for Corrosion Control	Lead and Copper Sampling Pool	60/6 months	**Between 01/01-6/30/2019 and 07/01-12/31/2019**	DIST	$26.00	36CC	CCUB

* See insert for additional information about water quality parameter analysis.

From:	Sarkipato, Ernest (EGLE)
To:	Ellis Mitchell; momalley@cityofbentonharbormi.gov; "lgolliday@cityofbentonharbormi.gov"
Cc:	Bolf, Michael (EGLE); "rrice@cityofbentonharbormi.gov"; "Darold Harlan"; awade@cityofbentonharbormi.gov
Subject:	Visit summary - City of Benton Harbor
Date:	Monday, November 4, 2019 10:41:59 AM
Attachments:	visit memo.doc 2019 Monitoring Schedule BH.pdf Benton Harbor Water Asset Management Plan - December 2017.pdf

---

Please find attached a summary of Friday's meeting, and some supporting documentation. The 2019 monitoring schedule is attached to give Mr. Mitchell an appreciation of all that Mike is keeping track of. The AMP is attached to show the final two pages which consists of the rate study for the city, with projected rate increases needed.

I especially appreciated the time of Lisa Golliday and Kaye Jenkins, to provide some administrative and financial insight to the city's water system.

Thank you also for the invitation to attend the final day of the BH city commission retreat, on December 13, 2019. We will look forward to getting more details on that, and discussing how to best utilize this opportunity.

Ernie Sarkipato, P.E.
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
MI Department of Environment, Great Lakes, and Energy
616-307-0261 mobile

EGLE

www.michigan.gov/drinkingwater

MICHIGAN DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT

INTEROFFICE COMMUNICATION

TO: Benton Harbor Public Water Supply (WSSN 600)

FROM: Ernie Sarkipato, P.E., District Engineer

DATE: November 1, 2019

SUBJECT: Meeting Summary

Meeting held from 10AM-12PM in City Manager's office, attended by Ernie Sarkipato from EGLE and city representatives included Ellis Mitchell, Mike O'Malley, Lisa Golliday, and Kaye Jenkins

ACO Review: Financial Components

-Rate study was completed by RW Baird, and was incorporated into Asset Management and included in Appendix G. A digital copy of the Asset Management Program will be emailed to all meeting participants. The ACO requirement is to ***Submit a plan to implement rate increases***, which will likely involve the city commission and is likely to be met with opposition from some particularly with an election in a few days. However, our goal is to help the city retain ownership of the water system and manage it sustainably, acknowledging it is a source of community pride. To do this, the water rates must be sufficient to cover all costs.
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To:	Darold Harlan; rjones@fv-operations.com; Catherine Winn; drice@bhcity.us; dmeeks@cityofbentonharbormi.gov; Lesia Osler
Cc:	emitchell@bhcity.us; Bolf, Michael (EGLE); Blair Selover; Chris J Cook; rrice@bhcity.us; Shawn Glynn; Bill Dustin; Jason Marquardt
Subject:	Weekly Check-in, Benton Harbor

Some discussion topics/ideas below. We may not get through everything! Please read through and be prepared to discuss.

1. After-action: Alum Underfeed. Prevention by integrating into SCADA?
2. Emergencies: any new breaks, leaks, water complaints, etc.
3. Other High Priority projects (Roof, Alum feed SCADA, Intake, Floc drives)
4. Lead sampling, LSL inventory, LSL replacement (Generally, compliance with lead and copper rule)
5. Corrosion Treatment
6. Other treatment: coagulation and disinfection
7. SCADA upgrades, instrumentation and integration, and Historian
8. ACO Progress

 a. TMF
 b. Corrosion Study
 c. Filter to waste
 d. Intake rehab, mussel control

9. Alum Sludge
10. Finances
11. Construction updates
12. Regulatory updates, upcoming communications

Microsoft Teams meeting

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Or call in (audio only)

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WATER ASSET MANAGEMENT PLAN

December 2017

Prepared by:

ABONMARCHE

95 West Main Street, Benton Harbor, MI 49022 • 269.927.2295
abonmarche.com

Contents

1 Executive Summary 1

1.0 Introduction 1

1.1 Mission Statement 1

1.2 Asset Management Team 2

2 Asset Inventory 2

2.0 Introduction 2

2.1 Water System Inventory 2

2.1.1 Water Plant 3

2.1.2 Distribution Piping 4

2.1.3 Water Meters 7

2.1.4 Fire Hydrants 7

2.1.5 Water Tower 8

2.1.6 Drinking Water Source 8

2.2 Condition Assessment, Remaining Life and Value 8

3 Level of Service 9

3.0 Introduction 9

3.1 Level of Service Goals 11

4 Asset Criticality 11

4.0 Introduction 11

4.1 Probability of Failure (POF) 12

4.2 Consequence of Failure (COF) 13

4.3 Criticality & Business Risk Evaluation 14

5 Revenue Structure 16

5.0 Introduction 16

5.1 Operation & Maintenance Budget and Staff Structure 16

5.2 Replacement Fund 17

6 Capital Improvement Project Plan 18

6.0 Introduction 18

6.1 Water System Reliability Study 18

6.2 Recommended CIP Projects 18

6.2.1 Five (5) Year CIP Plan 18

6.2.2 Twenty (20) Year CIP Plan 21
6.3 CIP Plan Summary 24
7 Conclusions 24

Summary of Tables

Table 1: City of Benton Harbor Water AMP Team 2
Table 2: Summary of Water Assets 3
Table 3: Water Distribution Network Summary 5
Table 4: Water Distribution Network Summary (By Age) 6
Table 5: Summary of Existing Water Meters by Use 7
Table 6: Distribution Pipe Service Life Summary 9
Table 7: Water Distribution Replacement Values 9
Table 8: Consequence of Failure Levels 13
Table 9: Business Risk Evaluation Score Priority Matrix 15
Table 10: City of Benton Harbor Public Services Department Staff Structure 17
Table 11: Water Supply 5 Year CIP (2020) 19
Table 12: Water Storage 5 Year CIP (2018-2019) 19
Table 13: Water Distribution 5 Year CIP from Criticality Ratings (2023) 20
Table 14: Water Distribution 5 Year CIP from Reliability Study (2023) 20
Table 15: Water Supply 20 Year CIP (2033) 21
Table 16: Water Storage 20 Year CIP (2033) 21
Table 17: Water Distribution 20 Year CIP from Criticality Ratings (2033-2037) 21
Table 18: Water Distribution 20 Year CIP from Reliability Study (2033-2037) 22
Table 19: 5 Year Water CIP Plan Summary 24
Table 20: 20 Year Water CIP Plan Summary 24

Summary of Figures

Figure 1: Water Distribution Network Summary (By Size) 5
Figure 2: Network Pipe Material and Size Distribution 6
Figure 3: Water Distribution Network Summary (By Age) 7
Figure 4: Network Probability of Failure Distribution 12
Figure 5: Network Consequence of Failure Distribution 14
Figure 6: Network BRE Score Distribution 15

Appendices

Appendix A: Benton Harbor Water Distribution Pipe Condition Summary Table
Appendix B: 2017 Hydrant Classification Map
Appendix C: 2008 Water Tower Inspection Report
Appendix D: 2011 - 2016 Annual Water Quality Reports
Appendix E: System Analysis Maps
Appendix F: 5 Year and 20 Year CIP Estimates
Appendix G: Benton Harbor Water System Cash Flow

1 Executive Summary

1.0 Introduction

The Michigan Department of Environmental Quality (MDEQ), through Michigan's Safe Drinking Water Act, has implemented the requirement that community water supplies servicing more than 1,000 people, prepare and execute an Asset Management Plan (AMP) for their water system. The City of Benton Harbor with a population of 10,038 per the 2010 census, meets the requirements for implementation of an AMP for their water infrastructure.

The goal of the AMP process is to provide the municipality with a comprehensive understanding of the quantity and condition of their existing system to ensure proper measures are being taken to provide a safe and reliable supply of water to consumers. Asset Management Plans analyze life cycle costing to develop a long term plan that associates the needed funding to projects that will be done in the future that include repairing, replacing or rehabilitating particular assets. This ensures that the water system will deliver the desired level of service perpetually.

The AMP consist of five core components as described in the MDEQ document, "Asset Management Guidance for Water Systems" these include:

- Asset Inventory
- Level of Service
- Critical Assets
- Revenue Structure
- Capital Improvement Project Plan

This Water Asset Management Plan was structured to follow the format suggested in the MDEQ "Asset Management Guidance for Water Systems."

1.1 Mission Statement

The Michigan Department of Environmental Quality requires that for an AMP to be approved there must be a mission statement. A Mission Statement is developed to represent the purpose and goals of the water department. The Mission Statement defines the asset management program. The following is a derivation of the standard mission statement recommended by the MDEQ in lieu of a formal statement by the municipality:

We commit to protecting public health, and maintaining and improving performance of our drinking water plant and distribution system assets, while minimizing the long-term cost of operating those assets. We strive to make the most cost-effective renewal and replacement investments and provide the highest-quality customer service possible.

1.2 Asset Management Team

The MDEQ also requires an Asset Management Team be established to oversee the asset management program. The team will also ensure that the mission statement is being fulfilled. When assembling an Asset Management Team, it is important to consider current and past municipal staff (officials, board members, clerks, accountants, and engineers), current and past utility staff (operators and other service workers), and any other stakeholders that can help in assembling the information to develop this Asset Management Plan. Provided below in Table 1 is a summary of the AMP Team. As the AMP is updated, these contacts may be updated and reviewed to determine if additional members are required or other changes are needed to best complete the stated goals of the AMP.

Table 1: City of Benton Harbor Water AMP Team

Member Role	*Current Member*
City Manager	Darwin Watson
Public Services Director	Michael O'Malley
Water Treatment Superintendent	Michael O'Malley
Engineer	Abonmarche

2 Asset Inventory

2.0 Introduction

The first core component of asset management, according to MDEQ, is the asset inventory. The following questions are a guideline for developing an inventory:

- What do I own?
- Where is it?
- What condition is it in?
- What is its remaining useful life?
- What is its value?

Developing the initial inventory on what assets the city owns can be one of the most difficult steps. The majority of the assets for a water system are underground and hidden from view. Therefore, it is difficult to keep track of what is there and what condition it is in. To develop the initial inventory, as-built drawings, invoices, staff knowledge, visual observation, interviews with residents and consultants are all resources that were used. Asset inventory is an ongoing process that should be updated when changes are made to the water system.

2.1 Water System Inventory

The first step in the asset management plan is to determine what assets are owned and maintained by the municipality. These assets for the water utility include not only the

physical pipes that transport water to users but also the water plant, storage facilities, pumps, and fire hydrants. A summary of owned water facilities can be seen in Table 2.

Table 2: Summary of Water Assets

Asset	*Measure*
Water Plant	Renovated 2010-2011
Water Distribution (Pipes)	347,645 Feet (65.8 miles)
Water Meters	2,844
Fire Hydrants	509
Water Tower	1 @ 650,000 Gallon Capacity

Maintenance of these assets is critical to meeting the city's goal of providing safe and reliable drinking water to its users. To complete an accurate and useful asset management plan it is important to gather as much data on the existing age and condition of all assets related to a utility. A more detailed summary of the above listed assets is provided in the following sections.

2.1.1 Water Plant

The Benton Harbor Water Plant is located at 601 Ridgeway, St. Joseph, MI, in the southwest corner of Jean Klock Park near the Lake Michigan shoreline. Built around 1955 by Pearson Construction Co., it is rated by the Michigan Department of Environmental Quality (MDEQ) as an F-1 Complete Treatment Surface Water Treatment Plant and is regulated by the Michigan Safe Drinking Water Act 399 in accordance with the Surface Water Treatment Rules (SWTR). From 2010-2011, the water plant was refurbished and expanded using Michigan's Drinking Water Revolving Loan Funds (DWRLF). Operation was restored to 16 million gallons of water per day (MGD) and technology improvements included: chemical treatment, safer and easier disinfection, particulate matter removal, waste treatment, and other operational equipment.

The current process of the water plant starts with raw Lake Michigan water conveyed via one or more of five low lift pumps at a typical rate of 2-5 MGD from an intake structure located 5,000 feet from the plant in Lake Michigan though a 30-inch diameter pipe to a raw water lift station and wet well. Liquid sodium hypochlorite, in 15% solution, is added as a disinfectant. Liquid aluminum sulfate, in 48% solution, is added to facilitate the chemical binding and settling process of coagulation. Hydrofluorosilicic acid (HFSA) is also added but will soon be switched to a granular sodium fluoride. The pumped raw water that has been chemically treated is discharged into the mixing portion of the two plate settler basins where the flow is mixed in five stages: in the pipeline, in the rapid mixer, and in three successively slower flocculation mixers. During this mixing, the alum destabilizes the particles and then acts as a binding chemical that forms a piece of insoluble floc. The water then enters a plate settler chamber where the floc is settled to the bottom and clear water is drawn off the upper levels. More than 95% of the suspended solids are removed in the flocculation/settling process. The water then flows

to the filters where additional suspended solids are removed before flowing to two underground reservoirs.

2.1.2 Distribution Piping

The existing water distribution system includes over 65 miles of 2" through 20" water main. The mains adjacent to the water treatment plant are 20" and main transmission lines are 8-20" in size. Many residential areas are served by 4"-8" mains. A significant portion of the city (23.7%) is served by mains 2" and 4" in diameter, inadequate for distribution systems with fire protection. Water is pumped from the reservoirs at the water plant via one or two of five high lift (HS) pumps at a rate of either 2 MGD or 4 MGD to the system at 70 to 90 psi. One 2 MGD pump is used during normal consumption to maintain a safe level in the Britain Avenue water tower. A second pump, with a capacity of 4 MGD, is used during emergency situations when the safe level is not maintained. Two 20-inch pipes carry the water from the plant to the city; 12-16-inch pipes distribute the water and 4, 6, & 8-inch pipes deliver water to homes and small businesses.

Improper and lack of looping water mains also causes reduced pressures, stagnant water and increased maintenance. The system is generally well looped, except at the now unused connection with Benton Charter Township on Pipestone and at the City borders. Improper sizing can also be detrimental to the overall pressure in the system, much of the residential areas are fed with 4" main which are too small to generate suitable fire flows.

The system was designed to distribute water to a much larger area than it currently supplies: Benton Charter Township now receives water from the Benton Charter Township Water Plant, St. Joseph Township now receives water from the St. Joseph Water Plant. The City of Benton Harbor distribution system still consists of the large mains that were necessary to distribute water to those further areas, but now only distributes water within the City limits. Therefore, large mains are feeding 4" mains in neighborhoods.

The current 10 State Standards for Water Works recommend water main diameters six (6) inches or greater with most typical applications calling for an eight (8) inch water main as a minimum diameter in order to provide adequate fire protection while maintaining acceptable residual pressures in the system. A breakdown of the City's water distribution system by pipe diameter can be seen in Table 3 and Figure 1. This breakdown shows 83,081 feet of the city's water distribution piping, 23.9% of the system, falls below the 6 inch minimum standard with a further 116,839 feet, or 33.6%, right at the 6 inch minimum diameter.

Table 3: Water Distribution Network Summary

Pipe Diameter (Inches)	*Length of Pipe (Feet)*	*% of System*
2	771	0.2%
4	82,310	23.7%
6	116,839	33.6%
8	44,398	12.8%
10	6,964	2.0%
12	57,054	16.4%
16	10,135	2.9%
18	1,181	0.3%
20	27,993	8.1%
Total	**347,645**	**100%**

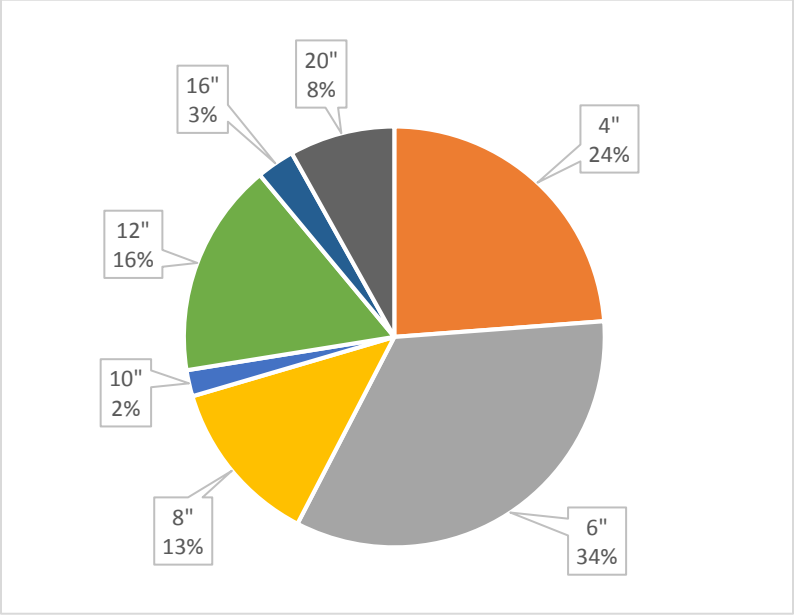

Figure 1: Water Distribution Network Summary (By Size)

A further breakdown of the existing distribution network, showing both piping materials and sizes is presented in Figure 2. An overall listing of all mains owned by the city can be found in Appendix A following this report.

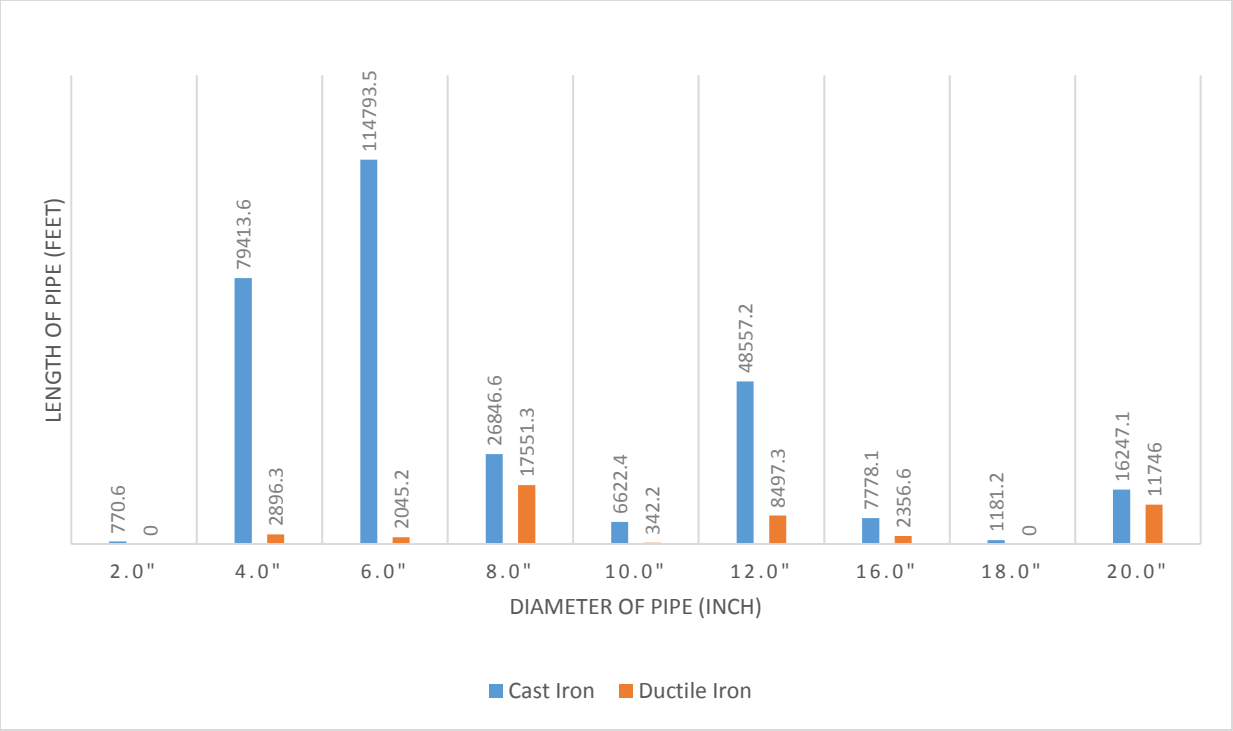

Figure 2: Network Pipe Material and Size Distribution

Table 4 and Figure 3 show the age ranges within the system. 75% of the system is greater than 50 years of age. Underground pipes have an effective life based on the pipe material and installation practices used during their installation. Galvanized pipes generally have an estimated effective life less than 50 years while cast iron pipes can last 75 years, and new ductile iron or plastic pipe materials are capable of lasting 90 years or longer with modern construction practices. The advanced age of the water distribution network is a significant factor in the condition assessment and probability of failure discussed later in the report.

Table 4: Water Distribution Network Summary (By Age)

Age Range	Length of Pipe, feet	%
0 - 25	49,440	14.2%
26 - 50	36,664	10.5%
51 +	261,541	75.2%
Total	**347,645**	**100%**

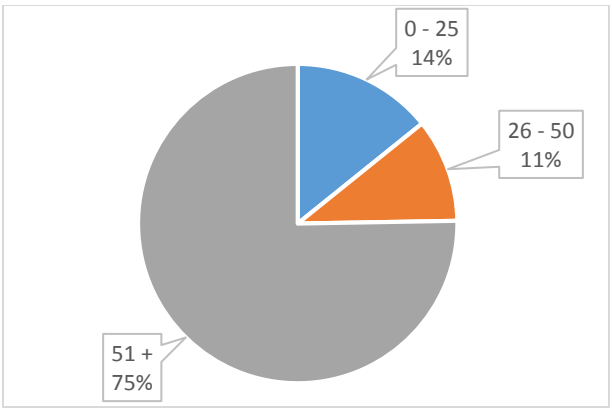

Figure 3: Water Distribution Network Summary (By Age)

2.1.3 Water Meters

The city currently utilizes 3,476 total service connections, 2,844 of these are metered. 2,612 of the meters were recently replaced as part of the SAW grant to provide more accurate readings. Water service connections that are not metered include; City Hall, the police station, the fire station, and several parks, with more being discovered. Water meters measure water usage for residential, commercial, industrial, and governmental customers. The current estimated breakdown of meter usage can be seen below in Table 5.

Table 5: Summary of Existing Water Meters by Use

User Type	*Number of Meters*	*% of System*
Residential	2,474	87%
Commercial	199	7%
Industrial	114	4%
Mixed Use	57	2%
Total	**2,844**	**100%**

2.1.4 Fire Hydrants

509 fire hydrants are connected to many strategically placed points on the system. The placement varies based upon the number and types of structures that may catch fire and the availability of water in the water mains around these structures. The ISO Criteria generally requires a flow of 1,000 to 1,500 gpm in residential areas (1- and 2- family dwellings not exceeding two stories in height) and up to 2,500 gpm in commercial areas. The minimum residual pressure at the fire flow is commonly required, by the National Board of Fire Insurance Underwriters, to be 20 psi. A detailed summary of improvements recommended based on increasing fire flows can be found in the reliability study recently completed. A map showing the location and classification of the hydrants as of 2017 can be found in Appendix B. 4" and 2" pipes throughout the City should be generally replaced with 8" to improve fire flows throughout the City. A minimum of 8" Ductile Iron

should be the standard used in any water system replacements or improvements throughout the City. We suggest further investigation via a hydrant flow testing program to best determine where localized hydrant and valve issues are present. A valve turning program is also recommended to better understand the system and improve faults.

2.1.5 Water Tower

A single pedestal elevated storage tank provides the City with water storage for fire protection and to improve system pressure. The water tower is located at Britain and 8th Street. The elevated tank was constructed in 1962 by Pittsburg Steel Company and has a storage capacity of 650,000 gallons. The elevation of the water tower provides 70-75 psi of pressure for the nearby water system. The water tower was last painted in 1990 and the last full inspection was performed by Dixon Engineering in 2008. A copy of this report can be found in Appendix C. In 2013, a partial inspection was performed by Dixon to look for damages relating to an overflow event.

2.1.6 Drinking Water Source

The drinking water source for the City of Benton Harbor is Lake Michigan. 5,000 feet of 36" piping that extends into the lake to an intake structure. In regards to the drinking water source quality, the City of Benton Harbor performs yearly water quality analysis and reporting to inform the public about drinking water quality. Water Quality Reports are created annually and made available to the public via the city's website. Water Quality Reports from 2011, 2012, 2014, 2015, and 2016 can be found in Appendix D.

2.2 Condition Assessment, Remaining Life and Value

Once an inventory of assets to be included in the asset management plan has been collected and reviewed, the next step is determining what the current condition of these assets are, how much remaining life they have, and what their overall value is. Determining the condition of the asset can help estimate what its remaining life will be. Knowing this information will help the city in setting budgeting priorities in the short and long term. Assets are hidden underground so it is difficult to determine their current condition through physical examination. Therefore, record documents are often the easiest way to estimate age.

To determine the anticipated condition of the water system in the City of Benton Harbor, historical mapping and as-built drawings from previous projects were collected and reviewed. As records for the water system have not been consistently updated, we had to make assumptions of the current approximate age of the pipe network. Any pipes installed prior to 1970 were assumed to be cast iron unless otherwise noted and pipes less than thee (3) inches in diameter were assumed to be galvanized unless otherwise noted. Appendix A provides a complete listing of the distribution network in the city which shows the assumed age, size, and length of distribution piping along with other related information.

In regards to anticipated life of the distribution network, Table 6 shows the service life values that were assumed for a given material.

Table 6: Distribution Pipe Service Life Summary

Material	*Service Life (Years)*
Galvanized	40
Cast Iron	75
PVC	90
Ductile Iron	90

It is important to have an order of magnitude understanding of the present value of assets owned so that maintenance and rehabilitation costs can be justified. In plain terms, more overall assets means more money needs to be allocated to their maintenance. Table 7 below summarizes and approximate value of the water distribution asset (water main, hydrants and valves) in the City.

Table 7: Water Distribution Replacement Values

Pipe Diameter (Inches)	*Length of Pipe (Feet)*	*Unit Replacement Cost ($/Foot)*	*Current Replacement Value ($)*
2.0*	771	$320	$246,720
4.0*	82,310	$320	$26,339,200
6.0*	116,839	$320	$37,388,480
8.0	44,398	$335	$14,873,330
10.0	6,964	$395	$2,750,780
12.0	57,054	$405	$23,106,870
16.0	10,135	$450	$4,560,750
18.0	1,181	$485	$572,785
20.0	27,993	$525	$14,696,325
Total	**347,645**		**$124,535,240**

*Assumed that mains 6 inches and under would be sized to the new 8 inch standard
** - Unit costs include removal and replacement of water main, installation of control valves, hydrants, and water services as well as replacement of pavement/surface improvements associated with a 10 foot wide trench.

3 Level of Service

3.0 Introduction

As described in the MDEQ Guidance Document, Level of Service (LOS) defines the way in which the utility stakeholders want the utility to perform over the long term. The LOS can include any technical, managerial, or financial components the utility wishes, as long as all regulatory requirements are met. The LOS will become a fundamental part of how the utility is operated.

All utilities must operate within the state and federal regulations and requirements. These regulations are generally specified in the Safe Drinking Water Act for water systems but there are additional rules and regulations at the state and federal level. Although the state and federal regulations set bare minimum standards of operation in the LOS, these standards will not adequately address all areas of operation and should not be the sole factor of the LOS. Utilities should include many other factors to delineate important areas of the utility's operation.

Within the range of the minimum (regulations) and maximum (absolute capabilities of assets), there are numerous items a utility could include within its LOS. Items may be included so the utility can communicate its intentions with its customers, measure its performance, and determine critical assets. Understanding what LOS to choose will help in developing an Asset Management Plan that truly captures the utility's performance and how to accomplish future goals.

Defining the LOS sets the goals for the utility. These goals allow the operations staff to have a better understanding of what is desired from them, and give management a better understanding of how to use staff and other resources more efficiently and effectively. Reviewing how the utility is meeting LOS also allows the management to shift resources if needed from one task to another to meet all the goals most effectively. Understanding the desired LOS will help to prioritize and characterize the system's assets, as well as how to manage finances to reach the LOS goals.

There is a direct link between the LOS provided and the cost to the customer. When a higher LOS is provided, costs to provide that level will likely increase. This direct link demands that the utility have an open dialogue with its customers regarding the LOS desired and the amount the customers are willing to pay for this LOS or increased services.

Typical questions to consider when developing the LOS for the system:

1) What is the LOS goal for health, safety, and security?

2) How often is the system out of compliance with regulations?

3) Are the operators properly certified?

4) How does the utility stay aware of and prepare for new regulations?

5) Do you share your LOS statement with your customers?

6) How do you track and respond to customer needs/complaints?

7) Can the current process be improved?

8) How quickly does the utility respond to customer issues?

9) Is maintenance being deferred to save money?

10) How much will the improvements cost and how will they be funded?

11) Are assets being properly maintained to insure they are in reliable working condition?

12) What areas within the system are most important to insure the best LOS possible?

13) When considering a preferred LOS, are asset age and life cycles, asset conditions, funding availability, etc. being factored in?

14) How often will the LOS statement be reviewed in order to capture changes such as funding availability (growth and decline), regulatory requirements, demand of customers (increases/decreases in customers), and physical deterioration of assets (addressing maintenance)?

15) Are O&M activities being maximized to meet the LOS goals?

3.1 Level of Service Goals

Upon review with the City, the following general LOS goals were selected as a guide to managing their water system.

- Deliver safe drinking water to all users
  - Meet State and Federal requirements for contaminants
- Ensure that taste and appearance are acceptable to all users
  - Meet selected secondary standards for taste, clarity, and color
  - City can track user feedback on water quality issues through City Works
  - Compliance tracked with laboratory testing and Monthly Operating Reports
- Provide adequate fire flows to ensure safety of community
  - "AA" (>1,500 gpm) flows to all commercial, industrial, and educational uses
  - "A" (>1,000 gpm) flows to all residential areas with City limits
  - Track with annual hydrant testing and 5-year computer modeling
- Undertake all necessary preventative maintenance and corrective actions on the system
  - Ensure that assets are meeting or exceeding their lifespans in good condition
  - Minimize cost of ownership
  - Minimize user interruptions due to unscheduled repairs and breaks
  - Record water line breaks so that trends can be identified and priorities can be adjusted

4 Asset Criticality

4.0 Introduction

The criticality of an asset is related to its probability of failure and its consequence of failure. Assets will have different criticality ratings. Criticality ratings are important in determining what assets need attention first. Assets with a higher criticality rating should receive priority first and should be outlined in the city's Asset Management Plan as being

a future project. This allows the city to start budgeting for the work that needs to be done. The two components of assessing criticality, Probability of Failure and Consequence of Failure, are described below.

4.1 Probability of Failure (POF)

Probability of Failure is estimating the likelihood that an asset will fail in the future. A ranking system to compare the probability of failure of multiple assets must be developed first before assigning a rating to each asset. By using the service life values defined in Table 6, and taking the assumed age of the pipes in the distribution network we are able to determine the anticipated probability of failure using equation (1) below. The result of this ratio is multiplied by 10 for use in criticality analysis of the network which is discussed in detail further in the report. In regards to probability of failure, a newly installed pipe will have a POF value of 0 which indicates very low to no probability of failure. A POF value of 10 indicates that the asset has reached or exceeded its intended service life and failure is likely imminent or that the reliability of the asset is severely degraded.

Equation (1): $$Probability\ of\ Failure\ (POF) = \frac{Age\ of\ Asset\ (Years)}{Service\ Life\ (Years)} * 10$$

If Age of Asset > Service Life, POF = 10

Figure 4 below shows a breakdown of the distribution network based on the POF rankings. Much of the system has aged to or beyond its maximum life as indicated by the large amount of the network in the 9-10 rating category. However, recent improvements to the water network have been completed, which is seen by the fair amount of pipes in the 0-2 rating category.

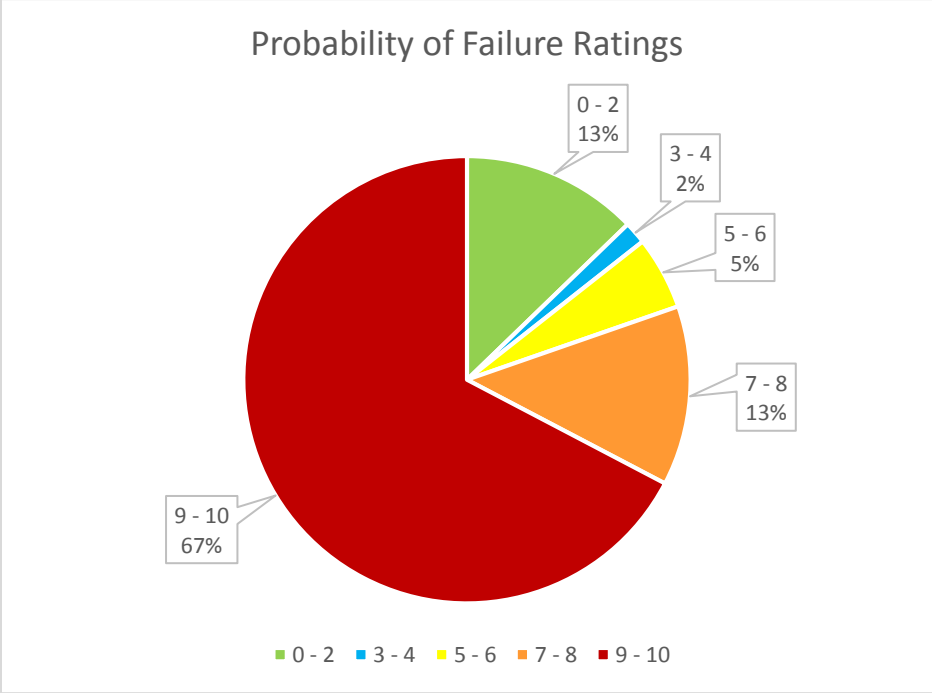

Figure 4: Network Probability of Failure Distribution

4.2 Consequence of Failure (COF)

Consequence of Failure is estimating all of the potential costs that will occur when there is failure to the asset. There are multiple costs to consider and often it tends to be a chain effect and accumulation of multiple different costs. Examples of the potential costs include: cost of repair; social cost associated with the loss of the asset; repair/replacement costs related to collateral damage caused by the failure; legal costs related to additional damage caused by the failure; environmental costs created by the failure; loss of business revenue to the community and any other associated costs or asset losses.

Table 8 below outlines the Consequence of Failure Levels that were developed and applied for this Asset Management Plan. It provides a summary of the selected factors and the ranges that were used to weight a given factor. As certain parameters, such a pipe size, play a larger role in determining consequence these factors were given greater overall weight in the scoring process.

Table 8: Consequence of Failure Levels

Factor & Weight	*Range of Value*	*Multiplier*
Size of Pipe (Inches) W: 5	< 4	0.1
	4 - 6	0.4
	8 - 10	0.7
	≥ 12	1.0
Proximity to Buildings W: 2	X ≥ 10	0
	5 < X < 10	0.5
	≤ 5	0.8
	0	1.0
Proximity to Roadways W: 3	Outside ROW	0
	In ROW Alley/Minor Road (Not Under)	0.2
	IN ROW Major Road (Not Under)	0.5
	Under Alley/Minor Road	0.8
	Under Major Road	1.0

The formula for determining COF has a value range of 0.5 to 10 with a lower score indicating the lowest criticality (small pipe, far away from buildings, outside of the ROW) and a 10 indicating the most critical situation (large pipe, under a building, under a major roadway). Equation 2 presented below was used in the calculation of criticality as previously discussed.

Equation (2): $Consequence\ of\ Failure\ (COF) = S * 5 + Prox_B * 2 + Prox_R * 3$

Where:
S = Size of Pipe
$Prox_B$ = Proximity to Buildings
$Prox_R$ = Proximity to Roadways

Figure 5 below shows a breakdown of the distribution network based on the COF rankings.

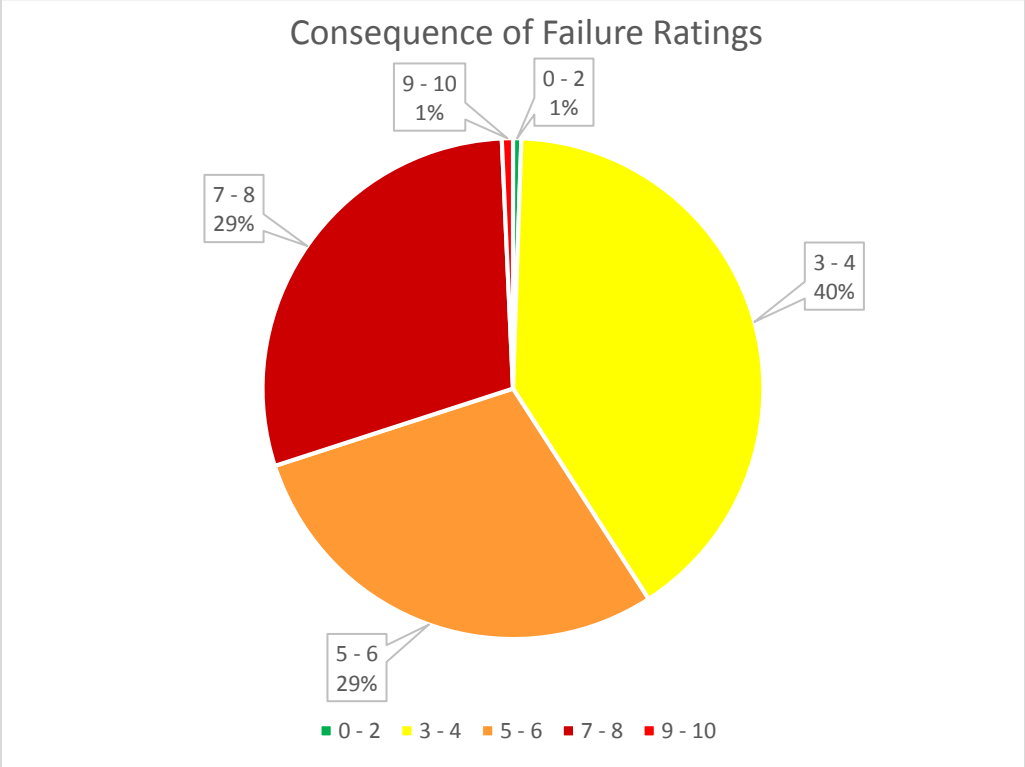

Figure 5: Network Consequence of Failure Distribution

4.3 Criticality & Business Risk Evaluation

Multiplying the Probability of Failure (POF) and the Consequence of Failure (COF) together results in determining the criticality, also referred to as the Business Risk Evaluation (BRE). The assets that have the greatest probability of failure along with the greatest consequence of failure will be the most critical. The equation for calculating the BRE can be seen below.

Equation (3): $BRE = POF * COF$

Where:
BRE = Business Risk Evaluation
POF = Probability of Failure
COF = Consequence of Failure

The product of multiplying the probability of failure with the consequence of failure produces a BRE score of 1 to 100. A BRE score of 1-20 is considered low priority, 21-55 are medium priority, and 56-100 are high priority. Table 9 shows the criticality matrix used for analyzing the assets. Assets with the highest BRE scores should be considered candidates for the 5-year or 20-year Capital Improvement Project list. Appendix A shows all the BRE scores for the Benton Harbor Water System. Appendix E provides mapping based on a variety of factors including remaining useful life, probability of failure, consequence of failure and criticality.

Table 9: Business Risk Evaluation Score Priority Matrix

Consequence of Failure (COF)											
	10	10	20	30	40	50	60	70	80	90	100
	9	9	18	27	36	45	54	63	72	81	90
	8	8	16	24	32	40	48	56	64	72	80
	7	7	14	21	28	35	42	49	56	63	70
	6	6	12	18	24	30	36	42	48	54	60
	5	5	10	15	20	25	30	35	40	45	50
	4	4	8	12	16	20	24	28	32	36	40
	3	3	6	9	12	15	18	21	24	27	30
	2	2	4	6	8	10	12	14	16	18	20
	1	1	2	3	4	5	6	7	8	9	10
		1	2	3	4	5	6	7	8	9	10
	Probability of Failure (POF)										

Figure 6 breaks down the current system by BRE ranking (low, medium, or high). More than 85% of the system is in a medium or high risk category from a BRE perspective. Projects will be selected from the 17% of the network that is currently in the high risk category.

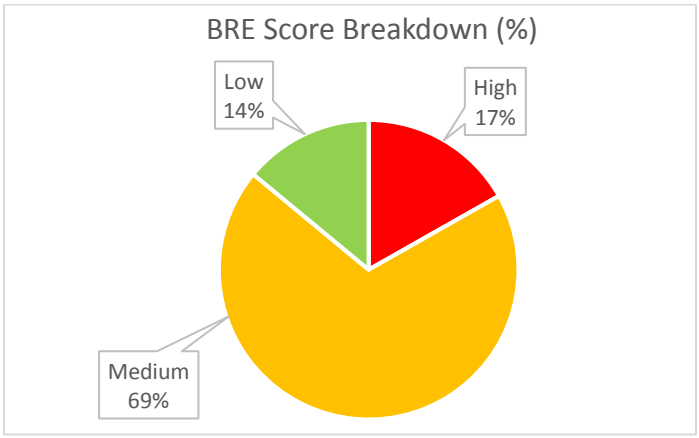

Figure 6: Network BRE Score Distribution

5 Revenue Structure

5.0 Introduction

To help fund rehabilitation or replacement of assets, methodologies are used to determine how revenue is generated. First, the fixed rate methodology can be utilized. Fixed rate methodology is a tool used to determine rates and charges to provide sufficient revenues to cover generally fixed costs that usually occur like the operation, maintenance, and replacement of assets. Next is billable flow methodology which generates revenue through a commodity rate based on consumer usage to address variable costs based upon flow, such as utility consumption. A fixed and variable methodology is typically used. In this method, revenue is generated from two sources, the fixed unit for the source and a commodity rate.

Once total expenses have been determined, the rates and charges for the user can be reviewed to ensure that there is sufficient revenue to cover expenses. If a shortfall exists, then the users are not paying for the cost of service and the difference must be addressed. Occasionally, temporary subsidies are necessary to cover unexpected expenses. However, a continuous use of subsidies will result in rate increases in the future or a deficit in the budget.

The City of Benton Harbor owns and operates the Drinking Water System and has the authority to establish rates to be charged for services as needed.

5.1 Operation & Maintenance Budget and Staff Structure

The annual operation and maintenance (O&M) budget includes typical costs associated with operating and maintaining the system for a year. Excluded from this budget are any major capital improvements that are needed to increase capacity or replace items with a useful life of more than 20 years. Included in the budget are the costs associated with personnel, energy use, supplies, etc. Budgetary projections assume an annual 3% increase in expenses to account for inflation and other factors.

The budget needs to account for the inflation of cost, wages, and utility charges. Efficiency within the City water distribution system is dependent on an adequate and qualified staffing structure. Table 10 is an outline of the existing city staffing that contributes to maintaining the water distribution system. That is, all employees from the department of public services including those who work specifically for the water department. The City will be facing the retirement of several key personnel within the 20 year planning period. Therefore, after the initial 5-year planning horizon, operating expenses are expected to remain flat.

In 2011, the emergency City manager set up a schedule for rates to increase to cover the cost of inflation, operations, maintenance and replacements to the system, and debt service cost on bonds. In 2013, a different emergency City manager approved a 5% reduction in this rate to reduce the financial burden placed on the residents who were facing economic hardships as the City was in a fiscal position to reduce the rates. The city currently operates with a water department budget of $2 million which provides

funding sufficient to address operations but may fall short of the funds needed to cover current debt payments. It appears that a 15% rate increase may be necessary in the next 6 months to close the funding gap for current debt. Annual increases of 2.5% -6.5% will also be needed until 2022. A larger rate increase, grant, or other mechanism of funding will be required to pay off debt necessary to complete all of the projects outlined in this report in 2023. More detail on this is included in Appendix G.

Table 10: City of Benton Harbor Public Services Department Staff Structure

Name	Title	DOB	DOH	License(s)
Michael O'Malley	Superintendent of Water Plant	9/27/1957	7/18/2016	S1 / F1 Certificate
Denny Edwards	Utility Service Operator I	10/20/1967	9/13/1994	F4 / S4 Certificate
Douglas Vanderploeg	Utility Service Operator I	5/20/1956	2/27/1992	F3 / S3 Certificate
Henry Clayton	General Labor	7/24/1978	9/15/2014	N/A
Eddie Davis	Heavy Equipment Operator	6/17/1973	10/20/2003	CDL Certificate
Shawn Echols	General Labor	7/4/1969	3/20/2017	N/A
Steve Forbear	Mechanic	11/17/1965	5/11/2015	CDL Certificate
Micah Goss	General Labor	2/18/1997	1/19/2016	N/A
Dennis Hudson	Heavy Equipment Operator	7/15/1965	11/25/2002	CDL Certificate
Floyd Johnson	Utility Service Technician I	10/1/1981	7/7/2016	CDL Certificate
Dimetrius Meeks	Supervisor Dept. of Public Works	8/15/1972	5/13/1997	N/A
Patrick Patterson	Heavy Equipment Operator	8/30/1963	5/2/2015	CDL Certificate
Richard Woods	Utility Service Technician I	8/20/1960	5/29/2013	CDL Certificate
Thomas Woodson	General Labor	9/19/1954	11/24/2014	CDL Certificate
Eddie Ellis	Utility Service Technician II	9/4/1969	11/30/2001	N/A

5.2 Replacement Fund

The rate methodology should include a replacement schedule for short-lived assets. The breakdown will identify items owned by the utility that have a useful life of 20 years or less

and contain moving parts. The replacement items will appear in the asset inventory, but should have a dedicated funding source due to their limited useful life and importance. On an annual basis, replacement funds are set aside and saved until needed. Once a particular item fails, money is drawn from the replacement fund to replace the failed item without having to disrupt the normal operating budget.

Most of the time, it is not known when any asset will need to be repaired or replaced, but their end of life has been estimated in this plan. The amount should be set aside each year, so that when a repair is needed, the funds are available without having to borrow money for the expense. The replacement schedule can be reviewed and amended annually for budgeting purposes.

6 Capital Improvement Project Plan

6.0 Introduction

A long-term Capital Improvement Plan (CIP) should look at the utility's needs for the future. Ideally, the planning period would be at least 20 years, with a 5 year plan identifying more pressing needs. It should be understood that the specific expenditures and needs of the utility in the latter years, 15 to 20 years, are more speculative than the needs for the first 5 to 10 years, particularly the first 5 years. However, the inclusion of the needs for this longer time period will provide a better opportunity for the water system to plan for its capital needs. Capital improvement projects are projects that the utility has an extended period of time to plan for and are projects that usually cover high cost, non-recurring items.

After the city has determined the projects it will include in its Capital Improvement Project Plan the next step is to associate an estimated cost to these projects. Once an estimated cost is developed, then is it important to think about how the project will be funded in the future. The city should plan on funding the majority of the capital improvement projects from its Water System revenue. Additionally, the city may look for outside sources of funding for projects. Grants and low interest loans should be explored to reduce the impact on rate payers. The city must budget and adjust their rates annually to address operational and capital improvement costs.

6.1 Water System Reliability Study

In 2017, Abonmarche completed another report related to the water distribution system in Benton Harbor. This was a Water System Reliability Study that focused on computer modeling the pressure in the system with reference to the desired fire flows in certain areas. The recommended project upgrade areas can be found in Tables 14 & 18. The full report can be found under the cover, "Water System Reliability Study."

6.2 Recommended CIP Projects

6.2.1 Five (5) Year CIP Plan

Presented on the following pages are the five (5) year projects for the water supply, storage, and distribution systems. To complete all the listed projects an estimated $15,798,790 would be required, which works out to approximately $750,000 per year

assuming a 30-year low interest loan is utilized for funding. Appendix F provides a detailed breakdown of the estimated costs for performing the water distribution 5 year CIP Plan.

Table 11: Water Supply 5 Year CIP (2020)

#	Project Description
1	Backwash & Waste Lagoon Improvements
2	High Service Pump #5 Soft Starter
3	New High Service Pump with VFD
4	Repair Roof over Offices
5	Software for Operations Computer
6	Zebra Mussel Pretreatment & Control
7	Alum Treatment
8	Overflow Protection
9	SCADA System Improvements
10	Pump Overhauls
5 Year Water Supply CIP Estimate	**$1,000,000**

Table 12: Water Storage 5 Year CIP (2018-2019)

#	Project Description	Estimated Cost
1	Exterior High Pressure Water Jet & Acrylic Recoat (Year 1)	$195,000
2	Cathodic Protection System Repair	$3,800
3	Adjust Sway Rods	$3,000
4	Install 30" Diameter Manway in Riser	$7,000
5	Install 30" Roof Hatch	$3,000
6	Install Roof Railing with Painter's Rail	$12,000
7	Paint Pit Piping	$5,000
8	Install Wet Interior Ladder with Fall Prevention	$8,000
9	Replace Sidewall Ladder with Vertical Ladder	$10,000
10	Weld Cathodic Caps and Hole in Roof Vent	$3,000
11	Repair & Replace Roof Beams and Plug Holes	$20,000
12	Repaint Interior	$50,000
5 Year Water Storage CIP Estimate		**$319,800**

Table 13: Water Distribution 5 Year CIP from Criticality Ratings (2023)

#	Location Description	Estimated Construction Cost
1	Britain Avenue (Riverview to Pipestone)	$3,022,890
2	8th Street (Hinkley to Britain)	$1,770,471
3	Pipestone Rd (Main Street to Washington Street)	$719,352
4	Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson)	$753,810
5	Whitwam-Riverview Dr (Main Street to Whitwam Dr)	$292,512
5 Year Water Distribution CIP from Criticality Estimate		**$6,559,035**

Table 14: Water Distribution 5 Year CIP from Reliability Study (2023)

#	Location Description	Estimated Construction Cost
1	Stevens (Riverside to Waukonda) Riverside (McCord to Stevens) Buena Vista (Winans to Waukonda) Winans (Buena Vista to Waukonda)	$1,604,025
2	Edwards (Winans to Morton)	$664,950
3	Morton (Green to Territorial) Green (Winans to Morton)	$740,100
4	Washington (Ross to Pipestone) Vineyard (East End to Ross)	$922,650
5	Britain Avenue (Seeley to McCord) Seeley (Britain to Pitkins) Pitkins (Fair to Warwick) Warwick (Fair to Pitkins)	$1,885,845
6	Robbins (Colfax to Windsor) Windsor (Colfax to Robbins) Salem (May to Robbins)	$1,571,685
7	Monroe (Cross to Emery)	$530,700
5 Year Water Distribution CIP from Reliability Study Estimate		**$7,919,955**

6.2.2 Twenty (20) Year CIP Plan

Presented on the following pages are the twenty (20) year projects for the water supply, storage, and distribution system. To complete all the listed projects an estimated $35,472,668 would be required, which works out to approximately $1.7 million per year if completed all at once with a 30-year low interest loan (assuming today's dollars for construction cost estimates). Appendix F provides a detailed breakdown of the estimated costs for performing the water distribution 20 year CIP Plan.

Table 15: Water Supply 20 Year CIP (2033)

#	Project Description
1	Repair Filters
2	Pump Replacement
3	Other Miscellaneous Needs
4	SCADA System Improvements
5	Pump Overhauls
20 Year Water Supply CIP Estimate	**$500,000**

Table 16: Water Storage 20 Year CIP (2033)

#	Project Description	Estimated Cost
1	Replacement of Water Tower	$3,000,000
20 Year Water Storage CIP Estimate		**$3,000,000**

Table 17: Water Distribution 20 Year CIP from Criticality Ratings (2033-2037)

#	Location Description	Estimated Construction Cost
1	Empire Ave (Riverview Dr to Salem Ave)	$736,058
2	Empire Ave (Columbus Ave to Ogden Ave)	$191,026
3	Empire Ave (Jennings Ave to Pipestone St)	$303,267
4	Salem Ave (Empire Ave to May St to Colfax Ave)	$601,043
5	Emery Ave (Union St to Milton and Hurd Ave south)	$519,476
6	Pearl St (Catalpa Ave to Empire Ave)	$641,992
7	Catalpa Ave (Colfax Ave to Columbus Ave)	$674,258
8	Pavone St (Lake Ave to Catalpa Ave)	$582,583
9	Ohio St Alleys (Britain Ave to Pavone St)	$313,131

10	Lake Ave (Market St to Broadway Ave)	$705,184
11	Broadway Ave / Jefferson St (Lake Ave to Highland Ave)	$720,545
12	McCord St (Main St to Britain Ave)	$1,320,774
13	2nd St (Klock Rd to Highland Ave)	$1,596,099
14	Waukonda Ave (Nowlen St to Fair Ave)	$712,673
15	Bond St (Market St to Colfax Ave)	$793,524
16	9th St (Main St to Oak St)	$293,589
17	Territorial Rd (4th St to 2nd St)	$285,734
18	3rd St / East Alley (Territorial to Highland Ave)	$418,060
19	8th St (Klock Rd to Graham Ave)	$955,494
20	Wall St (Riverview Dr to 12th St)	$503,326
21	Hull Ave (Frank St to ~350 ft North of Edwards Ave)	$152,862
22	Klock Rd (Water Plant to East)	$460,755
23	North Shore Dr (Klock Rd to North)	$167,847
24	West of Paw Paw Ave between Waukonda Ave and Frank St	$266,980
25	Building Lot (Water St to 2nd St)	$177,759
26	Maple St (Pipestone St to Cedar St)	$200,361
27	Riverview Dr and River St	$142,862
28	9th St, Britain Ave to South	$227,755
29	Brunson Ave (Hornack Rd to Jefferson St)	$178,681
30	Weld St (Union St to Agard Ave)	$91,555
31	4th St (Territorial Rd to Main St)	$99,025
20 Year Water Distribution CIP from Criticality Estimate		**$15,034,278**

Table 18: Water Distribution 20 Year CIP from Reliability Study (2033-2037)

#	Location Description	Estimated Construction Cost
1	Jean Klock Blvd (Grand Blvd to Hydrant) Grand Blvd (Hydrant to End)	$2,583,465
2	Waukonda (Loop 12" with 6" far E end)	$18,375
3	Nowlen (Waukonda to Madison) Madison (N McCord to Nowlen) Winans (Madison to LaSalle)	$1,514,235
4	N Fair (Wauceda to LaSalle)	$492,720
5	Hull (1st Hydrant)	$126,525

6	NE Whirlpool Hydrant (Hinkley to Benton Harbor Tech Center)*	$0
7	Hinkley (8th to Bend)	$493,500
8	N Seeley (76' S of Main to hydrant)*	$0
9	N Fair (100' S of Main to hydrant)*	$0
10	Highland (Cass to Winans) Nowlen (Highland to Cass)	$458,070
11	Highland (Seeley to 37' N on Fair)	$582,465
12	Thresher (Hull to McCord) S Winans (Thresher to Buss)	$744,960
13	Fair (Thresher to Vineyard) High (McCord to Fair)	$1,715,355
14	Ohio (Bellview to Hydrant)	$157,500
15	Pleasant (Bellview to Pipestone)	$488,550
16	Thayer Ct (Bellview to Hydrant)	$100,800
17	Colby (Pipestone to Hydrant)	$132,675
18	Ohio (W Britain to Hydrant)*	$0
19	Cedar (Cherry to Britain)	$207,900
20	Apple (Hydrant to McAllister)	$249,540
21	Foster (Superior to Columbus)	$193,200
22	Plummer Ct (Pipestone to Heck)	$167,670
23	Catalpa (Columbus to Pipestone)	$748,335
24	Kline (Colfax to McAllister)	$604,800
25	9th St (2nd Hydrant to Apartment Complex)	$576,450
26	Harrison (Colfax to Broadway)	$561,660
27	Division (Pipestone to Columbus) Columbus (Empire to Division)	$1,842,840
28	Niles (Pipestone to Monroe)	$473,355
29	Clay (Lavette to Broadway)	$654,015
30	Clay (Colfax to End)	$15,750
31	Agard (Loop onto Pipestone)	$84,000
32	Weld (Union to Hurd)*	$0
33	Cross (Colfax to McAllister)	$574,200
34	Colfax (Windsor to Emery)	$375,480
20 Year Water Distribution CIP from Reliability Estimate		**$16,938,390**

**Cost omitted because already part of Criticality CIP Costs*

6.3 CIP Plan Summary

In summary, as seen below in Tables 19 & 20, for both the five (5) and twenty (20) year CIP plans, an estimated total in excess of $51 million dollars will be needed to address issues with the water system, particularly to replace aging materials that are reaching the end of their useful life.

Table 19: 5 Year Water CIP Plan Summary

Overall 5 Year Water CIP Plan Summary	Estimated Construction Cost
Water Supply	$1,000,000
Water Storage	$319,800
Water Distribution – Criticality Ratings	$6,559,035
Water Distribution - Reliability Study	$7,919,955
Overall 5 Year Water CIP Estimate Summary	**$15,798,790**

Table 20: 20 Year Water CIP Plan Summary

Overall 20 Year Water CIP Plan Summary	Estimated Construction Cost
Water Supply	$500,000
Water Storage	$3,000,000
Water Distribution – Criticality Ratings	$15,034,278
Water Distribution - Reliability Study	$16,938,390
Overall 20 Year Water CIP Estimate Summary	**$35,472,668**

7 Conclusions

Overall, the City of Benton Harbor has an aging water infrastructure network, similar to many other communities, which will require continual investment to ensure that it meets both State and Federal requirements as well as the City's specific operating goals. The level of investment for both the five (5) year and twenty (20) year CIP plans should be implemented to ensure that the existing water quality and reliability is maintained and improved within the network. These projects should be coordinated with sewer and roadway projects identified in the SAW funded - Sewer Asset Management Plan and the soon-to-be completed Street Asset Management Plan.

As stated in the MDEQ guidance document, asset management is a systematic process of operating, maintaining, and upgrading assets cost-effectively. It is an active, on-going

process that provides information to managers in order to make sound decisions about their capital assets and allows decision makers to better identify and manage needed investments in their utility's infrastructure. This asset management plan should be updated yearly to reflect changes to the asset inventory, criticality analysis and progress on the capital improvement projects. Thoroughly updating this document regularly is more efficient than trying to figure out what happened years ago and having to make large updates.

Once the most cost effective funding solution has been determined, the city can proceed with adjustments to rates to cover the necessary costs. In the short term it would be beneficial for the city to reinstate the 5% rate increase that was reduced in 2013. A 15% rate increase may be needed in early 2018 to cover current and expected debt service requirements. Due to the large amount of funding necessary to complete the improvements identified, it is expected that the city will complete large projects together and be required to finance them over a long-term with rates adjusted accordingly. Grants should be utilized to the maximum extent possible to minimize impact on users.

Once the improvements outlined in this plan are completed, it should be anticipated that other assets will be reaching the end of their expected effective life, requiring further investment. Benton Harbor is nearing the end of its first generation of water infrastructure with other generations following closely behind.

APPENDIX A

BENTON HARBOR WATER DISTRIBUTION PIPE CONDITION SUMMARY TABLE

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00144	Cast Iron, Assumed	2"	24.0	1909	108	1	0	0.1	75	3.5	10.0	35.0	1.0	0
WMAIN-00146	Cast Iron, Assumed	2"	234.8	1909	108	1	0	0.1	75	3.5	10.0	35.0	1.0	0
WMAIN-00272	Cast Iron, Assumed	2"	293.7	1909	108	0.8	0.8	0.1	75	4.5	10.0	45.0	1.0	0
WMAIN-00512	Cast Iron, Assumed	2"	22.0	1909	108	1	0	0.1	75	3.5	10.0	35.0	1.0	0
WMAIN-00513	Cast Iron, Assumed	2"	31.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01088	Cast Iron, Assumed	2"	164.3	1909	108	0.8	0	0.1	75	2.9	10.0	29.0	1.0	0
WMAIN-00003	Cast Iron, Assumed	4"	279.6	1956	61	0.8	0	0.4	75	4.4	8.1	35.8	0.8	14
WMAIN-00005	Cast Iron, Assumed	4"	563.4	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00006	Cast Iron, Assumed	4"	611.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00010	Cast Iron, Assumed	4"	327.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00024	Cast Iron, Assumed	4"	485.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00025	Cast Iron, Assumed	4"	344.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00026	Cast Iron, Assumed	4"	404.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00027	Cast Iron, Assumed	4"	4.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00028	Cast Iron, Assumed	4"	326.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00029	Cast Iron, Assumed	4"	327.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00030	Cast Iron, Assumed	4"	979.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00035	Cast Iron, Assumed	4"	6.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00036	Cast Iron, Assumed	4"	71.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00037	Cast Iron, Assumed	4"	311.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00039	Cast Iron, Assumed	4"	452.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00042	Cast Iron, Assumed	4"	249.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00053	Cast Iron, Assumed	4"	546.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00054	Cast Iron, Assumed	4"	314.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00055	Cast Iron, Assumed	4"	657.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00069	Cast Iron, Assumed	4"	299.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00070	Cast Iron, Assumed	4"	543.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00071	Cast Iron, Assumed	4"	918.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00076	Cast Iron, Assumed	4"	39.2	1940	77	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00090	Cast Iron, Assumed	4"	366.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00118	Cast Iron, Assumed	4"	24.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00119	Cast Iron, Assumed	4"	79.7	1909	108	0.2	1	0.4	75	4.6	10.0	46.0	1.0	0
WMAIN-00120	Cast Iron, Assumed	4"	105.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00121	Cast Iron, Assumed	4"	5.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00131	Cast Iron, Assumed	4"	266.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00141	Cast Iron, Assumed	4"	636.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00142	Cast Iron, Assumed	4"	5.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00143	Cast Iron, Assumed	4"	281.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00159	Cast Iron, Assumed	4"	56.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00161	Cast Iron, Assumed	4"	33.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00162	Cast Iron, Assumed	4"	445.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00165	Cast Iron, Assumed	4"	495.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00166	Cast Iron, Assumed	4"	332.8	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00169	Cast Iron, Assumed	4"	328.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00175	Cast Iron, Assumed	4"	162.1	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00176	Cast Iron, Assumed	4"	15.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00179	Cast Iron, Assumed	4"	40.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00180	Cast Iron, Assumed	4"	14.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00188	Cast Iron, Assumed	4"	254.4	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00189	Cast Iron, Assumed	4"	310.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00197	Cast Iron, Assumed	4"	327.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00198	Cast Iron, Assumed	4"	336.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00199	Cast Iron, Assumed	4"	309.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00200	Cast Iron, Assumed	4"	317.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00205	Cast Iron, Assumed	4"	70.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00208	Cast Iron, Assumed	4"	305.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00219	Cast Iron, Assumed	4"	5.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00222	Cast Iron, Assumed	4"	357.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00223	Cast Iron, Assumed	4"	43.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00224	Cast Iron, Assumed	4"	705.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00225	Cast Iron, Assumed	4"	425.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00229	Cast Iron, Assumed	4"	7.0	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00230	Cast Iron, Assumed	4"	46.0	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00231	Cast Iron, Assumed	4"	298.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00232	Cast Iron, Assumed	4"	637.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00235	Cast Iron, Assumed	4"	287.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00239	Cast Iron, Assumed	4"	335.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00240	Cast Iron, Assumed	4"	377.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00241	Cast Iron, Assumed	4"	594.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00249	Cast Iron, Assumed	4"	186.2	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00250	Cast Iron, Assumed	4"	3.0	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00251	Cast Iron, Assumed	4"	455.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00255	Cast Iron, Assumed	4"	585.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00258	Cast Iron, Assumed	4"	311.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00259	Cast Iron, Assumed	4"	95.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00264	Cast Iron, Assumed	4"	128.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00265	Cast Iron, Assumed	4"	299.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00266	Cast Iron, Assumed	4"	120.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00268	Cast Iron, Assumed	4"	18.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00269	Cast Iron, Assumed	4"	1058.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00270	Cast Iron, Assumed	4"	398.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00271	Cast Iron, Assumed	4"	358.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00273	Cast Iron, Assumed	4"	732.3	1909	108	1	0.5	0.4	75	6	10.0	60.0	1.0	0
WMAIN-00275	Cast Iron, Assumed	4"	452.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00279	Cast Iron, Assumed	4"	42.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00280	Cast Iron, Assumed	4"	640.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00282	Cast Iron, Assumed	4"	196.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00283	Cast Iron, Assumed	4"	1313.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00284	Cast Iron, Assumed	4"	196.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00285	Cast Iron, Assumed	4"	631.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00286	Cast Iron, Assumed	4"	697.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00287	Cast Iron, Assumed	4"	665.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00289	Cast Iron, Assumed	4"	214.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00290	Cast Iron, Assumed	4"	523.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00291	Cast Iron, Assumed	4"	453.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00292	Cast Iron, Assumed	4"	28.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00293	Cast Iron, Assumed	4"	785.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00294	Cast Iron, Assumed	4"	334.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00295	Cast Iron, Assumed	4"	328.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00296	Cast Iron, Assumed	4"	310.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00297	Cast Iron, Assumed	4"	654.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00298	Cast Iron, Assumed	4"	660.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00299	Cast Iron, Assumed	4"	653.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00300	Cast Iron, Assumed	4"	344.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00301	Cast Iron, Assumed	4"	344.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00309	Cast Iron, Assumed	4"	297.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00310	Cast Iron, Assumed	4"	316.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00311	Cast Iron, Assumed	4"	627.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00312	Cast Iron, Assumed	4"	895.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00313	Cast Iron, Assumed	4"	74.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00317	Cast Iron, Assumed	4"	610.7	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00333	Cast Iron, Assumed	4"	633.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00334	Cast Iron, Assumed	4"	294.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00337	Cast Iron, Assumed	4"	312.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00338	Cast Iron, Assumed	4"	184.4	1940	77	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00339	Cast Iron, Assumed	4"	918.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00347	Cast Iron, Assumed	4"	349.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00354	Cast Iron, Assumed	4"	41.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00356	Cast Iron, Assumed	4"	59.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00361	Cast Iron, Assumed	4"	644.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00362	Cast Iron, Assumed	4"	329.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00363	Cast Iron, Assumed	4"	309.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00364	Cast Iron, Assumed	4"	546.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00367	Cast Iron, Assumed	4"	264.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00368	Cast Iron, Assumed	4"	522.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00375	Cast Iron, Assumed	4"	45.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00376	Cast Iron, Assumed	4"	1293.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00380	Cast Iron, Assumed	4"	102.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00381	Cast Iron, Assumed	4"	659.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00392	Cast Iron, Assumed	4"	60.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00394	Cast Iron, Assumed	4"	300.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00402	Cast Iron, Assumed	4"	200.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00403	Cast Iron, Assumed	4"	411.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00405	Cast Iron, Assumed	4"	9.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00406	Cast Iron, Assumed	4"	540.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00407	Cast Iron, Assumed	4"	28.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00408	Cast Iron, Assumed	4"	330.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00409	Cast Iron, Assumed	4"	607.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00410	Cast Iron, Assumed	4"	240.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00411	Cast Iron, Assumed	4"	909.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00412	Cast Iron, Assumed	4"	3.0	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00413	Cast Iron, Assumed	4"	389.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00414	Cast Iron, Assumed	4"	73.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00422	Cast Iron, Assumed	4"	697.6	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00424	Cast Iron, Assumed	4"	658.1	1950	67	1	0.5	0.4	75	6	8.9	53.6	0.9	8
WMAIN-00430	Cast Iron, Assumed	4"	8.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00452	Cast Iron, Assumed	4"	11.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00486	Cast Iron, Assumed	4"	145.1	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00487	Cast Iron, Assumed	4"	310.7	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00510	Cast Iron, Assumed	4"	546.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00522	Cast Iron, Assumed	4"	108.2	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00526	Cast Iron, Assumed	4"	918.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00527	Cast Iron, Assumed	4"	294.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00530	Cast Iron, Assumed	4"	37.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00531	Cast Iron, Assumed	4"	599.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00533	Cast Iron, Assumed	4"	31.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00540	Cast Iron, Assumed	4"	813.2	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00546	Cast Iron, Assumed	4"	388.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00548	Cast Iron, Assumed	4"	461.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00557	Cast Iron, Assumed	4"	140.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00561	Cast Iron, Assumed	4"	468.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00562	Cast Iron, Assumed	4"	418.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00563	Cast Iron, Assumed	4"	46.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00564	Cast Iron, Assumed	4"	282.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00565	Cast Iron, Assumed	4"	28.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00566	Cast Iron, Assumed	4"	11.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00568	Cast Iron, Assumed	4"	67.7	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00571	Cast Iron, Assumed	4"	1.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00572	Cast Iron, Assumed	4"	357.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00574	Cast Iron, Assumed	4"	44.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00575	Cast Iron, Assumed	4"	546.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00576	Cast Iron, Assumed	4"	217.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00577	Cast Iron, Assumed	4"	465.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00578	Cast Iron, Assumed	4"	29.8	1909	108	0.8	1	0.4	75	6.4	10.0	64.0	1.0	0
WMAIN-00579	Cast Iron, Assumed	4"	288.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00581	Cast Iron, Assumed	4"	155.6	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00590	Cast Iron, Assumed	4"	495.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00601	Cast Iron, Assumed	4"	90.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00602	Cast Iron, Assumed	4"	575.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00603	Cast Iron, Assumed	4"	583.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00609	Cast Iron, Assumed	4"	576.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00610	Cast Iron, Assumed	4"	16.1	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00617	Cast Iron, Assumed	4"	36.3	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00620	Cast Iron, Assumed	4"	453.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00630	Cast Iron, Assumed	4"	125.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00631	Cast Iron, Assumed	4"	12.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00636	Cast Iron, Assumed	4"	293.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00638	Cast Iron, Assumed	4"	294.4	1909	108	0.2	1	0.4	75	4.6	10.0	46.0	1.0	0
WMAIN-00641	Cast Iron, Assumed	4"	80.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00642	Cast Iron, Assumed	4"	2.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00643	Cast Iron, Assumed	4"	9.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00644	Cast Iron, Assumed	4"	9.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00647	Cast Iron, Assumed	4"	9.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00650	Cast Iron, Assumed	4"	316.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00661	Cast Iron, Assumed	4"	189.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00662	Cast Iron, Assumed	4"	97.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00666	Cast Iron, Assumed	4"	1009.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00669	Cast Iron, Assumed	4"	201.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00672	Cast Iron, Assumed	4"	319.2	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00682	Cast Iron, Assumed	4"	13.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00685	Cast Iron, Assumed	4"	41.5	1934	83	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00686	Cast Iron, Assumed	4"	68.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00691	Cast Iron, Assumed	4"	258.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00699	Cast Iron, Assumed	4"	5.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00704	Cast Iron, Assumed	4"	47.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00705	Cast Iron, Assumed	4"	9.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00709	Cast Iron, Assumed	4"	43.7	1909	108	0.8	0.5	0.4	75	5.4	10.0	54.0	1.0	0
WMAIN-00717	Cast Iron, Assumed	4"	874.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00727	Cast Iron, Assumed	4"	257.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00728	Cast Iron, Assumed	4"	426.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00730	Cast Iron, Assumed	4"	162.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00739	Cast Iron, Assumed	4"	817.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00764	Cast Iron, Assumed	4"	27.1	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00765	Cast Iron, Assumed	4"	39.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00766	Cast Iron, Assumed	4"	9.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00777	Cast Iron, Assumed	4"	504.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00788	Cast Iron, Assumed	4"	31.6	1909	108	0.8	0.5	0.4	75	5.4	10.0	54.0	1.0	0
WMAIN-00789	Cast Iron, Assumed	4"	164.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00806	Cast Iron, Assumed	4"	300.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00807	Cast Iron, Assumed	4"	194.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00808	Cast Iron, Assumed	4"	189.6	1969	48	1	0	0.4	75	5	6.4	32.0	0.6	27
WMAIN-00836	Cast Iron, Assumed	4"	229.8	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00845	Cast Iron, Assumed	4"	426.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00850	Cast Iron, Assumed	4"	99.5	Pre-1969	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00851	Cast Iron, Assumed	4"	52.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00852	Cast Iron, Assumed	4"	256.3	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00912	Cast Iron, Assumed	4"	242.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00913	Cast Iron, Assumed	4"	61.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00914	Cast Iron, Assumed	4"	444.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00944	Cast Iron, Assumed	4"	257.0	1940	77	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00980	Cast Iron, Assumed	4"	345.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00982	Cast Iron, Assumed	4"	371.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00997	Cast Iron, Assumed	4"	225.9	1950	67	0.3	0	0.4	75	2.9	8.9	25.9	0.9	8
WMAIN-01020	Cast Iron, Assumed	4"	298.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01021	Cast Iron, Assumed	4"	389.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01022	Cast Iron, Assumed	4"	92.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01023	Cast Iron, Assumed	4"	85.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01028	Cast Iron, Assumed	4"	156.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01029	Cast Iron, Assumed	4"	461.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01049	Cast Iron, Assumed	4"	161.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01050	Cast Iron, Assumed	4"	46.3	1909	108	0.3	1	0.4	75	4.9	10.0	49.0	1.0	0
WMAIN-01077	Cast Iron, Assumed	4"	278.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01078	Cast Iron, Assumed	4"	130.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01089	Cast Iron, Assumed	4"	689.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01090	Cast Iron, Assumed	4"	302.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01100	Cast Iron, Assumed	4"	335.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01108	Cast Iron, Assumed	4"	3.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01110	Cast Iron, Assumed	4"	26.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01111	Cast Iron, Assumed	4"	67.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01171	Cast Iron, Assumed	4"	24.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01247	Cast Iron, Assumed	4"	206.4	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01265	Cast Iron, Assumed	4"	22.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01315	Cast Iron, Assumed	4"	227.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01325	Cast Iron, Assumed	4"	675.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01326	Cast Iron, Assumed	4"	32.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01327	Cast Iron, Assumed	4"	45.8	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01328	Cast Iron, Assumed	4"	35.2	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01329	Cast Iron, Assumed	4"	250.5	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01350	Cast Iron, Assumed	4"	35.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01474	Cast Iron, Assumed	4"	20.9	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01475	Cast Iron, Assumed	4"	22.5	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01476	Cast Iron, Assumed	4"	23.2	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01493	Cast Iron, Assumed	4"	45.7	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01519	Cast Iron, Assumed	4"	25.7	1909	108	0.8	0.5	0.4	75	5.4	10.0	54.0	1.0	0
WMAIN-01545	Cast Iron, Assumed	4"	5.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01546	Cast Iron, Assumed	4"	3.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01618	Cast Iron, Assumed	4"	11.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01620	Cast Iron, Assumed	4"	7.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01621	Cast Iron, Assumed	4"	10.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01628	Cast Iron, Assumed	4"	32.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01630	Cast Iron, Assumed	4"	41.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01632	Cast Iron, Assumed	4"	39.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01638	Cast Iron, Assumed	4"	17.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01639	Cast Iron, Assumed	4"	38.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01640	Cast Iron, Assumed	4"	3.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01643	Cast Iron, Assumed	4"	2.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01654	Cast Iron, Assumed	4"	131.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01655	Cast Iron, Assumed	4"	4.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01660	Cast Iron, Assumed	4"	46.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01662	Cast Iron, Assumed	4"	428.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01664	Cast Iron, Assumed	4"	46.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01667	Cast Iron, Assumed	4"	306.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01668	Cast Iron, Assumed	4"	54.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01669	Cast Iron, Assumed	4"	11.0	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01672	Cast Iron, Assumed	4"	37.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01673	Cast Iron, Assumed	4"	30.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01677	Cast Iron, Assumed	4"	144.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01682	Cast Iron, Assumed	4"	29.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01684	Cast Iron, Assumed	4"	8.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01685	Cast Iron, Assumed	4"	5.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01686	Cast Iron, Assumed	4"	26.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01687	Cast Iron, Assumed	4"	4.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01688	Cast Iron, Assumed	4"	5.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01693	Cast Iron, Assumed	4"	189.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01701	Cast Iron, Assumed	4"	30.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01721	Cast Iron, Assumed	4"	26.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01723	Cast Iron, Assumed	4"	157.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01724	Cast Iron, Assumed	4"	178.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01726	Cast Iron, Assumed	4"	115.0	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01727	Cast Iron, Assumed	4"	97.9	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01728	Cast Iron, Assumed	4"	22.6	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01730	Cast Iron, Assumed	4"	51.6	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01737	Cast Iron, Assumed	4"	80.7	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01738	Cast Iron, Assumed	4"	7.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00221	Cast Iron, Assumed	4"	35.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01742	Ductile Iron	4"	22.6	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
WMAIN-01743	Ductile Iron	4"	20.3	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
WMAIN-01745	Ductile Iron	4"	15.6	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
<Null>	Ductile Iron	4"	5.9	2015	2	1	0	0.4	90	5	0.2	1.1	0.0	88
WMAIN-00046	Ductile Iron, Assumed	4"	124.2	2008	9	1	0	0.4	90	5	1.0	5.0	0.1	81
WMAIN-00211	Ductile Iron, Assumed	4"	442.5	2006	11	0.8	0	0.4	90	4.4	1.2	5.4	0.1	79
WMAIN-00350	Ductile Iron, Assumed	4"	578.9	1980	37	0.8	0	0.4	90	4.4	4.1	18.1	0.4	53
WMAIN-00586	Ductile Iron, Assumed	4"	448.2	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00744	Ductile Iron, Assumed	4"	45.6	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00746	Ductile Iron, Assumed	4"	3.8	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00748	Ductile Iron, Assumed	4"	807.6	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
WMAIN-00760	Ductile Iron, Assumed	4"	377.9	1971	46	1	0	0.4	90	5	5.1	25.6	0.5	44
WMAIN-01692	Ductile Iron, Assumed	4"	3.1	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00007	Cast Iron, Assumed	6"	662.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00008	Cast Iron, Assumed	6"	51.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00009	Cast Iron, Assumed	6"	281.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00011	Cast Iron, Assumed	6"	16.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00012	Cast Iron, Assumed	6"	332.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00013	Cast Iron, Assumed	6"	354.4	1956	61	0.8	0	0.4	75	4.4	8.1	35.8	0.8	14
WMAIN-00018	Cast Iron, Assumed	6"	680.7	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00019	Cast Iron, Assumed	6"	44.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00021	Cast Iron, Assumed	6"	9.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00022	Cast Iron, Assumed	6"	69.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00023	Cast Iron, Assumed	6"	489.0	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00031	Cast Iron, Assumed	6"	3.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00032	Cast Iron, Assumed	6"	3.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00033	Cast Iron, Assumed	6"	412.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00034	Cast Iron, Assumed	6"	88.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00047	Cast Iron, Assumed	6"	269.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00050	Cast Iron, Assumed	6"	241.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00051	Cast Iron, Assumed	6"	613.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00052	Cast Iron, Assumed	6"	295.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00056	Cast Iron, Assumed	6"	1273.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00057	Cast Iron, Assumed	6"	336.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00058	Cast Iron, Assumed	6"	332.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00059	Cast Iron, Assumed	6"	664.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00060	Cast Iron, Assumed	6"	656.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00061	Cast Iron, Assumed	6"	329.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00067	Cast Iron, Assumed	6"	634.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00068	Cast Iron, Assumed	6"	60.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00078	Cast Iron, Assumed	6"	39.5	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00083	Cast Iron, Assumed	6"	10.7	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00092	Cast Iron, Assumed	6"	432.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00093	Cast Iron, Assumed	6"	826.6	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00094	Cast Iron, Assumed	6"	1362.1	1969	48	0.8	0	0.4	75	4.4	6.4	28.2	0.6	27
WMAIN-00108	Cast Iron, Assumed	6"	295.9	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00109	Cast Iron, Assumed	6"	14.3	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00113	Cast Iron, Assumed	6"	450.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00122	Cast Iron, Assumed	6"	173.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00123	Cast Iron, Assumed	6"	21.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00124	Cast Iron, Assumed	6"	100.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00129	Cast Iron, Assumed	6"	12.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00136	Cast Iron, Assumed	6"	220.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00138	Cast Iron, Assumed	6"	149.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00139	Cast Iron, Assumed	6"	384.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00140	Cast Iron, Assumed	6"	179.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00148	Cast Iron, Assumed	6"	207.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00163	Cast Iron, Assumed	6"	58.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00164	Cast Iron, Assumed	6"	72.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00168	Cast Iron, Assumed	6"	220.1	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00170	Cast Iron, Assumed	6"	334.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0

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WMAIN-00171	Cast Iron, Assumed	6"	494.4	1979	38	1	0	0.4	75	5	5.1	25.3	0.5	37
WMAIN-00182	Cast Iron, Assumed	6"	10.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00183	Cast Iron, Assumed	6"	19.0	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00184	Cast Iron, Assumed	6"	15.0	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00185	Cast Iron, Assumed	6"	27.7	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00186	Cast Iron, Assumed	6"	29.9	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00187	Cast Iron, Assumed	6"	192.2	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00190	Cast Iron, Assumed	6"	806.7	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00191	Cast Iron, Assumed	6"	296.3	1979	38	1	0	0.4	75	5	5.1	25.3	0.5	37
WMAIN-00192	Cast Iron, Assumed	6"	1313.0	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00193	Cast Iron, Assumed	6"	514.3	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00194	Cast Iron, Assumed	6"	25.1	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00202	Cast Iron, Assumed	6"	1341.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00203	Cast Iron, Assumed	6"	672.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00204	Cast Iron, Assumed	6"	80.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00206	Cast Iron, Assumed	6"	308.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00207	Cast Iron, Assumed	6"	181.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00218	Cast Iron, Assumed	6"	253.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00233	Cast Iron, Assumed	6"	491.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00234	Cast Iron, Assumed	6"	479.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00247	Cast Iron, Assumed	6"	188.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00252	Cast Iron, Assumed	6"	869.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00253	Cast Iron, Assumed	6"	11.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00256	Cast Iron, Assumed	6"	259.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00263	Cast Iron, Assumed	6"	55.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00267	Cast Iron, Assumed	6"	1240.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00276	Cast Iron, Assumed	6"	20.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00277	Cast Iron, Assumed	6"	589.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00278	Cast Iron, Assumed	6"	168.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00288	Cast Iron, Assumed	6"	22.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00302	Cast Iron, Assumed	6"	330.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00303	Cast Iron, Assumed	6"	331.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00304	Cast Iron, Assumed	6"	306.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00305	Cast Iron, Assumed	6"	412.9	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00306	Cast Iron, Assumed	6"	211.3	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00307	Cast Iron, Assumed	6"	100.4	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00308	Cast Iron, Assumed	6"	542.7	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00314	Cast Iron, Assumed	6"	8.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00315	Cast Iron, Assumed	6"	39.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00316	Cast Iron, Assumed	6"	47.6	Pre-1949	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00318	Cast Iron, Assumed	6"	61.4	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00320	Cast Iron, Assumed	6"	301.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00321	Cast Iron, Assumed	6"	1306.7	Pre-1947	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00322	Cast Iron, Assumed	6"	625.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00323	Cast Iron, Assumed	6"	1322.3	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00332	Cast Iron, Assumed	6"	708.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00335	Cast Iron, Assumed	6"	173.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00336	Cast Iron, Assumed	6"	10.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00340	Cast Iron, Assumed	6"	730.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00341	Cast Iron, Assumed	6"	207.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00342	Cast Iron, Assumed	6"	295.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00343	Cast Iron, Assumed	6"	341.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00346	Cast Iron, Assumed	6"	668.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00348	Cast Iron, Assumed	6"	691.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00349	Cast Iron, Assumed	6"	673.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00351	Cast Iron, Assumed	6"	655.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00352	Cast Iron, Assumed	6"	297.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00353	Cast Iron, Assumed	6"	281.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00355	Cast Iron, Assumed	6"	120.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00365	Cast Iron, Assumed	6"	671.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00366	Cast Iron, Assumed	6"	679.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00370	Cast Iron, Assumed	6"	684.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00371	Cast Iron, Assumed	6"	427.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00372	Cast Iron, Assumed	6"	1285.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00373	Cast Iron, Assumed	6"	627.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00374	Cast Iron, Assumed	6"	657.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00377	Cast Iron, Assumed	6"	832.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00378	Cast Iron, Assumed	6"	650.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00379	Cast Iron, Assumed	6"	669.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00382	Cast Iron, Assumed	6"	664.9	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00387	Cast Iron, Assumed	6"	660.6	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00393	Cast Iron, Assumed	6"	180.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00395	Cast Iron, Assumed	6"	366.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00396	Cast Iron, Assumed	6"	561.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00397	Cast Iron, Assumed	6"	327.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00398	Cast Iron, Assumed	6"	10.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00399	Cast Iron, Assumed	6"	37.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00400	Cast Iron, Assumed	6"	23.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00401	Cast Iron, Assumed	6"	39.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00404	Cast Iron, Assumed	6"	84.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00425	Cast Iron, Assumed	6"	145.5	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00433	Cast Iron, Assumed	6"	366.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00434	Cast Iron, Assumed	6"	6.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00435	Cast Iron, Assumed	6"	207.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00436	Cast Iron, Assumed	6"	7.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00437	Cast Iron, Assumed	6"	26.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00439	Cast Iron, Assumed	6"	5.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00440	Cast Iron, Assumed	6"	10.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00441	Cast Iron, Assumed	6"	13.3	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00442	Cast Iron, Assumed	6"	59.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00443	Cast Iron, Assumed	6"	3.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00444	Cast Iron, Assumed	6"	9.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00445	Cast Iron, Assumed	6"	4.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00446	Cast Iron, Assumed	6"	0.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00447	Cast Iron, Assumed	6"	9.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00448	Cast Iron, Assumed	6"	56.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00450	Cast Iron, Assumed	6"	333.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00454	Cast Iron, Assumed	6"	658.8	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00455	Cast Iron, Assumed	6"	2.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00456	Cast Iron, Assumed	6"	11.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00457	Cast Iron, Assumed	6"	10.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00462	Cast Iron, Assumed	6"	6.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00464	Cast Iron, Assumed	6"	722.7	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00474	Cast Iron, Assumed	6"	4.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00475	Cast Iron, Assumed	6"	3.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00477	Cast Iron, Assumed	6"	5.2	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00478	Cast Iron, Assumed	6"	9.8	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00482	Cast Iron, Assumed	6"	660.7	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00484	Cast Iron, Assumed	6"	58.6	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00485	Cast Iron, Assumed	6"	8.5	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00490	Cast Iron, Assumed	6"	1294.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00492	Cast Iron, Assumed	6"	1301.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00493	Cast Iron, Assumed	6"	1329.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00494	Cast Iron, Assumed	6"	1347.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00495	Cast Iron, Assumed	6"	670.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00496	Cast Iron, Assumed	6"	1314.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00498	Cast Iron, Assumed	6"	125.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00499	Cast Iron, Assumed	6"	1026.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00500	Cast Iron, Assumed	6"	55.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00503	Cast Iron, Assumed	6"	37.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00511	Cast Iron, Assumed	6"	588.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00514	Cast Iron, Assumed	6"	36.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00515	Cast Iron, Assumed	6"	29.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00516	Cast Iron, Assumed	6"	7.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00519	Cast Iron, Assumed	6"	237.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00520	Cast Iron, Assumed	6"	69.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00521	Cast Iron, Assumed	6"	6.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00523	Cast Iron, Assumed	6"	70.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00524	Cast Iron, Assumed	6"	179.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00525	Cast Iron, Assumed	6"	323.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00532	Cast Iron, Assumed	6"	478.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00534	Cast Iron, Assumed	6"	981.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00535	Cast Iron, Assumed	6"	303.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00536	Cast Iron, Assumed	6"	379.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00537	Cast Iron, Assumed	6"	64.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00538	Cast Iron, Assumed	6"	502.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00539	Cast Iron, Assumed	6"	336.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00541	Cast Iron, Assumed	6"	493.0	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00542	Cast Iron, Assumed	6"	9.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00543	Cast Iron, Assumed	6"	301.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00544	Cast Iron, Assumed	6"	170.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00545	Cast Iron, Assumed	6"	163.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00547	Cast Iron, Assumed	6"	13.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00549	Cast Iron, Assumed	6"	419.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00550	Cast Iron, Assumed	6"	326.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00551	Cast Iron, Assumed	6"	370.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00552	Cast Iron, Assumed	6"	285.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00553	Cast Iron, Assumed	6"	296.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00554	Cast Iron, Assumed	6"	351.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00555	Cast Iron, Assumed	6"	2.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00556	Cast Iron, Assumed	6"	114.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00558	Cast Iron, Assumed	6"	432.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00559	Cast Iron, Assumed	6"	153.9	Pre-1969	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00560	Cast Iron, Assumed	6"	34.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00567	Cast Iron, Assumed	6"	53.8	1909	108	0.2	1	0.4	75	4.6	10.0	46.0	1.0	0
WMAIN-00570	Cast Iron, Assumed	6"	120.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00580	Cast Iron, Assumed	6"	12.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00587	Cast Iron, Assumed	6"	105.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00588	Cast Iron, Assumed	6"	45.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00589	Cast Iron, Assumed	6"	876.7	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00597	Cast Iron, Assumed	6"	10.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00599	Cast Iron, Assumed	6"	36.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00600	Cast Iron, Assumed	6"	279.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00604	Cast Iron, Assumed	6"	12.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00611	Cast Iron, Assumed	6"	451.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00616	Cast Iron, Assumed	6"	1067.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00618	Cast Iron, Assumed	6"	89.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00619	Cast Iron, Assumed	6"	98.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00622	Cast Iron, Assumed	6"	626.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00623	Cast Iron, Assumed	6"	304.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00624	Cast Iron, Assumed	6"	257.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00632	Cast Iron, Assumed	6"	1035.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00633	Cast Iron, Assumed	6"	4.4	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00634	Cast Iron, Assumed	6"	23.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00637	Cast Iron, Assumed	6"	649.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00657	Cast Iron, Assumed	6"	11.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00658	Cast Iron, Assumed	6"	9.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00659	Cast Iron, Assumed	6"	16.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00660	Cast Iron, Assumed	6"	610.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00663	Cast Iron, Assumed	6"	1297.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00664	Cast Iron, Assumed	6"	311.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00665	Cast Iron, Assumed	6"	27.9	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00667	Cast Iron, Assumed	6"	417.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00668	Cast Iron, Assumed	6"	145.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00674	Cast Iron, Assumed	6"	312.1	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00675	Cast Iron, Assumed	6"	321.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00678	Cast Iron, Assumed	6"	654.8	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00680	Cast Iron, Assumed	6"	9.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00683	Cast Iron, Assumed	6"	480.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00687	Cast Iron, Assumed	6"	388.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00688	Cast Iron, Assumed	6"	84.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00689	Cast Iron, Assumed	6"	98.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00690	Cast Iron, Assumed	6"	104.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00692	Cast Iron, Assumed	6"	144.7	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00693	Cast Iron, Assumed	6"	50.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00696	Cast Iron, Assumed	6"	45.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00697	Cast Iron, Assumed	6"	55.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00707	Cast Iron, Assumed	6"	7.0	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00708	Cast Iron, Assumed	6"	13.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00710	Cast Iron, Assumed	6"	743.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00711	Cast Iron, Assumed	6"	409.8	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00715	Cast Iron, Assumed	6"	39.9	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00718	Cast Iron, Assumed	6"	287.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00721	Cast Iron, Assumed	6"	10.0	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00722	Cast Iron, Assumed	6"	7.7	1967	50	1	0	0.4	75	5	6.7	33.3	0.7	25
WMAIN-00723	Cast Iron, Assumed	6"	10.4	1967	50	1	0	0.4	75	5	6.7	33.3	0.7	25
WMAIN-00724	Cast Iron, Assumed	6"	3.0	1967	50	1	0	0.4	75	5	6.7	33.3	0.7	25
WMAIN-00725	Cast Iron, Assumed	6"	205.1	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00729	Cast Iron, Assumed	6"	50.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00731	Cast Iron, Assumed	6"	501.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00732	Cast Iron, Assumed	6"	593.1	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00733	Cast Iron, Assumed	6"	319.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00736	Cast Iron, Assumed	6"	8.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00737	Cast Iron, Assumed	6"	8.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00740	Cast Iron, Assumed	6"	615.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00741	Cast Iron, Assumed	6"	300.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00743	Cast Iron, Assumed	6"	86.4	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-00745	Cast Iron, Assumed	6"	211.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00749	Cast Iron, Assumed	6"	10.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00754	Cast Iron, Assumed	6"	9.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00755	Cast Iron, Assumed	6"	11.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00756	Cast Iron, Assumed	6"	391.5	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00757	Cast Iron, Assumed	6"	148.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00759	Cast Iron, Assumed	6"	13.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00775	Cast Iron, Assumed	6"	1122.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00776	Cast Iron, Assumed	6"	96.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00778	Cast Iron, Assumed	6"	57.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00794	Cast Iron, Assumed	6"	84.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00799	Cast Iron, Assumed	6"	24.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00800	Cast Iron, Assumed	6"	29.9	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00801	Cast Iron, Assumed	6"	16.5	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00802	Cast Iron, Assumed	6"	19.4	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00803	Cast Iron, Assumed	6"	23.4	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00834	Cast Iron, Assumed	6"	373.3	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-00835	Cast Iron, Assumed	6"	850.0	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00838	Cast Iron, Assumed	6"	518.7	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00842	Cast Iron, Assumed	6"	116.2	1947	70	1	0	0.4	75	5	9.3	46.7	0.9	5
WMAIN-00844	Cast Iron, Assumed	6"	246.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00849	Cast Iron, Assumed	6"	87.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00853	Cast Iron, Assumed	6"	118.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00854	Cast Iron, Assumed	6"	25.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00855	Cast Iron, Assumed	6"	352.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00899	Cast Iron, Assumed	6"	10.4	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17
WMAIN-00900	Cast Iron, Assumed	6"	375.1	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17

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WMAIN-00915	Cast Iron, Assumed	6"	129.8	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17
WMAIN-00916	Cast Iron, Assumed	6"	64.8	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00938	Cast Iron, Assumed	6"	21.4	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00939	Cast Iron, Assumed	6"	21.6	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00950	Cast Iron, Assumed	6"	62.3	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00956	Cast Iron, Assumed	6"	277.9	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-00957	Cast Iron, Assumed	6"	96.0	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00958	Cast Iron, Assumed	6"	186.4	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00959	Cast Iron, Assumed	6"	79.9	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00960	Cast Iron, Assumed	6"	40.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00961	Cast Iron, Assumed	6"	128.6	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00962	Cast Iron, Assumed	6"	20.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00963	Cast Iron, Assumed	6"	166.6	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00964	Cast Iron, Assumed	6"	19.7	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00965	Cast Iron, Assumed	6"	61.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00966	Cast Iron, Assumed	6"	246.6	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00967	Cast Iron, Assumed	6"	99.3	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00968	Cast Iron, Assumed	6"	6.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00969	Cast Iron, Assumed	6"	57.7	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00970	Cast Iron, Assumed	6"	25.4	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00971	Cast Iron, Assumed	6"	71.4	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00972	Cast Iron, Assumed	6"	109.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00973	Cast Iron, Assumed	6"	132.8	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00974	Cast Iron, Assumed	6"	4.4	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00977	Cast Iron, Assumed	6"	367.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00978	Cast Iron, Assumed	6"	355.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00979	Cast Iron, Assumed	6"	343.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00981	Cast Iron, Assumed	6"	203.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00984	Cast Iron, Assumed	6"	857.3	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00988	Cast Iron, Assumed	6"	8.5	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00989	Cast Iron, Assumed	6"	4.0	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00992	Cast Iron, Assumed	6"	7.1	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-00994	Cast Iron, Assumed	6"	98.9	1947	70	0	0	0.4	75	2	9.3	18.7	0.9	5
WMAIN-00995	Cast Iron, Assumed	6"	107.5	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00996	Cast Iron, Assumed	6"	23.8	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00998	Cast Iron, Assumed	6"	3.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01002	Cast Iron, Assumed	6"	15.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01006	Cast Iron, Assumed	6"	225.6	1998	19	0.2	0	0.4	75	2.6	2.5	6.6	0.3	56
WMAIN-01007	Cast Iron, Assumed	6"	140.7	1998	19	0.2	0	0.4	75	2.6	2.5	6.6	0.3	56
WMAIN-01008	Cast Iron, Assumed	6"	349.2	1998	19	0.2	1	0.4	75	4.6	2.5	11.7	0.3	56
WMAIN-01016	Cast Iron, Assumed	6"	323.3	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01017	Cast Iron, Assumed	6"	141.0	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01018	Cast Iron, Assumed	6"	148.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01019	Cast Iron, Assumed	6"	48.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01035	Cast Iron, Assumed	6"	184.8	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01037	Cast Iron, Assumed	6"	368.6	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01038	Cast Iron, Assumed	6"	8.7	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01039	Cast Iron, Assumed	6"	82.8	1909	108	1	0.8	0.4	75	6.6	10.0	66.0	1.0	0
WMAIN-01044	Cast Iron, Assumed	6"	11.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01047	Cast Iron, Assumed	6"	215.1	1909	108	1	0.5	0.4	75	6	10.0	60.0	1.0	0
WMAIN-01048	Cast Iron, Assumed	6"	21.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01051	Cast Iron, Assumed	6"	13.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01068	Cast Iron, Assumed	6"	131.9	1950	67	0.2	1	0.4	75	4.6	8.9	41.1	0.9	8
WMAIN-01069	Cast Iron, Assumed	6"	738.2	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01070	Cast Iron, Assumed	6"	290.0	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01073	Cast Iron, Assumed	6"	174.8	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01079	Cast Iron, Assumed	6"	805.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01080	Cast Iron, Assumed	6"	11.3	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01081	Cast Iron, Assumed	6"	63.3	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-01083	Cast Iron, Assumed	6"	156.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01086	Cast Iron, Assumed	6"	4.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

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WMAIN-01087	Cast Iron, Assumed	6"	562.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01092	Cast Iron, Assumed	6"	672.1	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01093	Cast Iron, Assumed	6"	50.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01094	Cast Iron, Assumed	6"	84.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01095	Cast Iron, Assumed	6"	413.8	1959	58	1	0.5	0.4	75	6	7.7	46.4	0.8	17
WMAIN-01096	Cast Iron, Assumed	6"	77.4	1959	58	0	0.5	0.4	75	3	7.7	23.2	0.8	17
WMAIN-01103	Cast Iron, Assumed	6"	8.8	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01112	Cast Iron, Assumed	6"	137.9	1947	70	0.8	0	0.4	75	4.4	9.3	41.1	0.9	5
WMAIN-01113	Cast Iron, Assumed	6"	600.7	1959	58	0.2	0.5	0.4	75	3.6	7.7	27.8	0.8	17
WMAIN-01114	Cast Iron, Assumed	6"	658.2	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-01128	Cast Iron, Assumed	6"	10.9	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01147	Cast Iron, Assumed	6"	4.9	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01150	Cast Iron, Assumed	6"	70.7	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01164	Cast Iron, Assumed	6"	3.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01168	Cast Iron, Assumed	6"	15.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01173	Cast Iron, Assumed	6"	21.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01174	Cast Iron, Assumed	6"	34.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01212	Cast Iron, Assumed	6"	34.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01214	Cast Iron, Assumed	6"	166.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01249	Cast Iron, Assumed	6"	6.5	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01253	Cast Iron, Assumed	6"	204.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01254	Cast Iron, Assumed	6"	142.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01262	Cast Iron, Assumed	6"	5.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01271	Cast Iron, Assumed	6"	269.2	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01272	Cast Iron, Assumed	6"	643.7	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01273	Cast Iron, Assumed	6"	694.1	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01309	Cast Iron, Assumed	6"	395.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01316	Cast Iron, Assumed	6"	197.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01321	Cast Iron, Assumed	6"	19.5	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-01352	Cast Iron, Assumed	6"	85.2	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01353	Cast Iron, Assumed	6"	181.9	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01354	Cast Iron, Assumed	6"	212.7	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01355	Cast Iron, Assumed	6"	24.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01358	Cast Iron, Assumed	6"	2007.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01360	Cast Iron, Assumed	6"	661.9	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01362	Cast Iron, Assumed	6"	30.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01391	Cast Iron, Assumed	6"	52.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01393	Cast Iron, Assumed	6"	7.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01421	Cast Iron, Assumed	6"	3.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01422	Cast Iron, Assumed	6"	0.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01442	Cast Iron, Assumed	6"	2.2	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01450	Cast Iron, Assumed	6"	52.6	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01452	Cast Iron, Assumed	6"	7.4	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-01453	Cast Iron, Assumed	6"	5.2	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01454	Cast Iron, Assumed	6"	45.9	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01458	Cast Iron, Assumed	6"	21.3	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-01470	Cast Iron, Assumed	6"	640.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01471	Cast Iron, Assumed	6"	53.0	Pre-1951	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01477	Cast Iron, Assumed	6"	24.5	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01478	Cast Iron, Assumed	6"	20.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01479	Cast Iron, Assumed	6"	24.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01480	Cast Iron, Assumed	6"	625.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01481	Cast Iron, Assumed	6"	623.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01482	Cast Iron, Assumed	6"	51.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01483	Cast Iron, Assumed	6"	55.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01484	Cast Iron, Assumed	6"	25.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01485	Cast Iron, Assumed	6"	39.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01486	Cast Iron, Assumed	6"	280.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01487	Cast Iron, Assumed	6"	49.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01488	Cast Iron, Assumed	6"	39.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01489	Cast Iron, Assumed	6"	190.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01490	Cast Iron, Assumed	6"	38.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01492	Cast Iron, Assumed	6"	38.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01494	Cast Iron, Assumed	6"	99.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01495	Cast Iron, Assumed	6"	52.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01496	Cast Iron, Assumed	6"	48.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01497	Cast Iron, Assumed	6"	3.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01498	Cast Iron, Assumed	6"	51.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01501	Cast Iron, Assumed	6"	103.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01502	Cast Iron, Assumed	6"	266.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01504	Cast Iron, Assumed	6"	5.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01505	Cast Iron, Assumed	6"	4.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01506	Cast Iron, Assumed	6"	8.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01507	Cast Iron, Assumed	6"	27.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01508	Cast Iron, Assumed	6"	141.5	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01509	Cast Iron, Assumed	6"	26.4	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01510	Cast Iron, Assumed	6"	56.0	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17
WMAIN-01511	Cast Iron, Assumed	6"	56.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01512	Cast Iron, Assumed	6"	83.8	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01527	Cast Iron, Assumed	6"	113.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01540	Cast Iron, Assumed	6"	4.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01541	Cast Iron, Assumed	6"	4.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01548	Cast Iron, Assumed	6"	113.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01562	Cast Iron, Assumed	6"	49.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01624	Cast Iron, Assumed	6"	141.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01625	Cast Iron, Assumed	6"	117.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01627	Cast Iron, Assumed	6"	2.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01631	Cast Iron, Assumed	6"	0.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01633	Cast Iron, Assumed	6"	2.2	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-01634	Cast Iron, Assumed	6"	7.3	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-01635	Cast Iron, Assumed	6"	11.9	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-01636	Cast Iron, Assumed	6"	11.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01641	Cast Iron, Assumed	6"	4.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01642	Cast Iron, Assumed	6"	55.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01644	Cast Iron, Assumed	6"	31.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01645	Cast Iron, Assumed	6"	20.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01647	Cast Iron, Assumed	6"	3.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01648	Cast Iron, Assumed	6"	36.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01649	Cast Iron, Assumed	6"	4.6	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01650	Cast Iron, Assumed	6"	173.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01651	Cast Iron, Assumed	6"	77.4	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01652	Cast Iron, Assumed	6"	15.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01653	Cast Iron, Assumed	6"	36.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01659	Cast Iron, Assumed	6"	3.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01663	Cast Iron, Assumed	6"	37.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01666	Cast Iron, Assumed	6"	97.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01674	Cast Iron, Assumed	6"	7.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01675	Cast Iron, Assumed	6"	2.8	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01676	Cast Iron, Assumed	6"	20.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01678	Cast Iron, Assumed	6"	37.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01681	Cast Iron, Assumed	6"	36.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01683	Cast Iron, Assumed	6"	18.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01689	Cast Iron, Assumed	6"	572.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01690	Cast Iron, Assumed	6"	61.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01695	Cast Iron, Assumed	6"	20.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01698	Cast Iron, Assumed	6"	33.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01704	Cast Iron, Assumed	6"	3.1	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01705	Cast Iron, Assumed	6"	4.5	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-01706	Cast Iron, Assumed	6"	3.9	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01714	Cast Iron, Assumed	6"	5.6	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01715	Cast Iron, Assumed	6"	45.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01716	Cast Iron, Assumed	6"	56.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0

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WMAIN-01717	Cast Iron, Assumed	6"	29.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01718	Cast Iron, Assumed	6"	315.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01719	Cast Iron, Assumed	6"	55.0	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01720	Cast Iron, Assumed	6"	9.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01722	Cast Iron, Assumed	6"	18.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01732	Cast Iron, Assumed	6"	23.5	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01733	Cast Iron, Assumed	6"	11.9	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-01736	Cast Iron, Assumed	6"	97.4	1951	66	0.8	0	0.4	75	4.4	8.8	38.7	0.9	9
<Null>	Ductile Iron	6"	7.1	2015	2	1	0	0.4	90	5	0.2	1.1	0.0	88
WMAIN-00629	Ductile Iron, Assumed	6"	9.0	2006	11	0.2	0	0.4	90	2.6	1.2	3.2	0.1	79
WMAIN-00652	Ductile Iron, Assumed	6"	37.7	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00653	Ductile Iron, Assumed	6"	32.2	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00655	Ductile Iron, Assumed	6"	10.0	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00656	Ductile Iron, Assumed	6"	8.0	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00742	Ductile Iron, Assumed	6"	51.1	2008	9	1	0	0.4	90	5	1.0	5.0	0.1	81
WMAIN-00761	Ductile Iron, Assumed	6"	47.0	1971	46	0	0	0.4	90	2	5.1	10.2	0.5	44
WMAIN-00762	Ductile Iron, Assumed	6"	45.0	1971	46	0.8	0	0.4	90	4.4	5.1	22.5	0.5	44
WMAIN-00779	Ductile Iron, Assumed	6"	116.1	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00793	Ductile Iron, Assumed	6"	6.6	1974	43	0	0	0.4	90	2	4.8	9.6	0.5	47
WMAIN-01003	Ductile Iron, Assumed	6"	102.5	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-01004	Ductile Iron, Assumed	6"	253.5	1974	43	0	0	0.4	90	2	4.8	9.6	0.5	47
WMAIN-01040	Ductile Iron, Assumed	6"	102.6	1974	43	0.2	0.8	0.4	90	4.2	4.8	20.1	0.5	47
WMAIN-01041	Ductile Iron, Assumed	6"	306.1	1974	43	0.2	0.8	0.4	90	4.2	4.8	20.1	0.5	47
WMAIN-01042	Ductile Iron, Assumed	6"	47.3	1974	43	0.2	0	0.4	90	2.6	4.8	12.4	0.5	47
WMAIN-01043	Ductile Iron, Assumed	6"	214.0	2007	10	1	0.8	0.4	90	6.6	1.1	7.3	0.1	80
WMAIN-01162	Ductile Iron, Assumed	6"	235.5	2008	8	1	0	0.4	90	5	0.9	4.4	0.1	82
WMAIN-01213	Ductile Iron, Assumed	6"	7.6	2007	10	0.3	0	0.4	90	2.9	1.1	3.2	0.1	80
WMAIN-01252	Ductile Iron, Assumed	6"	120.0	2008	8	1	0	0.4	90	5	0.9	4.4	0.1	82
WMAIN-01525	Ductile Iron, Assumed	6"	248.0	2007	10	1	0	0.4	90	5	1.1	5.6	0.1	80
WMAIN-01542	Ductile Iron, Assumed	6"	14.0	2008	9	1	0	0.4	90	5	1.0	5.0	0.1	81
WMAIN-01543	Ductile Iron, Assumed	6"	11.2	2008	8	1	0	0.4	90	5	0.9	4.4	0.1	82
WMAIN-01670	Ductile Iron, Assumed	6"	9.7	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-01697	Ductile Iron, Assumed	6"	3.3	1974	43	0	0	0.4	90	2	4.8	9.6	0.5	47
WMAIN-00004	Cast Iron, Assumed	8"	330.1	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00017	Cast Iron, Assumed	8"	662.5	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00048	Cast Iron, Assumed	8"	22.6	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00049	Cast Iron, Assumed	8"	3.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00072	Cast Iron, Assumed	8"	357.9	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00073	Cast Iron, Assumed	8"	436.4	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00074	Cast Iron, Assumed	8"	349.1	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00079	Cast Iron, Assumed	8"	261.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00081	Cast Iron, Assumed	8"	69.4	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00082	Cast Iron, Assumed	8"	13.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00086	Cast Iron, Assumed	8"	279.8	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00087	Cast Iron, Assumed	8"	353.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00149	Cast Iron, Assumed	8"	187.5	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00156	Cast Iron, Assumed	8"	713.1	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00160	Cast Iron, Assumed	8"	7.9	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00172	Cast Iron, Assumed	8"	281.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00210	Cast Iron, Assumed	8"	3.3	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00236	Cast Iron, Assumed	8"	291.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00237	Cast Iron, Assumed	8"	301.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00238	Cast Iron, Assumed	8"	7.1	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00242	Cast Iron, Assumed	8"	36.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00243	Cast Iron, Assumed	8"	8.2	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00244	Cast Iron, Assumed	8"	36.7	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00245	Cast Iron, Assumed	8"	22.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00257	Cast Iron, Assumed	8"	925.8	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00281	Cast Iron, Assumed	8"	551.1	1909	108	1	0.8	0.7	75	8.1	10.0	81.0	1.0	0
WMAIN-00319	Cast Iron, Assumed	8"	305.4	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00324	Cast Iron, Assumed	8"	674.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00326	Cast Iron, Assumed	8"	197.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00357	Cast Iron, Assumed	8"	664.2	2000	17	1	0	0.7	75	6.5	2.3	14.7	0.2	58
WMAIN-00358	Cast Iron, Assumed	8"	305.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00359	Cast Iron, Assumed	8"	289.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00383	Cast Iron, Assumed	8"	688.1	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00384	Cast Iron, Assumed	8"	12.8	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00419	Cast Iron, Assumed	8"	333.2	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00453	Cast Iron, Assumed	8"	56.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00463	Cast Iron, Assumed	8"	363.3	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00479	Cast Iron, Assumed	8"	9.4	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00488	Cast Iron, Assumed	8"	325.5	Pre-1956	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00489	Cast Iron, Assumed	8"	6.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00497	Cast Iron, Assumed	8"	567.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00504	Cast Iron, Assumed	8"	27.7	1967	50	1	0	0.7	75	6.5	6.7	43.3	0.7	25
WMAIN-00506	Cast Iron, Assumed	8"	27.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00507	Cast Iron, Assumed	8"	3.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00517	Cast Iron, Assumed	8"	88.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00518	Cast Iron, Assumed	8"	4.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00569	Cast Iron, Assumed	8"	214.0	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00585	Cast Iron, Assumed	8"	334.3	Pre-1956	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00592	Cast Iron, Assumed	8"	35.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00593	Cast Iron, Assumed	8"	352.9	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00596	Cast Iron, Assumed	8"	18.4	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00605	Cast Iron, Assumed	8"	22.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00607	Cast Iron, Assumed	8"	262.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00608	Cast Iron, Assumed	8"	5.6	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00670	Cast Iron, Assumed	8"	292.6	Pre-1947	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00671	Cast Iron, Assumed	8"	640.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00695	Cast Iron, Assumed	8"	627.5	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00702	Cast Iron, Assumed	8"	578.2	1909	108	1	0.5	0.7	75	7.5	10.0	75.0	1.0	0
WMAIN-00769	Cast Iron, Assumed	8"	649.8	1959	58	1	0.8	0.7	75	8.1	7.7	62.6	0.8	17
WMAIN-00771	Cast Iron, Assumed	8"	355.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00772	Cast Iron, Assumed	8"	33.1	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00773	Cast Iron, Assumed	8"	38.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00774	Cast Iron, Assumed	8"	193.0	1959	58	1	0.8	0.7	75	8.1	7.7	62.6	0.8	17
WMAIN-00804	Cast Iron, Assumed	8"	47.7	1937	80	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00805	Cast Iron, Assumed	8"	298.6	1937	80	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00829	Cast Iron, Assumed	8"	743.6	1940	77	0.2	0.8	0.7	75	5.7	10.0	57.0	1.0	0
WMAIN-00846	Cast Iron, Assumed	8"	201.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01001	Cast Iron, Assumed	8"	541.3	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01010	Cast Iron, Assumed	8"	159.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01025	Cast Iron, Assumed	8"	207.0	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01026	Cast Iron, Assumed	8"	128.7	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01027	Cast Iron, Assumed	8"	96.7	1950	67	0.8	0	0.7	75	5.9	8.9	52.7	0.9	8
WMAIN-01036	Cast Iron, Assumed	8"	1051.4	1950	67	0.2	0	0.7	75	4.1	8.9	36.6	0.9	8
WMAIN-01074	Cast Iron, Assumed	8"	7.4	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17
WMAIN-01075	Cast Iron, Assumed	8"	80.4	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17
WMAIN-01076	Cast Iron, Assumed	8"	260.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01115	Cast Iron, Assumed	8"	238.7	1947	70	1	0.5	0.7	75	7.5	9.3	70.0	0.9	5
WMAIN-01132	Cast Iron, Assumed	8"	63.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01136	Cast Iron, Assumed	8"	60.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01137	Cast Iron, Assumed	8"	92.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01138	Cast Iron, Assumed	8"	81.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01139	Cast Iron, Assumed	8"	108.6	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01140	Cast Iron, Assumed	8"	59.6	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01141	Cast Iron, Assumed	8"	143.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01145	Cast Iron, Assumed	8"	5.5	1937	80	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01146	Cast Iron, Assumed	8"	6.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01160	Cast Iron, Assumed	8"	83.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01170	Cast Iron, Assumed	8"	97.1	2008	9	1	0	0.7	75	6.5	1.2	7.8	0.1	66
WMAIN-01257	Cast Iron, Assumed	8"	10.1	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01258	Cast Iron, Assumed	8"	4.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01259	Cast Iron, Assumed	8"	61.6	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01266	Cast Iron, Assumed	8"	7.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01267	Cast Iron, Assumed	8"	2.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01268	Cast Iron, Assumed	8"	6.0	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01269	Cast Iron, Assumed	8"	19.1	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01310	Cast Iron, Assumed	8"	214.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01311	Cast Iron, Assumed	8"	14.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01317	Cast Iron, Assumed	8"	312.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01319	Cast Iron, Assumed	8"	148.5	1947	70	0.8	0.5	0.7	75	6.9	9.3	64.4	0.9	5
WMAIN-01320	Cast Iron, Assumed	8"	88.0	1947	70	0.8	1	0.7	75	7.9	9.3	73.7	0.9	5
WMAIN-01322	Cast Iron, Assumed	8"	793.2	2005	11	0.8	0	0.7	75	5.9	1.5	8.7	0.1	64
WMAIN-01323	Cast Iron, Assumed	8"	1179.3	2005	11	0.8	0	0.7	75	5.9	1.5	8.7	0.1	64
WMAIN-01330	Cast Iron, Assumed	8"	7.5	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01339	Cast Iron, Assumed	8"	296.4	Pre-2006	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01340	Cast Iron, Assumed	8"	360.9	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01367	Cast Iron, Assumed	8"	0.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01377	Cast Iron, Assumed	8"	18.9	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01378	Cast Iron, Assumed	8"	24.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01389	Cast Iron, Assumed	8"	16.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01427	Cast Iron, Assumed	8"	0.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01440	Cast Iron, Assumed	8"	111.8	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01441	Cast Iron, Assumed	8"	10.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01443	Cast Iron, Assumed	8"	9.1	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01444	Cast Iron, Assumed	8"	58.1	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01445	Cast Iron, Assumed	8"	70.1	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01446	Cast Iron, Assumed	8"	661.3	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01468	Cast Iron, Assumed	8"	72.1	Pre-1956	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01469	Cast Iron, Assumed	8"	293.8	Pre-1956	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01472	Cast Iron, Assumed	8"	43.2	Pre-1947	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01473	Cast Iron, Assumed	8"	25.0	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01499	Cast Iron, Assumed	8"	25.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01500	Cast Iron, Assumed	8"	7.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01518	Cast Iron, Assumed	8"	55.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01520	Cast Iron, Assumed	8"	90.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01547	Cast Iron, Assumed	8"	23.5	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01617	Cast Iron, Assumed	8"	18.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01619	Cast Iron, Assumed	8"	3.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01661	Cast Iron, Assumed	8"	5.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01671	Cast Iron, Assumed	8"	43.5	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01725	Cast Iron, Assumed	8"	284.8	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01729	Cast Iron, Assumed	8"	5.6	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01731	Cast Iron, Assumed	8"	30.9	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00357	Cast Iron, Assumed	8"	332.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01356	Ductile Iron	8"	13.0	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01357	Ductile Iron	8"	636.1	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01739	Ductile Iron	8"	20.8	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01740	Ductile Iron	8"	12.4	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01741	Ductile Iron	8"	805.1	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01744	Ductile Iron	8"	732.5	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01746	Ductile Iron	8"	689.9	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01747	Ductile Iron	8"	629.4	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
<Null>	Ductile Iron	8"	8.8	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	29.9	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	289.6	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	116.5	2015	2	1	0	0.7	90	6.5	0.2	1.4	0.0	88
<Null>	Ductile Iron	8"	75.5	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	399.5	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	487.0	2015	2	1	0	0.7	90	6.5	0.2	1.4	0.0	88
WMAIN-00167	Ductile Iron, Assumed	8"	212.0	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-00212	Ductile Iron, Assumed	8"	15.5	2006	11	1	0	0.7	90	6.5	1.2	7.9	0.1	79

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00651	Ductile Iron, Assumed	8"	196.3	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-00785	Ductile Iron, Assumed	8"	16.0	1993	24	1	0	0.7	90	6.5	2.7	17.3	0.3	66
WMAIN-00787	Ductile Iron, Assumed	8"	24.0	1993	24	1	0	0.7	90	6.5	2.7	17.3	0.3	66
WMAIN-00813	Ductile Iron, Assumed	8"	265.7	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00814	Ductile Iron, Assumed	8"	427.6	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00815	Ductile Iron, Assumed	8"	216.8	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00816	Ductile Iron, Assumed	8"	12.5	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00817	Ductile Iron, Assumed	8"	94.3	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-00833	Ductile Iron, Assumed	8"	1176.9	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-00860	Ductile Iron, Assumed	8"	5.0	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-00887	Ductile Iron, Assumed	8"	6.5	2002	15	0.3	0	0.7	90	4.4	1.7	7.3	0.2	75
WMAIN-00891	Ductile Iron, Assumed	8"	70.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01091	Ductile Iron, Assumed	8"	481.1	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-01107	Ductile Iron, Assumed	8"	17.7	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01215	Ductile Iron, Assumed	8"	324.8	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01216	Ductile Iron, Assumed	8"	38.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01217	Ductile Iron, Assumed	8"	18.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01218	Ductile Iron, Assumed	8"	19.0	2007	10	1	0.5	0.7	90	7.5	1.1	8.3	0.1	80
WMAIN-01219	Ductile Iron, Assumed	8"	3.4	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01220	Ductile Iron, Assumed	8"	32.2	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01221	Ductile Iron, Assumed	8"	32.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01222	Ductile Iron, Assumed	8"	338.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01223	Ductile Iron, Assumed	8"	141.5	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01224	Ductile Iron, Assumed	8"	284.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01225	Ductile Iron, Assumed	8"	231.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01226	Ductile Iron, Assumed	8"	76.8	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01227	Ductile Iron, Assumed	8"	34.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01228	Ductile Iron, Assumed	8"	17.9	2007	10	1	0.5	0.7	90	7.5	1.1	8.3	0.1	80
WMAIN-01229	Ductile Iron, Assumed	8"	7.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01230	Ductile Iron, Assumed	8"	9.6	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01231	Ductile Iron, Assumed	8"	119.2	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01232	Ductile Iron, Assumed	8"	89.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01233	Ductile Iron, Assumed	8"	89.0	2007	10	1	0.5	0.7	90	7.5	1.1	8.3	0.1	80
WMAIN-01234	Ductile Iron, Assumed	8"	15.7	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01235	Ductile Iron, Assumed	8"	59.7	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01236	Ductile Iron, Assumed	8"	93.1	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01237	Ductile Iron, Assumed	8"	131.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01238	Ductile Iron, Assumed	8"	10.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01239	Ductile Iron, Assumed	8"	30.0	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01240	Ductile Iron, Assumed	8"	16.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01241	Ductile Iron, Assumed	8"	15.0	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01242	Ductile Iron, Assumed	8"	22.4	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01243	Ductile Iron, Assumed	8"	249.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01244	Ductile Iron, Assumed	8"	52.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01245	Ductile Iron, Assumed	8"	11.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01246	Ductile Iron, Assumed	8"	50.5	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01270	Ductile Iron, Assumed	8"	107.3	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01274	Ductile Iron, Assumed	8"	9.7	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-01275	Ductile Iron, Assumed	8"	75.1	2009	8	0.2	0.8	0.7	90	5.7	0.9	5.1	0.1	82
WMAIN-01276	Ductile Iron, Assumed	8"	244.5	2009	8	0.8	0.5	0.7	90	6.9	0.9	6.1	0.1	82
WMAIN-01277	Ductile Iron, Assumed	8"	60.5	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01278	Ductile Iron, Assumed	8"	191.3	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01279	Ductile Iron, Assumed	8"	257.6	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01280	Ductile Iron, Assumed	8"	54.2	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01281	Ductile Iron, Assumed	8"	100.7	2009	8	0.2	0.5	0.7	90	5.1	0.9	4.5	0.1	82
WMAIN-01282	Ductile Iron, Assumed	8"	28.8	2009	8	0.2	0.8	0.7	90	5.7	0.9	5.1	0.1	82
WMAIN-01283	Ductile Iron, Assumed	8"	23.8	2009	8	0.2	0.8	0.7	90	5.7	0.9	5.1	0.1	82
WMAIN-01284	Ductile Iron, Assumed	8"	90.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01285	Ductile Iron, Assumed	8"	75.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01286	Ductile Iron, Assumed	8"	56.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01287	Ductile Iron, Assumed	8"	36.5	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01288	Ductile Iron, Assumed	8"	539.5	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01289	Ductile Iron, Assumed	8"	21.6	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01290	Ductile Iron, Assumed	8"	29.9	2009	8	0.2	0.5	0.7	90	5.1	0.9	4.5	0.1	82
WMAIN-01291	Ductile Iron, Assumed	8"	32.7	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01292	Ductile Iron, Assumed	8"	14.6	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01293	Ductile Iron, Assumed	8"	18.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01294	Ductile Iron, Assumed	8"	8.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01295	Ductile Iron, Assumed	8"	8.4	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01296	Ductile Iron, Assumed	8"	22.5	2009	8	0.2	0.5	0.7	90	5.1	0.9	4.5	0.1	82
WMAIN-01297	Ductile Iron, Assumed	8"	16.5	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01298	Ductile Iron, Assumed	8"	0.4	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01299	Ductile Iron, Assumed	8"	104.4	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01308	Ductile Iron, Assumed	8"	1273.1	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01312	Ductile Iron, Assumed	8"	19.4	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01331	Ductile Iron, Assumed	8"	697.2	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01332	Ductile Iron, Assumed	8"	650.1	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01333	Ductile Iron, Assumed	8"	195.8	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01334	Ductile Iron, Assumed	8"	236.9	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01335	Ductile Iron, Assumed	8"	30.3	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01336	Ductile Iron, Assumed	8"	28.9	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01337	Ductile Iron, Assumed	8"	14.0	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01338	Ductile Iron, Assumed	8"	228.8	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01341	Ductile Iron, Assumed	8"	362.5	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01342	Ductile Iron, Assumed	8"	134.9	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01343	Ductile Iron, Assumed	8"	14.9	2006	11	1	0	0.7	90	6.5	1.2	7.9	0.1	79
WMAIN-01344	Ductile Iron, Assumed	8"	12.0	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01345	Ductile Iron, Assumed	8"	5.6	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01346	Ductile Iron, Assumed	8"	9.3	2006	11	1	0	0.7	90	6.5	1.2	7.9	0.1	79
WMAIN-01347	Ductile Iron, Assumed	8"	32.8	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
WMAIN-01359	Ductile Iron, Assumed	8"	96.1	1974	43	0.2	0	0.7	90	4.1	4.8	19.6	0.5	47
WMAIN-01375	Ductile Iron, Assumed	8"	78.6	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01376	Ductile Iron, Assumed	8"	0.1	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01522	Ductile Iron, Assumed	8"	55.5	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01523	Ductile Iron, Assumed	8"	78.1	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01524	Ductile Iron, Assumed	8"	9.9	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01528	Ductile Iron, Assumed	8"	98.4	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01529	Ductile Iron, Assumed	8"	27.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01530	Ductile Iron, Assumed	8"	11.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01626	Ductile Iron, Assumed	8"	4.3	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01707	Ductile Iron, Assumed	8"	3.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01708	Ductile Iron, Assumed	8"	31.6	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01709	Ductile Iron, Assumed	8"	6.3	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01710	Ductile Iron, Assumed	8"	0.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01711	Ductile Iron, Assumed	8"	0.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01712	Ductile Iron, Assumed	8"	9.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
<Null>	Ductile Iron, Assumed	8"	13.6	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
WMAIN-00084	Cast Iron, Assumed	10"	574.8	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00096	Cast Iron, Assumed	10"	291.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00097	Cast Iron, Assumed	10"	308.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00098	Cast Iron, Assumed	10"	325.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00099	Cast Iron, Assumed	10"	369.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00100	Cast Iron, Assumed	10"	291.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00606	Cast Iron, Assumed	10"	598.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00615	Cast Iron, Assumed	10"	90.7	1969	48	1	0	0.7	75	6.5	6.4	41.6	0.6	27
WMAIN-00758	Cast Iron, Assumed	10"	71.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00795	Cast Iron, Assumed	10"	144.6	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00796	Cast Iron, Assumed	10"	129.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00797	Cast Iron, Assumed	10"	116.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00798	Cast Iron, Assumed	10"	121.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00811	Cast Iron, Assumed	10"	10.5	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00830	Cast Iron, Assumed	10"	381.5	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00831	Cast Iron, Assumed	10"	313.9	1959	58	0.2	0.5	0.7	75	5.1	7.7	39.4	0.8	17
WMAIN-00923	Cast Iron, Assumed	10"	434.4	1959	58	0.2	1	0.7	75	6.1	7.7	47.2	0.8	17
WMAIN-00954	Cast Iron, Assumed	10"	260.1	1959	58	0.8	0	0.7	75	5.9	7.7	45.6	0.8	17
WMAIN-00955	Cast Iron, Assumed	10"	419.4	1959	58	0.8	0	0.7	75	5.9	7.7	45.6	0.8	17
WMAIN-01082	Cast Iron, Assumed	10"	52.2	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17
WMAIN-01129	Cast Iron, Assumed	10"	96.1	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01166	Cast Iron, Assumed	10"	17.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01256	Cast Iron, Assumed	10"	429.9	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01314	Cast Iron, Assumed	10"	638.6	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01451	Cast Iron, Assumed	10"	38.4	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01699	Cast Iron, Assumed	10"	20.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01700	Cast Iron, Assumed	10"	74.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01713	Cast Iron, Assumed	10"	3.3	1959	58	0.8	0	0.7	75	5.9	7.7	45.6	0.8	17
WMAIN-00825	Ductile Iron, Assumed	10"	11.1	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01104	Ductile Iron, Assumed	10"	8.0	1974	43	0.2	0	0.7	90	4.1	4.8	19.6	0.5	47
WMAIN-01133	Ductile Iron, Assumed	10"	64.6	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01428	Ductile Iron, Assumed	10"	1.5	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01503	Ductile Iron, Assumed	10"	257.0	1974	43	0.2	0	0.7	90	4.1	4.8	19.6	0.5	47
WMAIN-00014	Cast Iron, Assumed	12"	8.0	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00015	Cast Iron, Assumed	12"	15.0	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00043	Cast Iron, Assumed	12"	172.7	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00044	Cast Iron, Assumed	12"	185.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00062	Cast Iron, Assumed	12"	8.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00063	Cast Iron, Assumed	12"	317.9	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00064	Cast Iron, Assumed	12"	7.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00065	Cast Iron, Assumed	12"	300.3	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00066	Cast Iron, Assumed	12"	9.4	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00077	Cast Iron, Assumed	12"	636.8	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00080	Cast Iron, Assumed	12"	9.4	1940	77	0	0	1	75	5	10.0	50.0	1.0	0
WMAIN-00088	Cast Iron, Assumed	12"	295.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00089	Cast Iron, Assumed	12"	286.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00091	Cast Iron, Assumed	12"	9.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00095	Cast Iron, Assumed	12"	44.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00116	Cast Iron, Assumed	12"	22.6	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00117	Cast Iron, Assumed	12"	16.1	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00125	Cast Iron, Assumed	12"	397.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00126	Cast Iron, Assumed	12"	363.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00127	Cast Iron, Assumed	12"	316.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00128	Cast Iron, Assumed	12"	272.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00130	Cast Iron, Assumed	12"	9.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00132	Cast Iron, Assumed	12"	275.9	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00133	Cast Iron, Assumed	12"	231.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00134	Cast Iron, Assumed	12"	315.1	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00173	Cast Iron, Assumed	12"	502.1	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00174	Cast Iron, Assumed	12"	324.9	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00177	Cast Iron, Assumed	12"	22.8	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00178	Cast Iron, Assumed	12"	73.5	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00181	Cast Iron, Assumed	12"	12.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00195	Cast Iron, Assumed	12"	312.4	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00196	Cast Iron, Assumed	12"	325.6	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00201	Cast Iron, Assumed	12"	342.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00214	Cast Iron, Assumed	12"	58.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00215	Cast Iron, Assumed	12"	225.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00216	Cast Iron, Assumed	12"	6.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00217	Cast Iron, Assumed	12"	5.8	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00220	Cast Iron, Assumed	12"	300.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00226	Cast Iron, Assumed	12"	360.8	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00227	Cast Iron, Assumed	12"	25.3	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00260	Cast Iron, Assumed	12"	74.5	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00261	Cast Iron, Assumed	12"	792.6	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00262	Cast Iron, Assumed	12"	1028.2	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00325	Cast Iron, Assumed	12"	8.9	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00327	Cast Iron, Assumed	12"	630.5	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00328	Cast Iron, Assumed	12"	290.2	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00329	Cast Iron, Assumed	12"	631.4	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00330	Cast Iron, Assumed	12"	29.7	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00331	Cast Iron, Assumed	12"	14.7	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00360	Cast Iron, Assumed	12"	670.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00385	Cast Iron, Assumed	12"	1223.5	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00386	Cast Iron, Assumed	12"	9.5	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00388	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00391	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00415	Cast Iron, Assumed	12"	277.1	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00416	Cast Iron, Assumed	12"	116.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00418	Cast Iron, Assumed	12"	348.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00420	Cast Iron, Assumed	12"	22.1	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00421	Cast Iron, Assumed	12"	25.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00423	Cast Iron, Assumed	12"	9.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00426	Cast Iron, Assumed	12"	9.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00428	Cast Iron, Assumed	12"	291.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00429	Cast Iron, Assumed	12"	296.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00431	Cast Iron, Assumed	12"	333.8	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00432	Cast Iron, Assumed	12"	725.6	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00438	Cast Iron, Assumed	12"	17.3	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00449	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00451	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00458	Cast Iron, Assumed	12"	15.6	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00459	Cast Iron, Assumed	12"	36.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00460	Cast Iron, Assumed	12"	15.1	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00461	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00465	Cast Iron, Assumed	12"	10.3	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00466	Cast Iron, Assumed	12"	0.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00467	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00468	Cast Iron, Assumed	12"	3.9	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00469	Cast Iron, Assumed	12"	676.3	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00470	Cast Iron, Assumed	12"	61.9	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00471	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00472	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00473	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00476	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00481	Cast Iron, Assumed	12"	657.9	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00483	Cast Iron, Assumed	12"	222.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00491	Cast Iron, Assumed	12"	674.3	1967	50	0.2	0	1	75	5.6	6.7	37.3	0.7	25
WMAIN-00528	Cast Iron, Assumed	12"	40.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00529	Cast Iron, Assumed	12"	18.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00612	Cast Iron, Assumed	12"	80.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00613	Cast Iron, Assumed	12"	181.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00614	Cast Iron, Assumed	12"	126.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00625	Cast Iron, Assumed	12"	22.1	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00628	Cast Iron, Assumed	12"	13.7	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00639	Cast Iron, Assumed	12"	243.1	1937	80	0.2	1	1	75	7.6	10.0	76.0	1.0	0
WMAIN-00640	Cast Iron, Assumed	12"	300.8	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00646	Cast Iron, Assumed	12"	58.4	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00649	Cast Iron, Assumed	12"	505.8	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00679	Cast Iron, Assumed	12"	5.5	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00700	Cast Iron, Assumed	12"	473.9	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00701	Cast Iron, Assumed	12"	180.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00726	Cast Iron, Assumed	12"	270.1	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00750	Cast Iron, Assumed	12"	31.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00751	Cast Iron, Assumed	12"	47.2	1909	108	0	0	1	75	5	10.0	50.0	1.0	0
WMAIN-00809	Cast Iron, Assumed	12"	60.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00819	Cast Iron, Assumed	12"	177.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00820	Cast Iron, Assumed	12"	35.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00821	Cast Iron, Assumed	12"	64.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00822	Cast Iron, Assumed	12"	41.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00823	Cast Iron, Assumed	12"	292.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00824	Cast Iron, Assumed	12"	91.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00826	Cast Iron, Assumed	12"	16.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00827	Cast Iron, Assumed	12"	90.9	1998	19	1	0	1	75	8	2.5	20.3	0.3	56
WMAIN-00837	Cast Iron, Assumed	12"	24.0	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00841	Cast Iron, Assumed	12"	305.2	2005	11	0.8	0	1	75	7.4	1.5	10.9	0.1	64
WMAIN-00843	Cast Iron, Assumed	12"	112.8	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00847	Cast Iron, Assumed	12"	347.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00848	Cast Iron, Assumed	12"	63.4	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00886	Cast Iron, Assumed	12"	71.4	2002	15	1	0	1	75	8	2.0	16.0	0.2	60
WMAIN-00896	Cast Iron, Assumed	12"	200.3	2002	15	1	0	1	75	8	2.0	16.0	0.2	60
WMAIN-00897	Cast Iron, Assumed	12"	111.6	2002	15	1	0	1	75	8	2.0	16.0	0.2	60
WMAIN-00901	Cast Iron, Assumed	12"	697.7	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-00902	Cast Iron, Assumed	12"	150.6	1969	48	0.2	0	1	75	5.6	6.4	35.8	0.6	27
WMAIN-00903	Cast Iron, Assumed	12"	79.6	1969	48	0.2	0	1	75	5.6	6.4	35.8	0.6	27
WMAIN-00907	Cast Iron, Assumed	12"	838.5	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00908	Cast Iron, Assumed	12"	23.3	1909	108	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-00909	Cast Iron, Assumed	12"	47.8	1909	108	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-00910	Cast Iron, Assumed	12"	33.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00919	Cast Iron, Assumed	12"	645.4	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00920	Cast Iron, Assumed	12"	642.4	1940	77	0	0	1	75	5	10.0	50.0	1.0	0
WMAIN-00922	Cast Iron, Assumed	12"	358.9	1940	77	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00945	Cast Iron, Assumed	12"	204.3	1909	108	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-00946	Cast Iron, Assumed	12"	203.9	1979	38	1	0	1	75	8	5.1	40.5	0.5	37
WMAIN-00951	Cast Iron, Assumed	12"	488.0	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00952	Cast Iron, Assumed	12"	23.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00975	Cast Iron, Assumed	12"	1099.0	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00985	Cast Iron, Assumed	12"	13.2	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00986	Cast Iron, Assumed	12"	93.6	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00993	Cast Iron, Assumed	12"	248.7	1947	70	0.8	1	1	75	9.4	9.3	87.7	0.9	5
WMAIN-00999	Cast Iron, Assumed	12"	269.6	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01000	Cast Iron, Assumed	12"	132.1	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01005	Cast Iron, Assumed	12"	132.2	1998	19	1	0	1	75	8	2.5	20.3	0.3	56
WMAIN-01009	Cast Iron, Assumed	12"	487.7	1909	108	0.2	0	1	75	5.6	10.0	56.0	1.0	0
WMAIN-01030	Cast Iron, Assumed	12"	24.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01031	Cast Iron, Assumed	12"	1009.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01045	Cast Iron, Assumed	12"	156.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01046	Cast Iron, Assumed	12"	20.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01062	Cast Iron, Assumed	12"	105.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01063	Cast Iron, Assumed	12"	11.7	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01064	Cast Iron, Assumed	12"	70.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01065	Cast Iron, Assumed	12"	14.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01066	Cast Iron, Assumed	12"	57.8	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01067	Cast Iron, Assumed	12"	162.0	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01085	Cast Iron, Assumed	12"	525.5	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01097	Cast Iron, Assumed	12"	649.0	1967	50	0.2	0	1	75	5.6	6.7	37.3	0.7	25
WMAIN-01101	Cast Iron, Assumed	12"	246.6	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01102	Cast Iron, Assumed	12"	1326.6	1967	50	0.2	0	1	75	5.6	6.7	37.3	0.7	25
WMAIN-01105	Cast Iron, Assumed	12"	13.0	1998	19	0.3	0	1	75	5.9	2.5	14.9	0.3	56
WMAIN-01106	Cast Iron, Assumed	12"	697.0	1998	19	1	0	1	75	8	2.5	20.3	0.3	56
WMAIN-01130	Cast Iron, Assumed	12"	5.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01143	Cast Iron, Assumed	12"	54.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01144	Cast Iron, Assumed	12"	69.8	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01161	Cast Iron, Assumed	12"	24.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01163	Cast Iron, Assumed	12"	52.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01165	Cast Iron, Assumed	12"	10.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01167	Cast Iron, Assumed	12"	22.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01172	Cast Iron, Assumed	12"	59.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01175	Cast Iron, Assumed	12"	11.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01176	Cast Iron, Assumed	12"	20.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01177	Cast Iron, Assumed	12"	88.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01178	Cast Iron, Assumed	12"	11.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01179	Cast Iron, Assumed	12"	9.9	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01180	Cast Iron, Assumed	12"	21.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01181	Cast Iron, Assumed	12"	144.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01182	Cast Iron, Assumed	12"	159.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01183	Cast Iron, Assumed	12"	404.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01184	Cast Iron, Assumed	12"	531.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01185	Cast Iron, Assumed	12"	25.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01187	Cast Iron, Assumed	12"	171.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01188	Cast Iron, Assumed	12"	19.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01189	Cast Iron, Assumed	12"	31.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01190	Cast Iron, Assumed	12"	221.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01191	Cast Iron, Assumed	12"	3.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01192	Cast Iron, Assumed	12"	88.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01193	Cast Iron, Assumed	12"	375.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01194	Cast Iron, Assumed	12"	204.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01195	Cast Iron, Assumed	12"	74.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01196	Cast Iron, Assumed	12"	55.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01197	Cast Iron, Assumed	12"	31.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01198	Cast Iron, Assumed	12"	36.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01199	Cast Iron, Assumed	12"	194.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01205	Cast Iron, Assumed	12"	292.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01206	Cast Iron, Assumed	12"	366.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01207	Cast Iron, Assumed	12"	544.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01208	Cast Iron, Assumed	12"	73.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01209	Cast Iron, Assumed	12"	73.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01210	Cast Iron, Assumed	12"	61.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01211	Cast Iron, Assumed	12"	2.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01250	Cast Iron, Assumed	12"	20.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01251	Cast Iron, Assumed	12"	106.2	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01260	Cast Iron, Assumed	12"	3.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01261	Cast Iron, Assumed	12"	18.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01307	Cast Iron, Assumed	12"	235.8	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01324	Cast Iron, Assumed	12"	100.2	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01348	Cast Iron, Assumed	12"	532.3	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01364	Cast Iron, Assumed	12"	33.2	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01365	Cast Iron, Assumed	12"	7.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01366	Cast Iron, Assumed	12"	6.3	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01368	Cast Iron, Assumed	12"	0.0	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01369	Cast Iron, Assumed	12"	0.0	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01370	Cast Iron, Assumed	12"	90.7	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01371	Cast Iron, Assumed	12"	25.7	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01372	Cast Iron, Assumed	12"	105.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01373	Cast Iron, Assumed	12"	31.2	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01374	Cast Iron, Assumed	12"	135.1	1969	48	0.8	0	1	75	7.4	6.4	47.4	0.6	27
WMAIN-01379	Cast Iron, Assumed	12"	57.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01380	Cast Iron, Assumed	12"	297.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01381	Cast Iron, Assumed	12"	24.3	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01382	Cast Iron, Assumed	12"	145.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01383	Cast Iron, Assumed	12"	45.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01384	Cast Iron, Assumed	12"	59.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01385	Cast Iron, Assumed	12"	52.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01386	Cast Iron, Assumed	12"	63.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01387	Cast Iron, Assumed	12"	55.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01388	Cast Iron, Assumed	12"	35.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01390	Cast Iron, Assumed	12"	5.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01392	Cast Iron, Assumed	12"	5.9	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01394	Cast Iron, Assumed	12"	62.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01395	Cast Iron, Assumed	12"	28.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01396	Cast Iron, Assumed	12"	40.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01397	Cast Iron, Assumed	12"	2.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01398	Cast Iron, Assumed	12"	63.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01399	Cast Iron, Assumed	12"	36.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01400	Cast Iron, Assumed	12"	21.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01401	Cast Iron, Assumed	12"	29.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01402	Cast Iron, Assumed	12"	15.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01403	Cast Iron, Assumed	12"	0.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01404	Cast Iron, Assumed	12"	146.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01405	Cast Iron, Assumed	12"	31.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01406	Cast Iron, Assumed	12"	11.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01407	Cast Iron, Assumed	12"	29.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01408	Cast Iron, Assumed	12"	13.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01409	Cast Iron, Assumed	12"	14.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01410	Cast Iron, Assumed	12"	9.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01411	Cast Iron, Assumed	12"	9.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01412	Cast Iron, Assumed	12"	2.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01413	Cast Iron, Assumed	12"	7.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01414	Cast Iron, Assumed	12"	2.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01415	Cast Iron, Assumed	12"	6.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01417	Cast Iron, Assumed	12"	21.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01418	Cast Iron, Assumed	12"	0.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01429	Cast Iron, Assumed	12"	10.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01430	Cast Iron, Assumed	12"	5.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01435	Cast Iron, Assumed	12"	53.2	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01436	Cast Iron, Assumed	12"	1.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01437	Cast Iron, Assumed	12"	6.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01438	Cast Iron, Assumed	12"	319.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01439	Cast Iron, Assumed	12"	154.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01456	Cast Iron, Assumed	12"	8.1	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01457	Cast Iron, Assumed	12"	37.7	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01459	Cast Iron, Assumed	12"	93.1	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01460	Cast Iron, Assumed	12"	82.6	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01461	Cast Iron, Assumed	12"	21.0	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01462	Cast Iron, Assumed	12"	186.7	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01463	Cast Iron, Assumed	12"	641.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01464	Cast Iron, Assumed	12"	450.7	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01465	Cast Iron, Assumed	12"	360.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01466	Cast Iron, Assumed	12"	261.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01467	Cast Iron, Assumed	12"	16.7	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-01513	Cast Iron, Assumed	12"	3.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01514	Cast Iron, Assumed	12"	185.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01515	Cast Iron, Assumed	12"	122.9	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01516	Cast Iron, Assumed	12"	29.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01517	Cast Iron, Assumed	12"	25.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01521	Cast Iron, Assumed	12"	101.8	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01532	Cast Iron, Assumed	12"	61.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01533	Cast Iron, Assumed	12"	6.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01534	Cast Iron, Assumed	12"	20.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01535	Cast Iron, Assumed	12"	6.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01536	Cast Iron, Assumed	12"	102.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01537	Cast Iron, Assumed	12"	10.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01544	Cast Iron, Assumed	12"	29.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01549	Cast Iron, Assumed	12"	382.5	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01550	Cast Iron, Assumed	12"	8.3	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01551	Cast Iron, Assumed	12"	10.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01552	Cast Iron, Assumed	12"	30.7	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01553	Cast Iron, Assumed	12"	10.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01563	Cast Iron, Assumed	12"	55.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01564	Cast Iron, Assumed	12"	23.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66

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WMAIN-01565	Cast Iron, Assumed	12"	63.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01566	Cast Iron, Assumed	12"	18.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01567	Cast Iron, Assumed	12"	35.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01568	Cast Iron, Assumed	12"	3.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01569	Cast Iron, Assumed	12"	51.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01570	Cast Iron, Assumed	12"	17.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01571	Cast Iron, Assumed	12"	22.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01572	Cast Iron, Assumed	12"	0.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01573	Cast Iron, Assumed	12"	10.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01574	Cast Iron, Assumed	12"	35.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01575	Cast Iron, Assumed	12"	27.0	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01576	Cast Iron, Assumed	12"	44.0	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01577	Cast Iron, Assumed	12"	52.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01578	Cast Iron, Assumed	12"	22.0	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01579	Cast Iron, Assumed	12"	56.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01580	Cast Iron, Assumed	12"	11.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01581	Cast Iron, Assumed	12"	10.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01582	Cast Iron, Assumed	12"	109.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01583	Cast Iron, Assumed	12"	60.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01584	Cast Iron, Assumed	12"	9.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01585	Cast Iron, Assumed	12"	54.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01586	Cast Iron, Assumed	12"	4.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01587	Cast Iron, Assumed	12"	22.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01588	Cast Iron, Assumed	12"	19.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01589	Cast Iron, Assumed	12"	0.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01590	Cast Iron, Assumed	12"	86.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01591	Cast Iron, Assumed	12"	7.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01592	Cast Iron, Assumed	12"	28.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01593	Cast Iron, Assumed	12"	26.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01594	Cast Iron, Assumed	12"	8.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01595	Cast Iron, Assumed	12"	4.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01596	Cast Iron, Assumed	12"	72.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01597	Cast Iron, Assumed	12"	39.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01598	Cast Iron, Assumed	12"	48.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01599	Cast Iron, Assumed	12"	2.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01600	Cast Iron, Assumed	12"	51.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01601	Cast Iron, Assumed	12"	33.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01602	Cast Iron, Assumed	12"	41.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01603	Cast Iron, Assumed	12"	1.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01604	Cast Iron, Assumed	12"	17.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01605	Cast Iron, Assumed	12"	53.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01606	Cast Iron, Assumed	12"	56.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01607	Cast Iron, Assumed	12"	2.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01608	Cast Iron, Assumed	12"	16.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01609	Cast Iron, Assumed	12"	46.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01610	Cast Iron, Assumed	12"	63.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01611	Cast Iron, Assumed	12"	57.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01612	Cast Iron, Assumed	12"	24.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01613	Cast Iron, Assumed	12"	32.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01614	Cast Iron, Assumed	12"	12.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01615	Cast Iron, Assumed	12"	43.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01616	Cast Iron, Assumed	12"	7.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01622	Cast Iron, Assumed	12"	8.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01623	Cast Iron, Assumed	12"	20.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01646	Cast Iron, Assumed	12"	52.6	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01691	Cast Iron, Assumed	12"	78.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01702	Cast Iron, Assumed	12"	2.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01703	Cast Iron, Assumed	12"	166.1	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01734	Cast Iron, Assumed	12"	604.1	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01735	Cast Iron, Assumed	12"	5.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00001	Ductile Iron	12"	55.6	1959	58	1	0	1	90	8	6.4	51.6	0.6	32

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00002	Ductile Iron	12"	13.5	1959	58	1	0	1	90	8	6.4	51.6	0.6	32
<Null>	Ductile Iron	12"	559.0	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
<Null>	Ductile Iron	12"	601.2	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-00228	Ductile Iron, Assumed	12"	1037.4	1971	46	0.8	0	1	90	7.4	5.1	37.8	0.5	44
WMAIN-00856	Ductile Iron, Assumed	12"	441.1	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00857	Ductile Iron, Assumed	12"	478.2	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00858	Ductile Iron, Assumed	12"	383.6	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00861	Ductile Iron, Assumed	12"	179.9	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00862	Ductile Iron, Assumed	12"	86.2	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00863	Ductile Iron, Assumed	12"	26.2	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00864	Ductile Iron, Assumed	12"	51.8	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00865	Ductile Iron, Assumed	12"	17.8	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00866	Ductile Iron, Assumed	12"	62.5	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00867	Ductile Iron, Assumed	12"	44.4	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00869	Ductile Iron, Assumed	12"	188.4	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00870	Ductile Iron, Assumed	12"	3.1	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00871	Ductile Iron, Assumed	12"	1.8	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00872	Ductile Iron, Assumed	12"	3.0	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00873	Ductile Iron, Assumed	12"	1.6	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00874	Ductile Iron, Assumed	12"	2.0	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00875	Ductile Iron, Assumed	12"	4.0	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00876	Ductile Iron, Assumed	12"	404.4	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00877	Ductile Iron, Assumed	12"	72.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00878	Ductile Iron, Assumed	12"	72.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00879	Ductile Iron, Assumed	12"	2.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00880	Ductile Iron, Assumed	12"	2.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00881	Ductile Iron, Assumed	12"	16.4	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00882	Ductile Iron, Assumed	12"	18.6	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00883	Ductile Iron, Assumed	12"	160.3	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00884	Ductile Iron, Assumed	12"	5.9	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00885	Ductile Iron, Assumed	12"	4.2	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00889	Ductile Iron, Assumed	12"	237.9	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00890	Ductile Iron, Assumed	12"	108.6	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00892	Ductile Iron, Assumed	12"	30.6	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00893	Ductile Iron, Assumed	12"	23.0	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00894	Ductile Iron, Assumed	12"	265.6	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00895	Ductile Iron, Assumed	12"	3.4	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-01134	Ductile Iron, Assumed	12"	24.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01135	Ductile Iron, Assumed	12"	6.5	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01142	Ductile Iron, Assumed	12"	38.0	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-01169	Ductile Iron, Assumed	12"	15.0	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01200	Ductile Iron, Assumed	12"	116.3	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01201	Ductile Iron, Assumed	12"	32.5	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01202	Ductile Iron, Assumed	12"	17.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01203	Ductile Iron, Assumed	12"	238.8	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01204	Ductile Iron, Assumed	12"	432.1	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01263	Ductile Iron, Assumed	12"	3.3	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01264	Ductile Iron, Assumed	12"	3.4	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01300	Ductile Iron, Assumed	12"	67.0	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01301	Ductile Iron, Assumed	12"	649.9	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01302	Ductile Iron, Assumed	12"	75.9	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01303	Ductile Iron, Assumed	12"	47.5	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01304	Ductile Iron, Assumed	12"	86.5	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01305	Ductile Iron, Assumed	12"	54.5	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01306	Ductile Iron, Assumed	12"	329.9	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01313	Ductile Iron, Assumed	12"	11.8	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01349	Ductile Iron, Assumed	12"	3.6	2006	11	1	0	1	90	8	1.2	9.8	0.1	79
WMAIN-01416	Ductile Iron, Assumed	12"	52.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01419	Ductile Iron, Assumed	12"	60.0	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01420	Ductile Iron, Assumed	12"	48.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01423	Ductile Iron, Assumed	12"	60.9	2008	8	1	0	1	90	8	0.9	7.1	0.1	82

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01424	Ductile Iron, Assumed	12"	35.1	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01425	Ductile Iron, Assumed	12"	72.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01426	Ductile Iron, Assumed	12"	50.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01431	Ductile Iron, Assumed	12"	13.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01432	Ductile Iron, Assumed	12"	8.8	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01433	Ductile Iron, Assumed	12"	6.4	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01434	Ductile Iron, Assumed	12"	19.3	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01526	Ductile Iron, Assumed	12"	24.1	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-01531	Ductile Iron, Assumed	12"	31.3	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-01554	Ductile Iron, Assumed	12"	9.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01555	Ductile Iron, Assumed	12"	10.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01556	Ductile Iron, Assumed	12"	16.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01557	Ductile Iron, Assumed	12"	35.4	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01558	Ductile Iron, Assumed	12"	14.9	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01560	Ductile Iron, Assumed	12"	3.2	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01561	Ductile Iron, Assumed	12"	1.1	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-00101	Cast Iron, Assumed	16"	31.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00102	Cast Iron, Assumed	16"	334.1	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00103	Cast Iron, Assumed	16"	363.8	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00104	Cast Iron, Assumed	16"	319.2	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00105	Cast Iron, Assumed	16"	7.0	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00106	Cast Iron, Assumed	16"	9.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00107	Cast Iron, Assumed	16"	311.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00115	Cast Iron, Assumed	16"	9.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00417	Cast Iron, Assumed	16"	9.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00501	Cast Iron, Assumed	16"	69.3	1934	83	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00502	Cast Iron, Assumed	16"	30.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00505	Cast Iron, Assumed	16"	9.4	1934	83	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00719	Cast Iron, Assumed	16"	15.5	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00720	Cast Iron, Assumed	16"	62.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00763	Cast Iron, Assumed	16"	250.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00810	Cast Iron, Assumed	16"	151.1	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00840	Cast Iron, Assumed	16"	304.0	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00917	Cast Iron, Assumed	16"	266.5	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00918	Cast Iron, Assumed	16"	569.8	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00921	Cast Iron, Assumed	16"	956.2	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00924	Cast Iron, Assumed	16"	731.2	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00940	Cast Iron, Assumed	16"	61.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00990	Cast Iron, Assumed	16"	84.3	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-01012	Cast Iron, Assumed	16"	477.6	1950	67	0	0	1	75	5	8.9	44.7	0.9	8
WMAIN-01013	Cast Iron, Assumed	16"	149.8	1934	83	0.2	0	1	75	5.6	10.0	56.0	1.0	0
WMAIN-01014	Cast Iron, Assumed	16"	98.5	1934	83	0.2	0	1	75	5.6	10.0	56.0	1.0	0
WMAIN-01015	Cast Iron, Assumed	16"	281.6	1934	83	0.2	1	1	75	7.6	10.0	76.0	1.0	0
WMAIN-01052	Cast Iron, Assumed	16"	110.6	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01053	Cast Iron, Assumed	16"	164.5	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01058	Cast Iron, Assumed	16"	84.2	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01059	Cast Iron, Assumed	16"	53.1	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01060	Cast Iron, Assumed	16"	130.4	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01084	Cast Iron, Assumed	16"	64.4	1937	80	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-01098	Cast Iron, Assumed	16"	623.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01131	Cast Iron, Assumed	16"	5.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01159	Cast Iron, Assumed	16"	23.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01255	Cast Iron, Assumed	16"	404.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01449	Cast Iron, Assumed	16"	40.3	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01455	Cast Iron, Assumed	16"	0.3	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01491	Cast Iron, Assumed	16"	59.8	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01559	Cast Iron, Assumed	16"	49.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00941	Ductile Iron, Assumed	16"	110.2	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-00942	Ductile Iron, Assumed	16"	421.1	1950	67	0.2	0.5	1	90	6.6	7.4	49.1	0.7	23
WMAIN-01054	Ductile Iron, Assumed	16"	155.2	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01055	Ductile Iron, Assumed	16"	92.5	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85

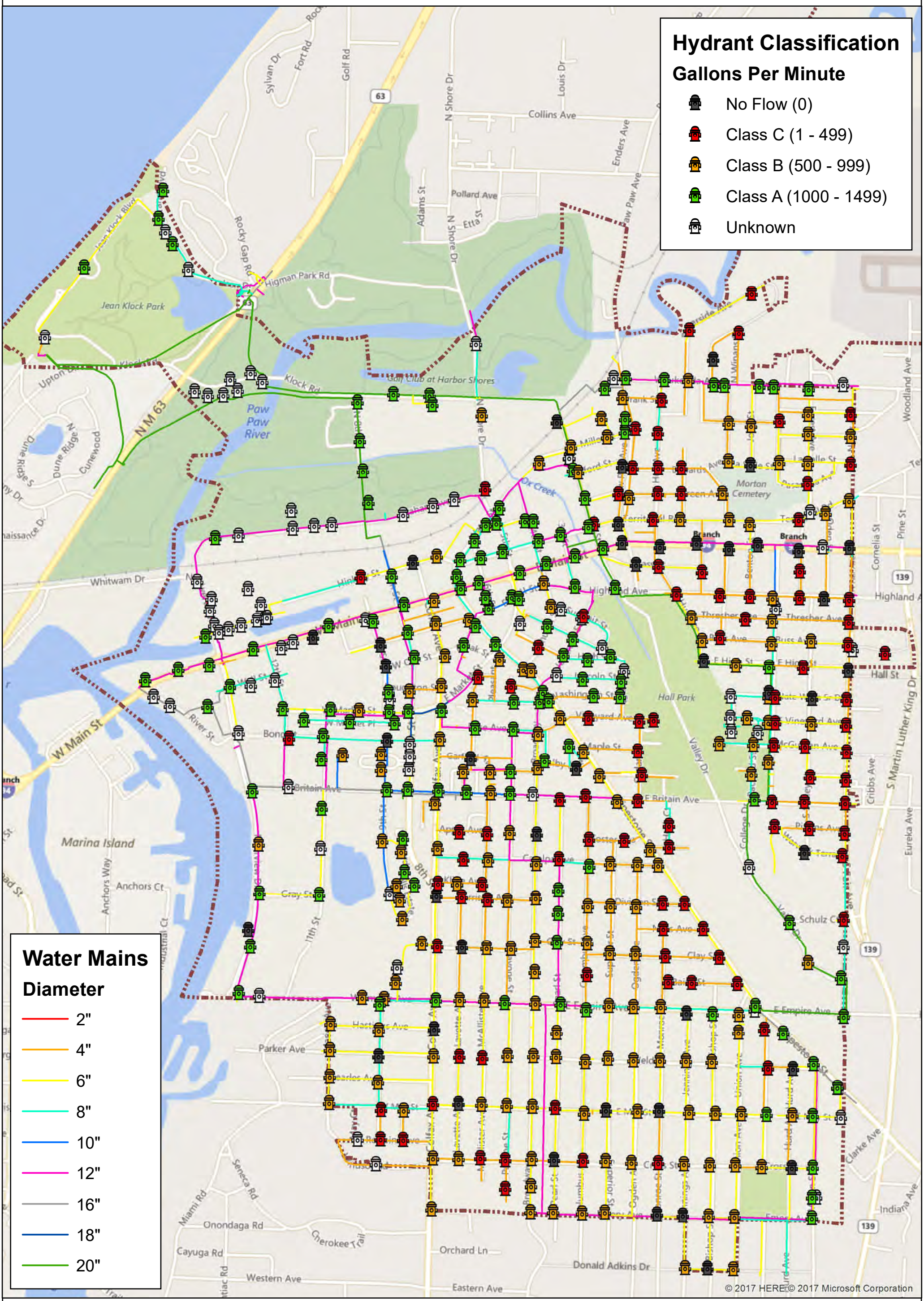
GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01056	Ductile Iron, Assumed	16"	93.3	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01057	Ductile Iron, Assumed	16"	397.8	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01061	Ductile Iron, Assumed	16"	420.8	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01318	Ductile Iron, Assumed	16"	665.8	Pre-1999	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00085	Cast Iron, Assumed	18"	181.8	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00427	Cast Iron, Assumed	18"	6.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00828	Cast Iron, Assumed	18"	111.3	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00904	Cast Iron, Assumed	18"	98.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00905	Cast Iron, Assumed	18"	196.9	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00906	Cast Iron, Assumed	18"	303.4	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00943	Cast Iron, Assumed	18"	123.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01447	Cast Iron, Assumed	18"	89.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01448	Cast Iron, Assumed	18"	70.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00112	Cast Iron, Assumed	20"	65.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00150	Cast Iron, Assumed	20"	174.5	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00151	Cast Iron, Assumed	20"	44.1	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00153	Cast Iron, Assumed	20"	15.2	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00154	Cast Iron, Assumed	20"	52.8	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00157	Cast Iron, Assumed	20"	703.3	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00508	Cast Iron, Assumed	20"	32.1	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00509	Cast Iron, Assumed	20"	97.8	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00591	Cast Iron, Assumed	20"	909.8	1968	49	0.2	0	1	75	5.6	6.5	36.6	0.7	26
WMAIN-00594	Cast Iron, Assumed	20"	354.1	1968	49	0.2	0	1	75	5.6	6.5	36.6	0.7	26
WMAIN-00595	Cast Iron, Assumed	20"	645.2	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00598	Cast Iron, Assumed	20"	93.9	1968	49	0.2	0	1	75	5.6	6.5	36.6	0.7	26
WMAIN-00694	Cast Iron, Assumed	20"	9.4	1934	83	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00712	Cast Iron, Assumed	20"	87.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00713	Cast Iron, Assumed	20"	647.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00716	Cast Iron, Assumed	20"	9.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00734	Cast Iron, Assumed	20"	589.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00735	Cast Iron, Assumed	20"	318.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00738	Cast Iron, Assumed	20"	9.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00752	Cast Iron, Assumed	20"	1548.1	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00753	Cast Iron, Assumed	20"	56.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00786	Cast Iron, Assumed	20"	22.9	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00790	Cast Iron, Assumed	20"	352.6	1909	108	0	0.8	1	75	6.6	10.0	66.0	1.0	0
WMAIN-00832	Cast Iron, Assumed	20"	1003.0	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00926	Cast Iron, Assumed	20"	990.2	2000	17	0	0	1	75	5	2.3	11.3	0.2	58
WMAIN-00931	Cast Iron, Assumed	20"	88.7	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00932	Cast Iron, Assumed	20"	195.5	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00933	Cast Iron, Assumed	20"	173.2	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00936	Cast Iron, Assumed	20"	921.5	1950	67	0.2	0	1	75	5.6	8.9	50.0	0.9	8
WMAIN-00937	Cast Iron, Assumed	20"	30.6	1950	67	0.2	0	1	75	5.6	8.9	50.0	0.9	8
WMAIN-00991	Cast Iron, Assumed	20"	67.7	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-01117	Cast Iron, Assumed	20"	1616.9	2000	17	1	0	1	75	8	2.3	18.1	0.2	58
WMAIN-01119	Cast Iron, Assumed	20"	2237.2	2000	17	1	0.5	1	75	9	2.3	20.4	0.2	58
WMAIN-01120	Cast Iron, Assumed	20"	881.0	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-01361	Cast Iron, Assumed	20"	51.6	1947	70	0.8	0	1	75	7.4	9.3	69.1	0.9	5
WMAIN-01538	Cast Iron, Assumed	20"	25.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01539	Cast Iron, Assumed	20"	111.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
<Null>	Cast Iron, Assumed	20"	225.4	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00752	Cast Iron, Assumed	20"	790.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00654	Ductile Iron, Assumed	20"	108.4	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00780	Ductile Iron, Assumed	20"	396.9	1993	24	1	0	1	90	8	2.7	21.3	0.3	66
WMAIN-00781	Ductile Iron, Assumed	20"	52.0	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00782	Ductile Iron, Assumed	20"	4.5	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00783	Ductile Iron, Assumed	20"	10.3	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00784	Ductile Iron, Assumed	20"	29.8	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00791	Ductile Iron, Assumed	20"	1575.5	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-00925	Ductile Iron, Assumed	20"	157.0	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00927	Ductile Iron, Assumed	20"	1624.5	1974	43	1	0	1	90	8	4.8	38.2	0.5	47

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00928	Ductile Iron, Assumed	20"	690.1	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00929	Ductile Iron, Assumed	20"	506.3	Pre-2012	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-00930	Ductile Iron, Assumed	20"	112.2	1974	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-00934	Ductile Iron, Assumed	20"	259.2	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00935	Ductile Iron, Assumed	20"	300.2	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00953	Ductile Iron, Assumed	20"	761.6	1993	24	0.8	0	1	90	7.4	2.7	19.7	0.3	66
WMAIN-01033	Ductile Iron, Assumed	20"	211.7	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-01034	Ductile Iron, Assumed	20"	176.0	1950	67	0	0	1	90	5	7.4	37.2	0.7	23
WMAIN-01109	Ductile Iron, Assumed	20"	2055.7	1993	24	0.8	0	1	90	7.4	2.7	19.7	0.3	66
WMAIN-01118	Ductile Iron, Assumed	20"	87.4	2000	17	1	0	1	90	8	1.9	15.1	0.2	73
WMAIN-01121	Ductile Iron, Assumed	20"	303.0	1974	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-01122	Ductile Iron, Assumed	20"	17.8	2000	17	0.3	0	1	90	5.9	1.9	11.1	0.2	73
WMAIN-01123	Ductile Iron, Assumed	20"	19.9	2000	17	0.3	0	1	90	5.9	1.9	11.1	0.2	73
WMAIN-01124	Ductile Iron, Assumed	20"	228.6	1974	43	0.2	0	1	90	5.6	4.8	26.8	0.5	47
WMAIN-01125	Ductile Iron, Assumed	20"	572.0	2000	17	0.3	0	1	90	5.9	1.9	11.1	0.2	73
WMAIN-01126	Ductile Iron, Assumed	20"	544.6	2000	17	0	0	1	90	5	1.9	9.4	0.2	73
WMAIN-01127	Ductile Iron, Assumed	20"	826.7	1974	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-01363	Ductile Iron, Assumed	20"	60.5	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-01696	Ductile Iron, Assumed	20"	53.6	1993	24	1	0	1	90	8	2.7	21.3	0.3	66

APPENDIX B

2017 HYDRANT CLASSIFICATION MAP

Hydrants by Classification



City of Benton Harbor, Michigan

0 0.125 0.25 0.5 Mi

ABONMARCHE
Confidence By Design

Prepared: September 2017

HYDRANT FLOW

Legend: Fire Flow (Available) (gpm)

Color		Value
Red	<=	500
Cyan	<=	750
Blue	<=	1,000
Green	<=	1,500

Color Coding Legend

Pipe: Diameter (in)

Color		Value
Red	<=	2.0
Orange	<=	4.0
Yellow	<=	6.0
Cyan	<=	8.0
Blue	<=	10.0
Magenta	<=	12.0
Gray	<=	16.0
Purple	<=	18.0
Green	<=	20.0

NO.	REVISION DESCRIPTION:	BY:	DATE:

ABONMARCHE

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Valparaiso, IN 46383
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Battle Creek
Benton Harbor
Manistee
South Haven

Goshen
Hobart
Lafayette
South Bend
Valparaiso

Engineering · Architecture · Land Surveying

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PROJECT:

BENTON HARBOR WATER RELIABILITY STUDY

SHEET TITLE:

TOTAL AVAILABLE FIRE FLOW CURRENT CONDITIONS

DRAWN BY: SRF

DESIGNED BY:

PM REVIEW:

QA/QC REVIEW:

DATE:

SEAL:

SIGNATURE:

DATE:

HARD COPY IS INTENDED TO BE 24" X 36" WHEN PLOTTED. SCALE(S) INDICATED AND GRAPHIC QUALITY MAY NOT BE ACCURATE FOR ANY OTHER SIZES

SCALE:
HORZ: 1"=750'
VERT:

ACI JOB #
16-1099

SHEET NO.
1 of 1

APPENDIX C

WATER TOWER

INSPECTION REPORT

Dixon Engineering, Inc.

Maintenance Inspection

650,000 Gallon Double Ellipse

Britain Tank
Benton Harbor, Michigan

Inspection Performed: May 7, 2008
Report Prepared: May 21, 2008
Reviewed by Ira M. Gabin, P.E.: June 4, 2008

Phone (616) 374-3221
Fax (616) 374-7116
http://www.dixonengineering.net
dixon@dixonengineering.net

Dixon Engineering Inc.
1104 Third Ave. Lake Odessa, MI 48849

CONCLUSIONS:

1. The exterior coating is a urethane system that is in fair condition, has poor adhesion, and is slightly faded. Primary modes of failure are delamination, primer bleed-through, and spot coating breaks to the substrate. There are numerous areas of spot coating failure on the sidewalls and roof. Coating deterioration is moderate. The logo and lettering are extensively faded.

2. The wet interior coating is a three coat epoxy system that is in good condition. There are areas of minor spot failure on the floor and sidewalls. Above the high water line the coating is in good condition. The roof coating is deteriorating at open lap seams and on the roof beam edges. The roof beams and lap joints have minor edge corrosion.

3. Lower sections of some of the radial roof stiffeners have fallen into the tank's bowl.

RECOMMENDATIONS:

1. Schedule regular cleanings and inspections of the tank by an independent, third party as recommended by AWWA, or once every five years.

2. In three years budget to high pressure water jet (10,000 – 20,000 psi) spot power tool clean, and recoat the exterior with an acrylic system. The estimated cost is $195,000.

3. Or, abrasive blast clean the tank's exterior to a commercial grade (SSPC-SP6) condition inside a dust-tight, flexible-frame containment system, and recoat with a four coat polyurethane system. The estimated cost is $300,000, plus $75,000 for containment.

4. Repair and continue cathodic protection for wet interior surfaces. Use a qualified cathodic protection contractor for maintenance.

5. Repair foundation cracks and seal the surface with an epoxy coating. Cost would be incidental if completed with a major recoating project.

6. Recaulk areas of missing caulk between the tank's column baseplates and foundations. This could be done by in-house personnel.

7. Adjust the sway rods. The estimated cost is $3,000.

8. Install a 30 in. manway in the bottom of the riser. The estimated cost is $7,000.

9. Enlarge the roof hatch to 30 in. diameter. The estimated cost is $3,000.

10. Install a 25 ft. diameter, 42 in. high railing and a painter's rail on the roof. The estimated cost is $12,000.

11. Abrasive blast clean to a near white grade (SSPC-SP10), and paint the rusted pit piping. The estimated cost is $5,000.

12. Install a new wet interior ladder from the roof hatch to the bowl. Equip with a fall prevention device. Remove the damaged 4 ft. of ladder at the sidewall manway and replace with new. The estimated cost is $8,000.

13. Remove the roof ladder, and replace with hand rails from the step-off platform to the roof hand rail. The estimated cost is $10,000.

14. Weld plates over the cathodic protection lift holes in the roof and the hole in the roof vent. The estimated cost is $3,000.

15. Reinstall the fallen sections of the roof beams and inspect the remaining beams for repair. Budget $20,000.

A DISCUSSION on RESCUE/RETRIEVAL OPERATIONS from ELEVATED LEGGED STORAGE TANKS

A series of accidents involving falls from or in water tanks has highlighted inadequacies in tank design and a potentially greater problem. The rescue may be more dangerous than the original accident, with the potential for more loss of life or injury. Contractors and engineers are responsible for their own employees. Even with safety training and proper equipment, accidents will occur. Most rescue squads are local or neighboring fire departments, some with more practice than other departments. Elevated tanks were designed to store water, not for rescue or retrieval convenience. The following items would make working on and retrieval from water tanks safer. This discussion is offered as a starting point. We recommend that you meet with your rescue personnel and draft a rescue plan. A copy of the plan should be kept at the tank and with the rescue crew.

OSHA now requires 30 in. manways and hatches, and roof ladders are to be replaced with platforms, steps, and railings. We have always objected to replacement of ladders every other year as regulations change, especially on retrofit of existing tanks. We recommend the changes be made during the next major tank painting project.

Retrieval from Interior:

Current Access:

Access to the roof is from the leg, sidewall, and roof ladders. The ladders do not meet MiOSHA size standards. All exterior ladders contain a rail-type fall prevention device. There is a ladder in the wet interior from the sidewall manway to the bowl area. The wet interior ladder is in poor condition and does not have a fall prevention device. There is a 12 in. x 18 in. manway in the bottom of the riser, and a 24 in. diameter roof hatch to the wet interior. The top of the bowl riser does have a grate, but has a safety railing.

Modified Access:

Providing safe access to rescue personnel is essential. Replace the sidewall ladder so it extends straight up to a work platform with railings that surrounds the roof edge hatch. Replace the existing roof hatch with a 30 in. hatch with a lockable, rainproof lid. The existing hatch is too small for a rescue basket and rescue personnel with equipment. Replace the roof ladder with a series of steps and railings to permit access to the center of the roof standing upright. Install a movable fall prevention device on the railing. Install a 42 in. high railing on the roof. The railing would allow tie-off locations and increased safety during routine maintenance. The ladder and railing could be used your personnel when checking lights, vents, and security annually; or by antenna personnel. The railing could also be used for antenna mounting. Install a new wet interior ladder from the roof hatch to the floor, and repair the damaged section of the sidewall/bowl ladder. Once in the tank there is a 6 ft. diameter riser. A 42 in. high railing has been installed around the top of the riser. This provides a safe, although slippery, work environment for the rescue crew for retrieval down the riser.

Retrieval down Riser:

1. *Retrieval down through the riser is usually the safest method. Remove the new vent from the top center of the tank, and attach a winch or pulley system to a tripod set-up over the vent.*

2. *Raise and lower the basket through the riser and out the new 30 in. diameter manway at the bottom of the riser. Rescue personnel would also raise and lower all their equipment through the riser, and then leave the wet interior using the wet interior ladder with fall prevention. On the roof, personnel would be working from inside the security of a roof railing around the center attachment area and roof hatch.*

Modifications Necessary:

1. *Install a 30 in. manway in the bottom of the riser ($7,000).*

2. *Install a new sidewall ladder with a step-off platform and roof hand rails ($10,000).*

3. *Install a new 30 in. roof hatch ($3,000).*

4. *Install a roof railing ($12,000).*

5. *Install a new wet interior ladder ($8,000).*

Equipment:

Winch or pulley system and tripod.
Basket.
Fall prevention sliders.

COST SUMMARY:

Exterior high pressure water jet and recoat with acrylic system:	$195,000
Adjust sway rods:	3,000
Install 30 in. diameter manway in riser:	7,000
Install 30 in. roof hatch:	3,000
Install roof railing with painter's rail:	12,000
Paint pit piping:	5,000
Install new wet interior ladder with fall prevention:	8,000
Replace sidewall ladder with vertical ladder and step-off platform:	10,000
Weld cathodic caps and hole in roof vent:	3,000
Repair and replace roof beams and seal weld remaining beams and plug holes:	20,000
	$266,000
Engineering and contingencies:	53,000
Total:	**$319,000**

Because of the delaminating topcoat, a long-term strategy includes removal of the total coating system and abrasive blast cleaning and repainting with a dust-tight, flexible-frame containment system – add $180,000 to exterior repainting costs.

Note: The age and design of this tank with its lattice legs, struts, sway rods, and riveted construction make it very expensive to maintain compared to modern tanks. By comparison, the cost to overcoat the exterior of a modern 650,000 gallon pedestal-style tank is estimated at $85,000. The City is encouraged to discuss with its consulting engineers long-term planning for a new tank that would be much cheaper to maintain.

INSPECTION:

On May 7, 2008, Dixon Engineering, Inc. (DIXON) performed a maintenance inspection on the 650,000 gallon double ellipse water storage tank owned by the City of Benton Harbor, MI. Purposes of the inspection were to evaluate the interior and exterior coatings' performance and life expectancy; assess the condition of metal surfaces and appurtenances; review safety and health aspects; and make budgetary recommendations for continued maintenance of the tank. All recommendations are incorporated into this report, with budgeting estimates for repairs. Inspectors for DIXON were Roy Wise, Larry Houck, and Eric Binkowski. Scheduling and arrangements for the inspection were completed through Greg Alimenti.

CONDITIONS and RECOMMENDATIONS:

Exterior Coating Conditions:

The exterior coating is a multiple coat urethane system applied in 1990. It is beginning to chalk and fade, and there is a loss of gloss. Surfaces have faded due to exposure to ultraviolet rays, which is a normal occurrence for an exposed coating system. The coating is adequately protecting the metal and aesthetics are fair. While the coating may appear to have an acceptable aesthetic quality, the actual condition is poor. Adhesion is poor and many, minor coating breaks and exposed prime coat will soon appear, allowing rust to form on the surface.

The riser coating is in fair condition, with minor breaks, with small amounts of surface rust and rust staining. Primary methods of deterioration are spot coating breaks and topcoat delamination.

The bowl coating is in fair condition, with minor coating breaks, with small amounts of surface rust and rust staining. Primary method of deterioration is spot coating breaks to the primer.

The balcony coating is in fair condition.

The exterior sidewall coating is in fair condition. Primary methods of deterioration are delamination and spot coating breaks to the primer, with small amounts of surface rust and rust staining. The sidewalls and lower bowl areas are covered with light algae growth.

The exterior roof coating is in fair condition. Primary methods of deterioration are spot coating breaks and undercoat bleed-through. There are minor areas of primer bleed-through on the roof.

Lettering on the tank consists of "BENTON HARBOR" in two locations. Lettering is block-style. There is a sidewall logo (City logo with gulls).

Exterior Coating Recommendations:

Budget for exterior overcoating by 2011, or when aesthetics dictate. The estimated cost to recoat is $195,000.

High pressure water jet (10,000 – 20,000 psi) the existing coating to remove loose and poorly adhering topcoats. The coating system would consist of a spot prime coat on the bare metal, followed by two full coats of acrylic. The acrylic system had good gloss and sheen retention. The additional recoat would supply an added barrier thickness for continued service. This alternative was selected because the existing primer has good adhesion. The purpose of this procedure is to remove all the poorly adhering topcoat, leaving the primer in-place. This procedure greatly reduces the cost of the project and prolongs the life of the coating system. The system can be repainted every eight-to-ten years without disturbing the primer. With regular recoating, the life of the existing system could be extended twenty years or more before the coating would have to be completely removed. The tank would be removed from service during the project to reduce moisture condensation on the surface.

Wet Interior Coating Conditions:

The wet interior coating is an epoxy system applied by G & M Painting in 1990. The roof coating is in good condition, 99% intact, with the primary areas of deterioration along the lap seams, beam edges, and in crevices. The tank's roof contains open lap seams that have started to rust and stain, typical for a tank of this construction where the lap seams are open and not seal welded or caulked. Staining in the lap seams is not a concern, but should be monitored during future inspections for corrosion growth. Roof beam edge corrosion is typical, but should be corrected before structural loss of steel occurs. Coating deterioration is occurring along edges of some of the roof support beams. Rust is also occurring at the roof-to-beam junction.

The sidewall coating is in good condition, 99% intact. There is no significant damage at the high water line, which would be the area most affected by ice pressures and ice movement. Causes of deterioration are spot coating breaks, delamination from age, and abrasion. The coating is still protecting the metal, with the exception of several spot coating breaks. The sidewalls are covered with light mineral staining, which does not affect the integrity of the coating system.

Coating on the bottom of the tank is in good condition, 99% intact. Causes of deterioration are blisters, spot coating breaks from age, and abrasion. The coating is still protecting the metal, with the exception of some spot coating breaks. The bottom is covered with light mineral staining, which does not affect the integrity of the coating system. The bottom of the tank was covered with approximately ¼ in. of mud sediment that was flushed from the interior.

The riser coating is in fair condition, 95% intact. Causes of deterioration are pinholes, and spot coating breaks at lap seams and stitch welds. The coating is still protecting the metal, with the exception of several spot coating breaks. The riser coating is covered with light mineral staining, which does not affect the integrity of the coating system.

Wet Interior Coating Recommendations:

The existing coating system has not deteriorated to the point where replacement is warranted. The cathodic protection system did not appear to be functioning based on the severed lines at the top of the riser. Long-term budget for repainting in ten years. The estimated cost is $95,000.

Cathodic Protection Conditions:

The floating ring cathodic protection system appeared to be non-functional. The wiring has been sheared in the bowl. Coating breaks are present on the floor, sidewalls, and riser. Pitting has started at the coating breaks, as the cathodic system is not working.

Cathodic Protection Recommendations:

Repair and continue operation of the submerged cathodic protection system. Have a qualified cathodic protection contractor maintain the system. Repairs to the system should be completed as soon as possible to minimize corrosion growth at areas of coating breaks.

Site Conditions:

The tank site is small in size and is fenced with a single locking gate. There is an average size staging area for contractors' equipment. The site is maintained. There is residential development to the east and north, and commercial development to the west. Neighbors are close to the tank and extra precaution will need to be taken to keep paint and/or debris from neighbors' properties. The site is accessible from a municipal street, and the tank is located approximately 20 ft. from the main access road. Drainage for the site is towards the foundation.

Foundation Conditions:

The exposed column and riser foundations are in good condition and showed minor amounts of deterioration. Deterioration includes chipping and spalling. The concrete is spalled without rebar exposure. Differential settlement of the foundations has not occurred from freeze/thaw cycles. The top 6 in. of the foundations are exposed. Corrosion is occurring on some of the anchor bolt chairs.

Grout Conditions:

The grout is in poor condition around the column baseplates. 20 ft. of grout is missing between the bottom plates and column foundations.

Grout Recommendations:

Remove all loose and deteriorated column caulk and repair. This could be done by in-house personnel.

Leg Conditions:

The tank is supported by ten single lattice columns that attach to the sidewalls and bowl at balcony level. The columns are in good condition and appeared in alignment.

Balcony Conditions:

Disclaimer: Unless we feel that ladders and balconies are unsafe, it is our opinion that if they were built to code at the time of construction, they do not require replacement. The code changed three times in the late 1980's and early 1990's and it seems ridiculous to replace each time. However, it is our responsibility to inform you of this possible deficiency.

The exterior balcony is in fair condition. It is located on the exterior sidewalls, is 30 in. wide, with a 42 in. high hand rail. The hand rail has a kick plate at the balcony floor. The diagonal balcony posts and top rail are angle iron. The balcony acts as a sidewall stiffener. There was no evidence of bird droppings or ponding water. There is minor corrosion at the balcony-to-tank connection.

Rod Conditions:

The tank's sway rods are in good condition. Coating on the sway rods is in fair condition, with minor spots of coating failure and surface rust on the rods and turnbuckles, and on the struts between the leg columns. Because of the inaccessibility of the sway rods, exact tension could not be determined. However, based on the amount of coating loss on the rods where the rub against each other, it was evident the rods are loose.

The riser tie rods are in good condition. The tank has ten riser tie rods that extend from the leg columns to the riser with bolted ring connections. Crevice corrosion is active behind the ring.

Rod Recommendations:

Adjust the sway rods. Loose sway rods will allow the tank to move excessively, placing undue stress on the connections. The estimated cost is $3,000.

Overflow Pipe Conditions:

The tank has an 8 in. diameter overflow pipe that exits the roof knuckle, extends down along the sidewall, through the balcony, and down along a leg column to ground level. The pipe discharges to a storm drain below grade.

Hatch/Manway Conditions:

The tank has a 24 in. diameter, flip-top, round roof access hatch to the wet interior that is in good condition. The hatch has a rainproof cover consisting of a 4 in. curb, and a 2 in. lip on the cover. It was locked. The hatch was not operable, as the roof ladder prevents opening the hatch.

The tank has a 24 in. diameter access manway in the sidewall shell, and a 24 in. diameter access manway in the riser that are in good condition. The sidewall manway is not hinged, and the gasket showed no signs of leaking. The bolts have no coating.

Hatch/Manway Recommendations:

Install a 30 in. manway in the riser. Average size rescue baskets will not pass through the existing manway. The estimated cost is $7,000.

Replace the roof access hatch with a new 30 in. curbed hatch that has a 2 in. lip, 4 in. curb, and a lockable hasp. Average size rescue baskets and rescue personnel wearing equipment will not pass through the existing 24 in. hatch. The estimated cost is $3,000.

Vent Conditions:

The roof vent is a 16 in. flow-through design. The vent has a 3 in. diameter hole cut through the top plate for antenna cable. The hole is open and would allow birds to enter the wet interior. The vent is properly screened. No evidence of entry was found.

Vent Recommendations:

Weld shut the hole that was cut in the top plate of the vent. This could be done in conjunction with roof repairs.

Roof Hand Rail/Painter's Rail Conditions:

The roof has neither a roof hand rail nor a painter's rail.

Roof Hand Rail/Painter's Rail Recommendations:

Install a 25 ft. diameter, 42 in. high railing on the roof. The railing would allow tie-off locations and safety during routine vent screen and obstruction light inspections, and would also provide a work area for retrieval personnel using roof extraction. The railing should provide sufficient area to rest a basket for helicopter lift, or for stabilizing before lowering down through the riser. Install a painter's rail outside the railing so contractor rigging does not interfere with the railing's interior clear area. The estimated cost is $12,000.

Install safety grabs and rigging couplings on the exterior roof near the painter's rail for fall prevention of workers in the wet interior. The grabs would allow workers in the wet interior to be completely tied off to fall prevention at all times. Cost would be incidental to coating costs.

Antenna Conditions:

The roof area contains one antenna that is attached to the roof vent.

The balcony has three antennas attached to mounting brackets on the hand rail. The antenna cables attached to the roof vent present a potential safety and health problem.

Antenna Recommendations:

Lock the access hatch to the wet interior. Because of the antennas there will be people working on the tank on a routine basis who may not be familiar with the sanitary requirements of a potable water supply. In addition, with more people accessing the tank, the door may be inadvertently left open.

Require the antenna contractor to return and correct the cable and hygiene problems. The simple solution is to have a mounting pole welded to the roof and a plate welded over the open hole.

Pit/Pit Piping Conditions:

The tank is operated by valves located in the pit below the tank. The pit does not have an altitude valve. The owner noted there have been no problems with the valve. The rusted piping is in poor condition. Coating on the piping is also in poor condition. The pipes and valves have extensive coating failure. Some of the valves are new and do not require painting. Said valves should be protected from damage during any maintenance painting. No coating remains on the piping. Steel loss is occurring on the flanges and bolts in the pit. The pit was dry during the inspection.

Pit/Pit Piping Recommendations:

Abrasive blast clean the piping to a near white condition (SSPC-SP10), and apply two coats of epoxy. The corroded bolts should be replaced after abrasive blast cleaning. The estimated cost is $5,000.

Fill Pipe Conditions:

The 10 in. diameter fill pipe extends 1 ft. into the bottom of the riser. The top of the pipe does not have a deflector plate.

Mud Valve Conditions:

A single mud valve is located in the bottom of the riser. The valve operated properly during the inspection.

Ladder Conditions:

The tank has an exterior leg ladder that starts approximately 12 ft. above ground level, and extends up to the balcony. The ladder is in good condition, and contains a rail-type fall prevention device.

The tank has a fixed sidewall shell and revolving roof ladder. The ladder has a rail-type fall prevention device, preventing movement. The roof ladder cannot move past the roof manway and overflow weir box. The revolving roof ladder attaches around the vent pipe at the center of the roof.

The wet interior has a ladder from the sidewall manway to the bottom of the bowl. The ladder is in poor condition, and does not meet current MiOSHA size requirements. The top section has been damaged by ice. The ladder does not have a rail-type fall prevention device. There is no ladder from the roof manway to the bowl.

Ladder Recommendations:

The revolving roof sidewall shell ladder should be replaced with a vertical sidewall ladder that runs up to a step-off platform that is surrounded with hand rails at the roof hatch. The step-off platform would provide a safe working area around the roof hatch. The estimated cost is $10,000. A hand rail from the step-off platform to the roof hand rail would replace the roof ladder. Steps or cleats would be installed to increase traction. This would remove all loading from the roof vent pipe.

Install a ladder in the wet interior from the roof to the bowl. Equip with a fall prevention device. Repair the damaged section of the sidewall/bowl ladder. The estimated cost is $8,000.

Wet Interior Metal Conditions:

The steel structure is in poor condition above the high water line, and in good condition below the high water line.

The interior roof is supported by twelve radial beams that are in poor condition, with minor corrosion at the edges. Several of the roof beams are bent and broken. There are gaps in the riveted seam where the roof meets the sidewalls. There are several old bolt holes in the roof.

There is a hand rail around the riser opening.

Metal in the riser is severely pitted. The pitting occurred prior to the current coating application. The metal is being protected by the current coating. There is minor, active corrosion in the riser.

Wet Interior Metal Recommendations:

Monitor corrosion on edges of the roof beams. Recoat the roof before metal loss becomes significant.

Reweld or replace the five bent and broken roof beams. The estimated cost is $20,000. This is budgeted separately and does not include any other paint touch-ups. Plug the old bolts holes in the roof and seal the gaps in the riveted seam where the roof meets the sidewall, and where the cathodic caps on the roof have shifted. Seal weld the remaining or undamaged roof beams.

STEEL TANK FIELD INSPECTION REPORT
LEG TANK

DATE: **May 7, 2008**

I. TANK DATA

OWNER: **City of Benton Harbor**
CLIENT CODE: **22-11-05-01**
TANK NAME: **650,000 Gallon Double Ellipse (Britain Tank)**
LOCATION: City: **Benton Harbor**
State: **MI**
TANK SIZE: Capacity: **650,000 gallons**
Height to bottom (LWL): **126 feet**
CONSTRUCTION: **Welded - Riveted**
Type of Structure: **Double Ellipse**
Type of Roof: **Ellipsoid**
Type of Bowl: **Ellipsoid**
DATE CONSTRUCTED: **1962**
MANUFACTURER: **PDM**

COATING HISTORY:	EXTERIOR	WET INTERIOR	DRY INTERIOR **N/A**
DATE LAST COATED	**1990**	**1990**	
CONTRACTOR	**G&M**	**G&M**	
PAINT SYSTEM	**Polyurethane**	**3 coat epoxy polyamide**	
SURFACE PREPARATION	**SP6**	**SP10**	
PAINT MANUFACTURER	**Tnemec**	**Tnemec**	
PAINT SAMPLES	**No**	**No**	
LEAD COATING	**No**	**No**	

INSPECTED BY: **Dixon Engineering, Inc.**
INSPECTORS: **Roy Wise; Larry Houck; Eric Binkowski**
TYPE OF INSPECTION: Maintenance
DATE LAST INSPECTED: **10/16/97**

II. INSPECTION DATA

SITE CONDITIONS:

Fenced: **Yes**
Control building: **No**
Antenna control sites: **Yes**
Number: **1**
Location: **Adjacent to riser; underneath bow; city antenna**
Site condition: **Not maintained**
Neighborhood: **Residential - Retail**
Describe surroundings: **Residential north and east; body shop west**
Power lines within 50 feet: **Yes**
Other concerns: **Building (8 ft. x 8 ft.) located 6 ft. from riser; trees and limbs touching tank southeast side; fencing 6 ft. – 8 ft. from tank legs**

PIPING:

Pit: **Yes**
Location: **Adjacent to tank**
Condition of pit structure: **Fair**
SCADA controls: **No**
Controls heated: **Yes**
Altitude valve: **Yes**
Condition of coating: **Poor**
Describe coating: **Erosion - No coating remaining**
Condition of metal: **Good**
Piping comments: **Some valves are new with intact coating; older valves/pipes have scale rust on bolts and flanges**

FOUNDATION:

Riser:

Foundation exposed: **Yes**
Amount exposed: **6 inches**
Exposed foundation condition: **Good**
Chipped or cracked: **Yes**
Severity: **Minor**
Type of grout: **None**
Indications of foundation settlement: **No**
Riser comments: **Riser moved during inspection**

Legs:

Foundation exposed: **Yes**

FOUNDATION:

Amount exposed: **6 inches**
Exposed foundation condition: **Good**
Concrete chipped or cracked: **Yes**
Severity: **Minor**
Type of grout: **Caulk**
Condition: **Fair**
Grout missing: **Yes**
Amount missing: **20 ft.**
Indications of foundation settlement: **No**
Leg comments: **Delaminated coating to substrate**

Site:

Site drainage: **Towards foundation**
Indications of underground leakage: **No**
Undermining of foundation: **No**
Shrubs, trees, etc. encroachment: **No**

EXTERIOR:

Legs:

Number: **10**
Type: **Lattice**
Exterior connection to tank: **Good**
Explain: **Minimal rusting/rust staining**
Topcoat condition: **Good**
Primer/Previous coating condition: **Good**
Describe coating: **Delamination - Spot coating breaks to substrate**
Dry film thickness (DFT) of coatings: **8 - 14 mils**
Metal condition: **Good**
Leg comments: **Delaminated topcoat to prime**

Riser:

Diameter: **72 inches**
Topcoat condition: **Fair**
Primer/Previous coating condition: **Good**
Describe coating: **Delamination - Rust bleed through**
Mildew growth: **Yes**
Amount: **Light**
Dry film thickness (DFT) of coatings: **6 - 10 mils**
Metal condition: **Good**

EXTERIOR:

Riser comments: **Delaminated topcoat-to-prime; exposed steel rusting**

Tank Bowl:

Topcoat condition: **Good**
Primer/Previous coating condition: **Good**
Mildew growth: **Yes**
Amount: **Light**
Metal condition: **Good**
Riser to bowl connection: **Good**
Bowl comments: **Light algae growth**

Tank Sidewall:

Lettering: **Yes** Number: **2**
Describe the lettering: **BENTON HARBOR**
Logo: **Yes** Number: **1**
Describe the logo: **City logo with gulls**
Topcoat condition: **Fair**
Primer/Previous coating condition: **Good**
Describe coating: **Fading - Delamination - Spot coating breaks to primer**
Dry film thickness (DFT) of coatings: **8 - 13 mils**
Metal condition: **Good**
Sidewall comments: **Topcoat cracks and delamination; areas of pinhole rusting at low film build**

Tank Roof:

Topcoat condition: **Good**
Primer/Previous coating condition: **Fair**
Describe coating: **Fading - Delamination - Spot coating breaks to substrate - Rust bleed-through**
Dry film thickness (DFT) of coatings: **7 - 14 mils**
Metal condition: **Good**
Roof comments: **Rusting at spot coating breaks; coating undercoat bleed-through from coating erosion**

EXTERIOR ACCESSORIES:

Anchor Bolts:

Number bolts per leg: **2**
Diameter: **1½ inches**

EXTERIOR ACCESSORIES:

Number of riser anchor bolts: **None**
Coating condition: **Good**
Metal condition: **Good**
Anchor bolt comments: **Some rust bleed-through and corrosion with minor steel loss**

Exterior Overflow Pipe:

Coating condition: **Good**
Metal condition: **Good**
Inside diameter: **8 inches**
Condition of screen: **None in-place**
Flap gate: **No**
Air gap: **No**
Splash pad: **No**
Overflow comments: **Overflow connects to storm sewer below grade**

Riser Manway:

Coating condition: **Fair**
Metal condition: **Good**
Size: **24 in. diameter**
Gasket leaking: **No**
Hinged: **Yes**

Struts and Rods:

Number of bays: **4**
Sway rods:
- Coating condition: **Fair**
- Metal condition: **Good**

Struts:
- Coating condition: **Fair**
- Metal condition: **Good**

Riser rods:
- Coating condition: **Fair**
- Metal condition: **Good**

Sway rods, struts, rod comments: **Loose sway rods in upper bay; coating delaminated from prime coat**

Leg Ladder:

Coating condition: **Good**

EXTERIOR ACCESSORIES:

Metal condition: **Good**
Toe clearance: **7 inches**
Width of rungs: **15 inches**
Thickness of rungs: **$^{5}/_{8}$ inch**
Shape of rungs: **Round**
Fall prevention device: **Yes**
Type: **Rail**
Condition: **Good**
Cage: **No**
Step-off Platform: **No**
Leg ladder comments: **Delaminated topcoat-to-prime; surface rusting at exposed prime**

Balcony:

Balcony width: **30 inches**
Railing height: **42 inches**
Midrail: **Diagonals**
Toe plate height: **3 inches**
Coating condition: **Fair**
Describe coating: **Delamination - Spot coating breaks to substrate**
Balcony supports and connections: **Good**
Missing bolts or rivets: **No**
Number of penetrations: **11**
Penetrations reinforced: **No**
Penetration uses: **Overflow pipe - columns**
Accumulation of bird droppings: **No**
Water pooling: **No**
Metal condition: **Good**
Balcony comments: **Antenna cables/conduit; rusting along balcony toe kick**

Sidewall Ladder:

Style: **Vertical**
Coating condition: **Good**
Metal condition: **Good**
Toe clearance: **6 inches**
Width of rungs: **15 inches**
Thickness of rungs: **$^{5}/_{8}$ inch**
Shape of rungs: **Round**

EXTERIOR ACCESSORIES:

Style: **Fixed**
Fall prevention device: **Yes**
Type: **Rail**
Cage: **No**

Sidewall Hatch:

Coating condition: **Good**
Metal condition: **Good**
Size: **24 in. diameter**
Bolted: **Yes**
Hinged: **No**
Gasket leaking: **No**

Platform: N/A

Roof Ladder:

Design: **Revolving**
Coating condition: **Good**
Metal condition: **Good**
Width of rungs: **15 inches**
Shape of rungs: **Round**
Fall prevention device: **Yes**
Type: **Rail**
Condition: **Good**
Cage: **No**
Roof ladder comments: **Roof ladder over top of the wet interior roof manway restricting manway operation; ladder offset to sidewall ladder**

Roof Handrail: N/A [Proposed Diameter: 25 feet]

Roof Access Hatches:

Wet interior:
Coating condition: **Good**
Metal condition: **Good**
Opening size: **24 inches**
Shape: **Round**
Hatch security: **Unknown**
Hatch comments: **Unable to open because of roof ladder**

EXTERIOR ACCESSORIES:

Roof Vents:

Number of vents: **1**
Type: **Standard**
Neck diameter: **16 inches**
Coating condition: **Good**
Metal condition: **Good**
Screen condition: **Good**
% of screen open: **100**
Vent Comments: **3 in. diameter hole cut in top of vent for antenna cable**

Aviation Lights: N/A

Cathodic Caps:

Number: **10 - 12**
Coating condition: **Good**
Metal condition: **Good**
Aligned: **No**
Cathodic cap comments: **Caps require adjustment to close open gaps in roof**

Rigging Couplings: N/A

Antennas:

Number: **3 + 1**
Location: **Balcony (3); Roof vent (1)**
Cable runs: **Up 2 legs**
Cables interfere with climbing: **No**
Antenna comments: **Antenna on roof runs through open hole in top of vent restricting closing of hole**

WET INTERIOR:

Tank Roof:

Topcoat condition: **Good**
Primer condition: **Good**
Metal condition: **Good**
Roof to sidewall connection: **Fair**
Condition of laps: **Good**
Laps: **Open**

EXTERIOR ACCESSORIES:

Tank roof comments: **5 approximately 6 in. gaps at roof-to-sidewall connection; several old bolt holes in roof**

Tank Sidewall:

Topcoat condition: **Good**
Primer condition: **Good**
Describe coating: **Rust undercutting - no coating where steel beams removed**
Mineral deposits: **Light**
Metal condition: **Good**
Active pitting: **No**
Previous pitting: **No**
Previous pit filling: **Unknown**
Tank Sidewall comments: **Spot rusting at rivets/lap seams**

Access Tube: N/A

Tank Bottom:

Topcoat condition: **Good**
Primer condition: **Good**
Describe coating: **Spot coating breaks to substrate**
Mineral deposits: **Light**
Metal condition: **Good**
Active pitting: **No**
Previous pitting: **No**
Previous pit filling: **Unknown**
Sediment on floor: **Yes**
Depth of sediment: **¼ inch**
Tank bottom comments: **Some burn marks from cut steel; multiple pinholes and rusting throughout bowl**

Riser:

Topcoat condition: **Good**
Primer condition: **Good**
Describe coating: **Spot coating breaks to substrate**
Metal condition: **Good**
Active pitting: **Yes**
Deepest pit depth: **⅛ inch**
Number of pits: **11-25**

EXTERIOR ACCESSORIES:

Previous pitting: **Yes**

Number of pits: **More than 75**

Previous pit filling: **Unknown**

Riser comments: **Rusting at all rivet seams**

WET INTERIOR ACCESSORIES:

Tank Ladder:

Coating condition: **Good**

Metal condition: **Fair**

Toe clearance: **8 inches**

Width of rungs: **16 inches**

Thickness of rungs: **$^{5}/_{8}$ inch**

Shape of rungs: **Round**

Shape of side rails: **Flat plate**

Fall prevention device: **No**

Tank ladder comments: **Previous steel loss on rungs**

Cathodic Protection:

Clips and pressure fitting present: **Yes**

Type: **Floating ring**

Condition: **Poor**

Explain: **Wires sheared off at top of riser**

Cathodic protection comments: **Cathodic requires repair**

Fill Pipe:

Diameter: **10 inches**

Coating condition: **Good**

Metal condition: **Good**

Height above floor: **18 inches**

Deflector plate/grate/bar: **No**

Recirculation line: **No**

Fill pipe comments: **No deflector plate**

Draw Pipe: N/A - (Same as fill pipe)

Overflow:

Type: **Weir box**

Coating condition: **Fair**

Metal condition: **Good**

WET INTERIOR ACCESSORIES:

Roof Beams: Radial
Number: **12**
Shape: **Angle**
Dimensions: **3 x 4 inches**
Coating condition: **Good**
Metal condition: **Good**
Roof beam comments: **Bottom sections have been removed approximately 5 ft. and fallen into the tank; 5 beams require repair**

Sidewall Beams: N/A

Riser Safety:
Riser grate: **No**
Riser railing: **Yes**
Railing height: **42 inches**
Midrail height: **24 inches**
Toe plate height: **4 inches**
Coating condition: **Good**
Metal condition: **Good**

Siphon: N/A

Interior Balcony: N/A

Spider: N/A

Recommendations:

Coating: **Budget to abrasive blast clean the exterior or high pressure water clean and acrylic overcoat system; abrasive blast clean pit piping and paint**

Health: **Weld cathodic caps and holes in roof; relocate antennas on roof vent; weld plate over open hole**

Safety: **Install exterior sidewall ladder with platform; adjust sway rods; install 30 in. manway in riser and 30 in. roof hatch; install railing and painter's rail on roof; new ladder in wet interior and on sidewall; install antenna post to roof and relocate antenna from roof vent**

Metal: **Fix and replace roof beams; repair cathodic protection; install deflector plate on fill pipe**

Field Inspection Report is prepared from the contractor's viewpoint. It contains most of the information the contractor needs to prepare his bid for any repairs or repainting. The Engineer uses it to prepare the engineering report. Cost estimates are more accurate if contractor problems can be anticipated. While prepared from the contractor's viewpoint, the only intended beneficiary is the owner. These reports are completed with diligence, but the accuracy is not guaranteed. The contractor is still advised to visit the site.

(1) Benton Harbor 650,000 gallon water storage tank.

(2) Delaminated coating on leg foundation, and missing grout beneath baseplate.

(3) Missing grouting on riser baseplate, and delaminated coating on foundation.

(4) Building with antenna control equipment next to riser.

(5) Delaminated topcoat on lattice leg.

(6) Delaminated topcoat on leg.

(7) Delaminated topcoat on leg and leg strut.

(8) Rust at buckles, and delaminated topcoat on strut.

(9) Delaminated topcoat on strut and leg.

(10) Delaminated coating on riser, and rust staining.

(11) Delaminated coating on riser, and rust staining.

(12) Delaminated coating on riser, and algae on bowl.

(13) Bottom of bowl, and areas of topcoat delamination.

(14) Lower bowl algae stain and accumulation.

(15) Coating intact on upper bowl.

(16) Delaminated coating/rust at balcony.

(17) Delaminated topcoat on sidewall.

(18) Sidewall ladder and pinhole rusting.

(19) Faded lettering, and overflow bracket.

(20) Pinhole rusting on sidewall.

(21) Roof coating is intact - areas of bleed-through.

(22) Exterior roof coating is intact.

(23) Roof cathodic cap.

(24) Roof ladder over top of the roof manway.

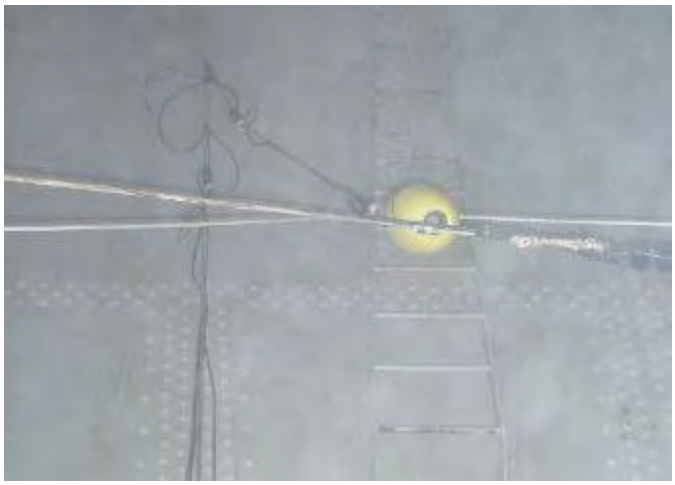
(25) Roof ladder over top of the roof manway.

(26) Overflow weir box and antenna cable showing rusting.

(27) Roof vent with antenna mount and open hole.

(28) Roof vent screen and antenna cable.

(29) Bottom of sidewall/bowl ladder.



(30) Sidewall/bowl ladder, and cathodic protection float.

(31) Damaged 4 ft. of sidewall/bowl ladder, and torn gasket.

(32) Coating breaks on lower sidewall rivets.

(33) Coating break and rusting on upper bowl.

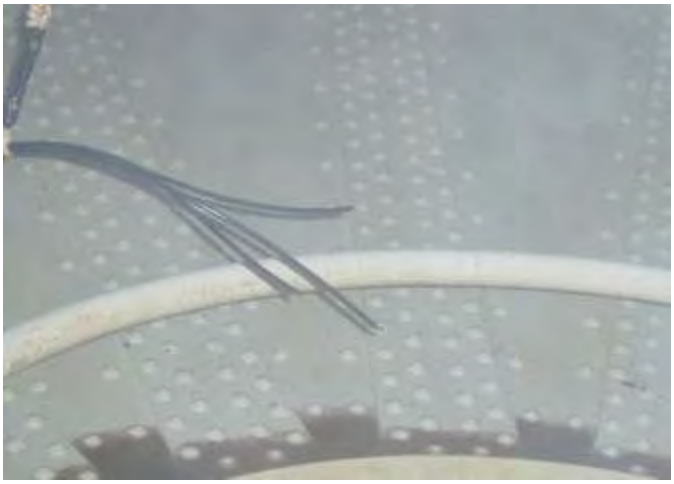
(34) Coating intact on lower sidewall.

(35) Coating intact on sidewall.

(36) Coating intact on previous pitting.

(37) Light coming through roof cathodic lift plates.

(38) Bottom of bowl, and riser railing.



(39) Cut or sheared cathodic wires.

(40) Riser-to-bowl junction - coating protecting steel.

(41) Rust staining at riser can stitch welds.

(42) Rust staining at riser can stitch welds.

(43) Rust staining at riser can stitch welds.

(44) Rusting in area of previous pitting.

(45) Coating intact in areas of previous pitting.

(46) Fill pipe and mud valve.

(47) Riser hatch manway cover hinge.

(48) Rusted pit piping and flanges.

(49) Leg ladder fall prevention rail and vandal guard.

(50) Deformed riser ladder rung.

(51) Pit door opening and stairway.

APPENDIX D

2010, 2011, 2015, 2016 ANNUAL WATER QUALITY REPORTS

City of Benton Harbor Utility Services Department's 2010 Consumers Confidence Report

Contact Us: Michael O'Malley, Benton Harbor Water Plant (269) 927-8471
Darwin Watson, Benton Harbor Public Works/Utility Services Director (269) 927-8445
Utility Billing Payment Center (269) 934-7638
Benton Charter Township Water (269) 925-0616

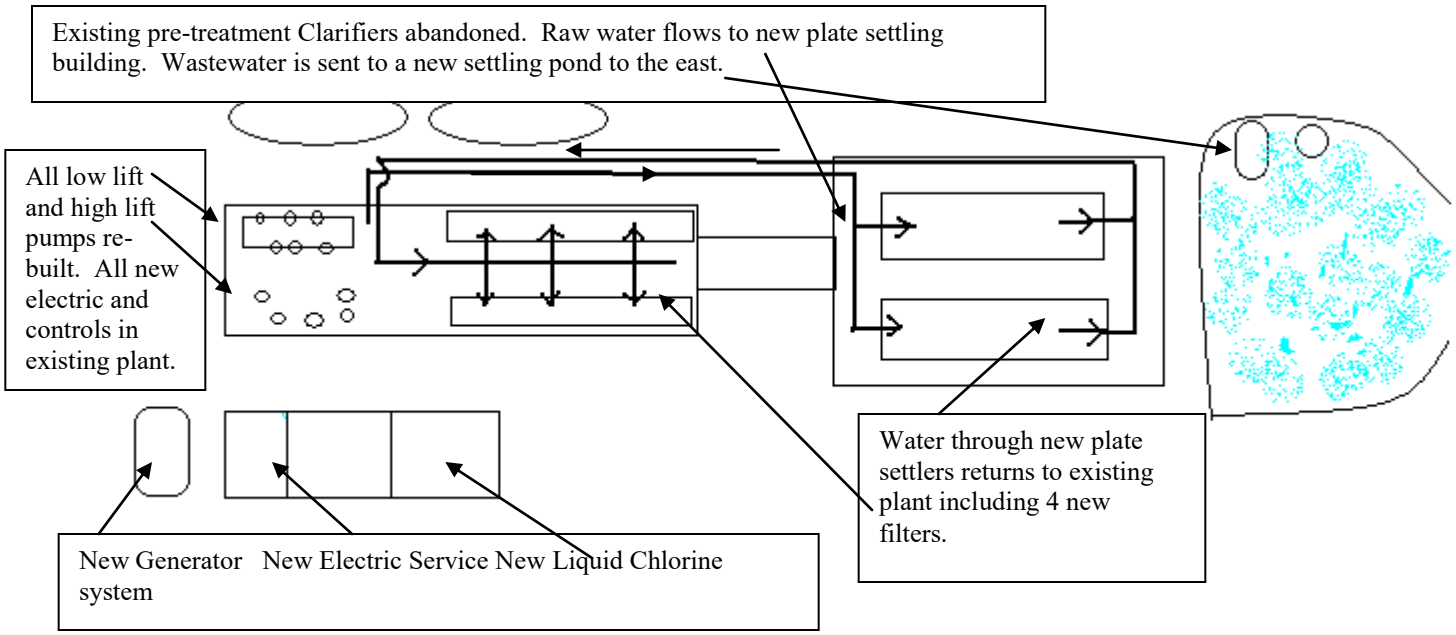
Water Plant Renovations are Nearly Complete

The Benton Harbor Water Plant is located in the southwest corner of Benton Harbor's beautiful Jean Klock Park. The Water Plant was constructed in the 1950's as a complete treatment plant that includes chemical addition for disinfection and particulate removal; mixing and settling chambers; filters; a storage reservoir; and high lift pumps to distribute the water to the City and the Townships of Benton Charter, St. Joe Charter, Hagar and Sodus. The water plant was aging and had experienced some failures. For the past 15 months the Contractor Davis Construction with several sub-contractors have been busy remodeling the existing plant and equipment and building the new treatment addition shown in the photograph. The project is nearly complete and will probably finish slightly over the $12 million budget. Funding for the project is through the State of Michigan's Drinking Water Revolving Loan Funds, which feature low interest loans to Michigan water projects. Additional funding was obtained from the Federal Government through the American Resources and Recovery Act, which will reduce the loan amount by 40%. The project is expected to be complete by October of 2011. Upon completion of the filtration plant project, the existing plant will have an anticipated life span in excess of 50 years and will offer 14 million gallons of water per day to our area users.

2010 Benton Harbor Water Quality Report

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township and St. Joseph and the soon to be completed Benton Charter Township Water Plant. Lake Michigan is a surface water supply and is venerable to a wide range of contaminates. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. A copy of the full report can be obtained by calling the water plant at (269) 927-8471.



General Health Information Provided by EPA

To ensure that tap water is safe to drink, EPA prescribes limits on the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

A. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance

For more information about our water quality, or to receive an additional copy of this report, please contact the Water Superintendent, Michael O'Malley (269) 927-8471 or e-mail to momalley@bhcity.org.

Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2010 and ending December 31, 2010, unless otherwise noted. The test results show that these contaminants were found, but are well below the drinking water guidelines.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Arsenic*	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	ND	NA	No	9/6/10	Naturally present in the environment.
Fluoride (ppm)	4	4	1.1	1.1	No	9/6/10	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	1.51	1.23 to 1.97	No	2010	Disinfectant
TOC**	TT	N/A	1.8	1.5 to 2.0	No	2010	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	7.5	7.5	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.

Chlorodibromomethane (ppb)	80	N/A	2.8	2.8	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	13	13	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.
Total Tri-halomethanes (ppb)	80	N/A	23.6	23.6	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.

**The Total Organic Carbon (TOC) was measured each quarter and the system met all TOC removal requirements set by the State of Michigan.

Regulated Monitoring Distribution System (Stage 1 Disinfection Byproduct Rule)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected/ (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	54	28 to 54	NO	2010	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	33	17 to 33	NO	2010	Formed when chlorine is added to water containing naturally occurring organic material

Unregulated Monitoring Distribution System (Stage 2 Disinfection Byproduct Rule) Testing in 2008-2009

Detected Substance	Benton Harbor city Samples Avg/High	Benton Twp Samples Ave/High	Range Across System	Likely Source of Contaminants. This testing is being conducted over a 12 month period to determine the vulnerability of various points in the 2 largest distribution systems served by the Benton Harbor Water Plant. Results listed are for tests run October to December 2008 only.
TTHM (ppb)	57/78	39/71	21 to 79	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	19/21	26/35	3 to 56	Formed when chlorine is added to water containing naturally occurring organic material

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. We have completed a 1- year study of these Chlorine by-products in the City and Township distribution systems. The results will dictate what sites we will sample from in the coming years to better assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Long Term 2 (Enhanced Surface Water Treatment Rule) Testing in 2008-2009

Detected Substance	Largest Number Detected	Range of organisms detected	Likely Source of Contaminants is Lake Michigan. Lake Michigan testing is was conducted over a 24 month period that began April 2008. Testing is complete in 2009
Cryptosporidium (# of organisms)	3	0 to 3	Open Lake Michigan. Cryptosporidium are microbes found in open water sources.
E. *coli* (# of organisms)	7	1 to 82	Open Lake Michigan. E. *coli* are bacteria found in open water sources.
Giardia	3	0 to 3	Open Lake Michigan. Giardia are microbes found in open water sources.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effulent NTU	0.3* or no sample above 1.00	N/A	0.48 & 0.38	0.07 to 0.48	No	2010	Soil runoff.

* Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indication of the effectiveness of our filtration system. The turbidity level of the filtered water shall be less than or equal to 0.30 NTU in 95% of the samples taken each month and shall not exceed 1.0 NTU at any time.

Distribution System Monitoring Lead and Copper. Last required test date 2008.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb)	15.0	0	5	2.2 to 17	0	No	Corrosion of Household plumbing
Copper (ppb)	1300	1300	76	660 to 1.9	0	No	Corrosion of Household plumbing

The testing for lead and copper was conducted at 41 homes and completed in September of 2008. Lead and copper monitoring began in the early 1990's. Testing has been done with success every three years since 1996. The results of the 2008 test are excellent with all samples tested found to be below the action level (AL) of 15 ppb for Lead and 1300 ppb for Copper. The tri-annual testing will be done as required by September 30, 2011.

Unregulated and Special Monitoring

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	7	Naturally present in the environment
Sulfate	N/A	N/A	28	Naturally present in the environment

Definitions

MCL Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

PPM parts per million or milligrams per liter (mg/l)

PPB parts per billion, or micrograms per liter (ug/l)

NTU Nephelometric Turbidity Units, a measure of the cloudiness of water

N/A Not applicable

RAA Running Annual Average.

TT Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Other Water Quality Parameters of Interest

At the plant we routinely perform other water quality tests. These tests are not for official reporting, but are useful when describing the quality of our drinking water.

Parameter	**2010 Average**	**2010 Range**	**Units**
Chlorine, distribution	0.82	.06 to 1.45	Mg/L as free Cl-
PH	7.1	6.6to 7.7	pH units
Total Alkalinity	97.4	80 to 122	Mg/L as CaCO3
Total Hardness	145	127 to 184	Mg/L as CaCO3
Calcium Hardness	45	37 to 74	Mg/L as Ca
Magnesium Hardness	8.5	2 to 13	Mg/L as Mg
Chloride	10.5	3.1 to 17.3	Mg/L as Cl-

- For Customers owning a new dishwasher the Benton Harbor average water hardness is *8-10 grains per gallon.*

Other water testing in 2010 included full testing for synthetic and additional organic chemicals. There were no detectable levels found among any of the un-regulated contaminates tested. And no detects found among the list of the contaminates including: 2 types of Carbamates; 5 types of Chlorinated Acid Herbicides; and 20 types of Pesticides.

Other Water and Sewer Projects in and around Benton Harbor

- The MDOT Business Loop I-94 project was completed in 2010. Two years of construction to replace all water, sewer a sewer lift station and storm water infrastructure; new road and sidewalks and attractive landscaping and lighting.
- Benton Charter Township began construction of its treatment plant and distribution piping in 2010 and should be complete near September of 2011. The raw water intake and pump station is on Rocky Gap Road. The treatment plant is on North Shore Drive. Water main for distribution and separation from the City lines is complete or underway on North Shore, Paw Paw Ave, Waukonda Ave, Fair Ave, Emery St, and Donald Atkins. Projects that will begin soon include M-139, Pipestone, and Colfax Ave. The City and Benton Township water departments have worked closely together to minimize interruptions in service and the project is proceeding according to plan.
- The City of Benton Harbor Sewer Department will begin an important sewer and sewer lift station project after the summer. Some badly needed sewer lines, 3 new lift stations and quality control upgrades to the other lift stations will improve overall sewer service for the residents of Benton Harbor. Funding for this project is through the State Revolving Fund (SRF) and will be approved in early to mid October 2011.

Benton Harbor Water Plant
200 E. Wall Street
Benton Harbor, MI. 49022

PRSRT STD
ECRWSS
U.S.POSTAGE PAID
EDDM Retail

**********ECRWSS**********

Local
Postal Customer
Benton Harbor, MI. 49022

City of Benton Harbor Utility Services Department's 2011 Consumers Confidence Report

Contact Us: Michael O'Malley, Benton Harbor Water Plant (269) 927-8471
Darwin Watson, Benton Harbor Public Works/Utility Services Director (269) 927-8471
Kaye Jenkins, Utility Billing Payment Center (269) 934-7638
Tom Spitzner, Water/Sewer Superintendent, (269) 927-8471

Water Plant Renovations are Complete

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2011 Benton Harbor Water Quality Report

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township and St. Joseph and Benton Charter Township Water Plant. Lake Michigan is a surface water supply and is venerable to a wide range of contaminates. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. A copy of the full report can be obtained by calling the water plant at (269) 927-8471.

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D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
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National Primary Drinking Water Regulation Compliance

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Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Public Notices Required in 2011

There were 3 events in the Benton Harbor Water System that required Public Notice to be made by the MDEQ.

1. A Filtered water turbidity sample that exceeded the 1 NTU rule on June 21, 2011.
2. A Coliform bacteria positive was found in the distribution system of St. Joseph Charter Township very near the border of the City of Benton Harbor on September 14, 2011.
3. The Water Department failed to sample all of the 30 lead and copper sites that have been collected over the past couple of years.

A Public notice for the turbidity event was distributed in 1 mass mailing by the end of July, 2011.

A Public notice for both the positive Coliform sample and the failure to complete all Lead & Copper sampling were combined into 1 notice and was distributed by mass mailing by mid-October, 2011.

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2011 and ending December 31, 2011, unless otherwise noted.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Arsenic	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	ND	NA	No	9/27/11	Naturally present in the environment.
Fluoride (ppm)	4	4	0.78	0.78	No	9/27/11	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	2.48	0.88 to 2.48	No	2011	Disinfectant
TOC**	TT	N/A	1.94	1.78 to 1.94	No	2011	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	7.2	7.2	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.
Chlorodibromomethane (ppb)	80	N/A	3.7	3.7	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	9.3	9.3	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.
Total Tri-halomethanes (ppb)	80	N/A	20	20	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.

Regulated Monitoring Distribution System (Stage 1 Disinfection Byproduct Rule)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected/ (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	45	40 to 50	NO	2011	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	33	22 to 39	NO	2011	Formed when chlorine is added to water containing naturally occurring organic material

Unregulated Monitoring Distribution System (Stage 2 Disinfection Byproduct Rule) Testing in 2008-2009

Detected Substance	Benton Harbor city Samples Avg/High	Benton Twp Samples Ave/High	Range Across System	Likely Source of Contaminants. This testing is being conducted over a 12 month period to determine the vulnerability of various points in the 2 largest distribution systems served by the Benton Harbor Water Plant. Results listed are for tests run October to December 2008 only.
TTHM (ppb)	57/78	39/71	21 to 79	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	19/21	26/35	3 to 56	Formed when chlorine is added to water containing naturally occurring organic material

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. We have completed a 1- year study of these Chlorine by-products in the City and Township distribution systems. The results will dictate what sites we will sample from in the coming years to better assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Long Term 2 (Enhanced Surface Water Treatment Rule) Testing in 2008-2009

Detected Substance	Largest Number Detected	Range of organisms detected	Likely Source of Contaminants is Lake Michigan. Lake Michigan testing is was conducted over a 24 month period that began April 2008. Testing is complete in 2009
Cryptosporidium (# of organisms)	3	0 to 3	Open Lake Michigan. Cryptosporidium are microbes found in open water sources.
E. *coli* (# of organisms)	7	1 to 82	Open Lake Michigan. E. *coli* are bacteria found in open water sources.
Giardia	3	0 to 3	Open Lake Michigan. Giardia are microbes found in open water sources.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effulent NTU	0.3* or no sample above 1.00	N/A	1.8 & 0.33	0.07 to 1.8	Yes, 1.8 NTU	2011 Violation 6/18/11	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

On June 18, 2011, our operators measured and recorded turbidity values in excess of the MDEQ standard of no sample greater than 1 NTU. This was an unusual and isolated event and has been attributed to contamination of the sample because of construction interference. Regardless of the reason for the improper result, the Water Department issued a public notice under the guidelines of the MDEQ and has to be reported in this 2011 Consumers Confidence Report (CCR).

Distribution System Monitoring Lead and Copper. Last Official Test Date 2008. And, Tests Not complete in 2011.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb) 2008	15.0	0	5	2.2 to 17	0	No	Corrosion of Household plumbing
Copper (ppb) 2008	1300	1300	76	660 to 1.9	0	No	Corrosion of Household plumbing
Lead (ppb) 2011	15.0	0	11	0 to 22	1	No	Corrosion of Household plumbing
Copper (ppb) 2011	1300	1300	70	0 to 100	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. Testing was conducted in September 2011. There were not enough homes participating in the testing and the Water Department received a violation for failing to monitor at 30 sites. Notice was sent in October, 2011 and testing is required by September 30, 2012. The results of the 2011 tests are not official but are included above.

Unregulated and Special Monitoring

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	10	Naturally present in the environment
Sulfate	N/A	N/A	33	Naturally present in the environment

Definitions

MCL Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

PPM parts per million or milligrams per liter (mg/l)

PPB parts per billion, or micrograms per liter (ug/l)

NTU Nephelometric Turbidity Units, a measure of the cloudiness of water

N/A Not applicable

RAA Running Annual Average.

TT Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Other Water Quality Parameters of Interest

At the plant we routinely perform other water quality tests. These tests are not for official reporting, but are useful when describing the quality of our drinking water.

Parameter	**2011Average**	**2011 Range**	**Units**
Chlorine	1.49	.88 to 2.48	Mg/L as free Cl-
PH	7.2	6.6to 7.7	pH units
Total Alkalinity	105	90 to 135	Mg/L as CaCO3
Total Hardness	150	130 to 197	Mg/L as CaCO3
Calcium Hardness	46	18 to 61	Mg/L as Ca
Magnesium Hardness	9	3 to 16	Mg/L as Mg
Chloride	11.5	1.4 to 19.5	Mg/L as Cl-

- For Customers owning a new dishwasher the Benton Harbor average water hardness is *8-10 grains per gallon.*

2014 Benton Harbor Water Quality Report

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 other water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township, St. Joseph, and Benton Charter Township. Lake Michigan is a surface water supply and is vulnerable to a wide range of contaminants. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry, and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River.

General Health Information Provided by EPA

To ensure that tap water is safe to drink, EPA prescribes limits on the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

A. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance
For more information about our water quality, or to receive an additional copy of this report, please contact Director of Utility Services, Stewart A. Beach (269) 927-8471 or e-mail to sbeach@cityofbentonharbormi.gov (mailto:sbeach@cityofbentonharbormi.gov) .

Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater (http://www.epa.gov/safewater/)

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2014 and ending December 31, 2014, unless otherwise noted.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants

Arsenic	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	1.5	ND to1.5	No	2/27/14	Naturally present in the environment.
Fluoride (ppm)	4	4	0.67	0.67	No	2/27/14	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	1.73	0.9 to 3.8	No	2014	Disinfectant
TOC	TT	N/A	1.785	1.31 to 3.83	No	2014	Naturally present in the environment

Regulated Monitoring Distribution System (Stage 1 Disinfection Byproduct Rule)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected/ (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	31	25.2 to 35	NO	2014	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	64	13 to 139	YES*	2014	Formed when chlorine is added to water containing naturally occurring organic material

*See "**Public Notices Required for 2014**"

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. We have completed a 1- year study of these Chlorine by-products in the City distribution system. The results will dictate what sites we will sample from in the coming years to better assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effluent NTU	0.3* or no sample above 1.00	N/A	.21	0.03 to 0.21	No	2014	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

Distribution System Monitoring Lead and Copper. Last Official Test Date 2012

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb) 2012	15.0	0	5	0 to 38	1	No	Corrosion of Household plumbing
Copper (ppb) 2012	1300	1300	200	0 to 670	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. Testing was conducted in September 2012.

If present, elevated levels of lead cab cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at http://water.epa.gov/drink/info/lead/index.cfm (http://water.epa.gov/drink/info/lead/index.cfm)

Unregulated and Special Monitoring 2/26/2014

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	16	Naturally present in the environment
Sulfate	N/A	N/A	39	Naturally present in the environment
Chloride	N/A	N/A	34	Naturally present in the environment, storm water

Definitions

MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using th
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow
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AL	Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.
PPM	parts per million or milligrams per liter (mg/l)
PPB	parts per billion, or micrograms per liter (ug/l)
NTU	Nephelometric Turbidity Units, a measure of the cloudiness of water
N/A	Not applicable
RAA	Running Annual Average.
TOC	Total Organic Carbon
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Public Notices Required for 2014

MONITORING VIOLATION

During the monitoring period July 1, 2014 to September 30, 2014, Benton Harbor did not collect the required number of routine samples for disinfection byproducts (TTHM and HAA5). We are required to collect these samples during the month of August. Additional samples were collected in the next monitoring period (October 1, 2014 to December 31, 2014), in the required sampling month of November, and our sampling returned to compliance. We are reviewing our monitoring schedule to ensure this does not happen again.

MCL VIOLATION

The City of Benton Harbor is required to sample for disinfection byproducts, which includes HAA5s, on a quarterly basis. The MCL for HAA5s is based on the Locational Running Annual Average (LRAA) which is the average of the past four quarter results. During May 2014, the City of Benton Harbor had a high irregular result but results since this sample have been below the MCL. Due to this irregular result, and the missed samples from the third quarter, we our running annual average for the fourth quarter 2014 was 64 ppb, which exceeds the MCL of 60 ppb. Some people who drink water containing haloacetic acids in excess of EPA's standard over many years may have an increased risk of getting cancer. The City of Benton Harbor collected additional samples, as required, on February 19, 2015, and the results have put the City of Benton Harbor back into compliance.

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Monitoring Requirements Not Met for City of Benton Harbor

We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During August 2014, we did not complete all monitoring for Total Trihalomethanes (TTHMs), and Haloacetic Acids (HAA5s); therefore, cannot be sure of the quality of our drinking water during that time.

What should I do? There is nothing you need to do at this time. This is not an emergency. You do not need to boil water or use an alternative source of water at this time.

The table below lists the contaminant we did not properly test for during August 2014, how often we are supposed to sample for this contaminant and how many samples we are supposed to take, how many samples we took, when samples should have been taken, and the date we collected follow-up samples.

Contaminant	Required sampling frequency	Number of samples taken	When all samples should have been taken	Date additional samples were (or will be) taken
TTHMs	2	0	8/1/2014 to 8/30/02014	11/1/2014 to 11/30/2014
HAA5s	2	0	8/1/2014 to 8/30/02014	11/1/2014 to 11/30/2014

What happened? What is being done? We failed to collect the necessary TTHMs and HAA5s samples for the monitoring period August 2014. Follow-up samples during the next compliance periods of November 2014 and February 2015 brought the City back into compliance. For more information, please contact: Stewart A. Beach at 269-927-8471

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you by the City of Benton Harbor.

<!--p>Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance

For more information about our water quality, or to receive an additional copy of this report, please contact the Water Superintendent, Stewart A. Beach (269) 927-8471 or e-mail to sbeach@cityofbentonharbormi.gov (mailto:sbeach@cityofbentonharbormi.gov) .

2015 Benton Harbor Water Quality Report

This report covers the drinking water quality for Benton Harbor for the calendar year 2015. This information is a snapshot of the quality of the water that we provided to you in 2015. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. To receive a paper copy in the mail, contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.

We invite public participation in decisions that affect drinking water quality. Meetings are held on the 1st and 3rd Monday of each month in the Lula Lee Commission Chambers, 200 E. Wall Street, Benton Harbor. For more information about your water, or the contents of this report, contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 other water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township, St. Joseph, and Benton Charter Township. Lake Michigan is a surface water supply and is vulnerable to a wide range of contaminants. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State DEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry, and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. For additional information, or to obtain a copy of the source water study, please contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.

General Health Information Provided by EPA

To ensure that tap water is safe to drink, EPA prescribes limits on the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

A. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

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National Primary Drinking Water Regulation Compliance
For more information about our water quality, or to receive an additional copy of this report, please contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.
Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Public Notices Required for 2015
Testing data from 2015 resulted in no public notices.

Water Quality Data Tables
Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists regulated contaminants detected in our water for the year beginning January 1, 2015 and ending December 31, 2015, unless otherwise noted.

Definitions

MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.
MRDL	Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MRDLG	Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
AL	Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.
PPM	parts per million or milligrams per liter (mg/l)
PPB	parts per billion, or micrograms per liter (ug/l)
NTU	Nephelometric Turbidity Units, a measure of the cloudiness of water
N/A	Not applicable
RAA	Running Annual Average.
TOC	Total Organic Carbon
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes, or No	Date of Sample	Likely Source of Contaminants
Fluoride (ppm)	4	4	0.15	N/A	No	2015	Water additive, which promotes strong teeth.
Chlorine Residual (ppm)	4	MRDL=4	1.38	0.64 to 2.16	No	2015	Disinfectant
TOC (ppm)	TT	N/A	2.11	0.79 to 2.11	No	2015	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	7.2	ND to 7.2	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.
Chlorodibromomethane (ppb)	80	N/A	2.9	ND to 2.9	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	11.0	ND to 11.0	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.

Total Trihalomethanes (ppb)	80	N/A	21.0	ND to 21.0	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.

Regulated Monitoring Distribution System (Disinfection Byproduct)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level (RAA)	Lowest-Highest Level Detected/	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	37	22.7 to 60.0	NO	2015	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	56	10 to 17	NO	2015	Formed when chlorine is added to water containing naturally occurring organic material

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effluent NTU	0.3* or no sample above 1.00	N/A	0.25	0.03 to 0.25	No	2015	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

Distribution System Monitoring Lead and Copper. Last Official Test Date 2015.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb) 2015	15.0	0	12	0 to 38	2	No	Corrosion of Household plumbing
Copper (ppb) 2015	1300	1300	0	0 to 670	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. Testing was conducted in September 2015.

** Additional Information for Lead If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Andrews University is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Unregulated and Special Monitoring 2/26/2015

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	8	Naturally present in the environment
Sulfate	N/A	N/A	23	Naturally present in the environment
Chloride	N/A	N/A	12	Naturally present in the environment, storm water

A Notice to our Benton Harbor Drinking Water Community.

Please note that the following required lead language was missing from our 2016 Consumer Confidence Report:

Information about lead: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

We apologize for this omission. A copy of the full report is available on our website at www.BentonHarborCity.com Follow the links on the opening page to the Water Page and the Updated Consumers Confidence Report. If you would like a copy you can request a paper copy by contacting The Benton Harbor Water Plant (269) 927-8471-2 or the Water Payment Center at (269) 927-8400-2. We are open weekdays 8:30 am to 5:00 pm.

The limits have not changed from 15ppb for Lead and 1300ppb for Copper but the focus on Lead in drinking has increased dramatically. Benton Harbor and nearly all Cities in Michigan are working very hard to protect the City water supply and our residents.

The lead sampling shown in the table of the report indicates that Lead is at very low or non-existent levels at most homes, but any Lead is still our focus to eliminate.

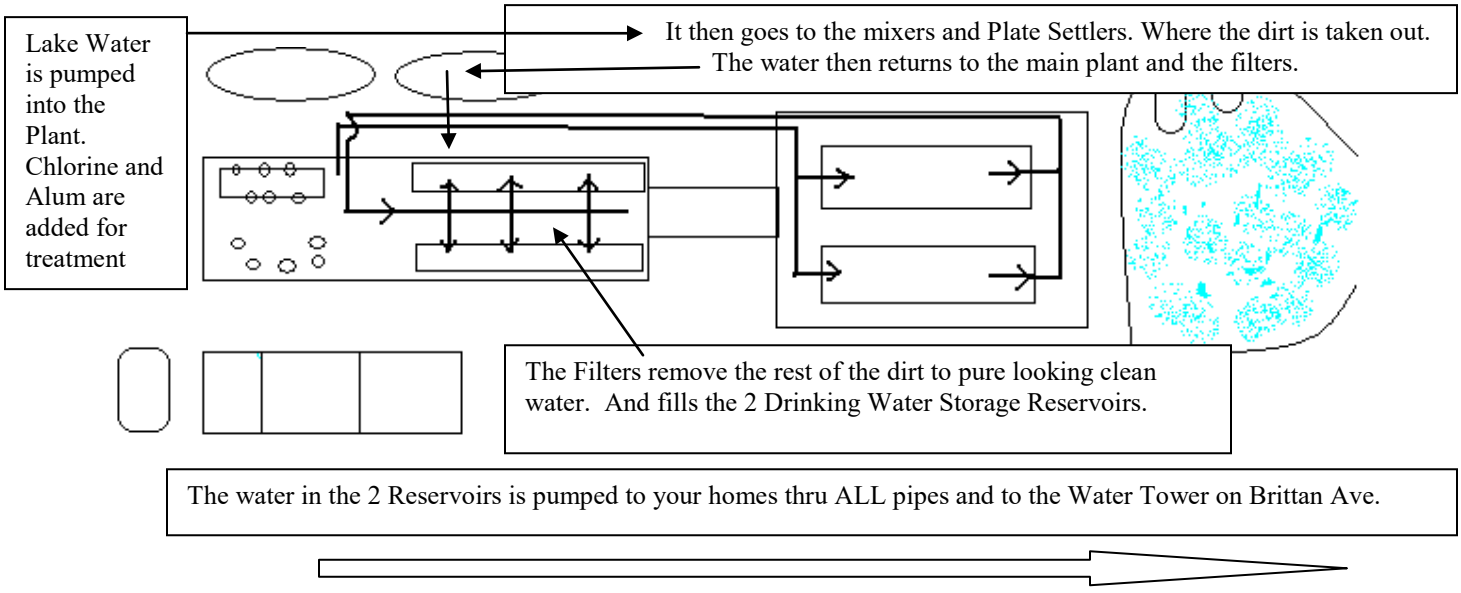
As stated above in the required MDEQ language, PLEASE, ALWAYS LET YOUR WATER RUN TILL COOL BEFORE YOU TAKE A DRINK. BE SURE TO TEACH YOUR CHILDREN AND GRANDCHILDREN TO DO THE SAME!

AND NOW OUR REVISED 2016 CCR

City of Benton Harbor Utility Services Department's 2016 Consumers Confidence Report

Contact Us: Michael O'Malley, Benton Harbor Water Plant (269) 927-8471
Darwin Watson, Benton Harbor City Manager (269) 927-
Kaye Jenkins, Utility Billing Payment Center (269) 934-7638

A diagram of the equipment and how we make Lake Michigan Safe for Drinking at the Benton Harbor Water Plant



2016 Benton Harbor Water Quality Report

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The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. A copy of the full report can be obtained by calling the water plant at (269) 927-8471.

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B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance

For more information about our water quality, or to receive an additional copy of this report, please contact the Water Superintendent, Michael O'Malley (269) 927-8471 or e-mail to momalley@cityofbentonharbormi.gov .

Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Public Notices Required in 2016

There was one (1) event in the Benton Harbor Water System that required Public Notice to be made to you by MDEQ rules. The notice was a testing violation where, the water was not tested for Disinfection by Products in February of 2016 on the appropriate day, as was required.

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2016 and ending December 31, 2016, unless otherwise noted. Other contaminates are required as regulated monitoring, that the Water Plant

Test results in the next few tables are tests that our Water Plant personnel cannot do. These are sampled and sent to the MDEQ laboratory in Lansing and listed in the tables with various dates assigned. The last table in this report are tests routinely done at the water plant.

Regulated Monitoring at the Plant Done at the MDEQ Laboratory in Lansing, MI.

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Arsenic◀	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	0.5	0.4 to 0.5	No	9/30/16& 11/21/16	Naturally present in the environment.
Fluoride (ppm)	4	4	0.78	0.6 to 0.78	No	9/30/16& 11/21/16	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	1.86	1.37 to 3.14	No	2016	Disinfectant
TOC**	TT	N/A	1.97	1.35 to 1.97	No	2016	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	11	11	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.
Chlorodibromomethane (ppb)	80	N/A	4.8	4.8	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	18	18	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.
Total Tri-halomethanes (ppb)	80	N/A		34	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.

Regulated Monitoring Distribution System (Stage 2 Disinfection Byproduct Rule) Testing in 2016

Detected Substance	LRRA is locational Running Annual Average	Benton Harbor city Samples LRRA Site 1	Benton Harbor city Samples LRRA Site 2	Likely Source of Contaminants. This testing is being conducted over a 12 month period to determine the vulnerability of various points in the 2 largest distribution systems served by the Benton Harbor Water Plant. Results listed are for tests run October to December 2008 only.
TTHM (ppb)	Each site is measured in ppb	**51.5**	**48.1**	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	19/21 Each site is measured in ppb	**14.5**	**12.0**	Formed when chlorine is added to water containing naturally occurring organic material

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. They form when Chlorine is in contact with organic matter over time. The results are averaged at each location as a running annual average (LRAA) to assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Long Term 2 (Enhanced Surface Water Treatment Rule) Testing in 2008-2009

Detected Substance	Largest Number Detected	Range of organisms detected	Likely Source of Contaminants is Lake Michigan. Lake Michigan testing is was conducted over a 24 month period that began April 2008. Testing is complete in 2009
Cryptosporidium (# of organisms)	3	0 to 3	Open Lake Michigan. Cryptosporidium are microbes found in open water sources.
E. *coli* (# of organisms)	7	1 to 82	Open Lake Michigan. E. *coli* are bacteria found in open water sources.
Giardia	3	0 to 3	Open Lake Michigan. Giardia are microbes found in open water sources.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effulent NTU	0.3* or no sample above 1.00	N/A	1.8 & 0.33	0.07 to 1.8	Yes, 1.8 NTU	2011 Violation 6/18/11	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

Distribution System Monitoring Lead and Copper. Last Official Test Date 2008. And, Tests Not complete in 2011.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Result Detected	Range	Sites Found Above AL of 15 ppb.	Violation	Likely Source of Contaminants
Lead (ppb)	15.0	0	12	0 to 38	2	No	Corrosion of Household plumbing
Copper (ppb)	1300	1300	0	0 to 670	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. The 9th round of Benton Harbor testing was conducted in September 2015. The 2 sites above the EPA action level were more than 12 ppb and one at 38 ppb. All homes on the list of sites are notified of their results and the site with 38 ppb had their water line replaced with copper. The next round of testing #10 is due in 2018.

Information about lead: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Unregulated and Special Monitoring

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	17	Naturally present in the environment
Sulfate	N/A	N/A	29	Naturally present in the environment
Fluoride	2 Secondary and 4 Primary	N/A	0.6	Water Additive to help protect teeth from Dental Caries and for Public Health

A sample was taken at the Water Plant on September 9, 2016. A laboratory in South Bend analyzed it for total Cyanide and did not detect any. Cyanide is a dangerous chemical and the EPA is determining how it may be monitored in water systems in the future.

Definitions

MCL Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

PPM parts per million or milligrams per liter (mg/l)

PPB parts per billion, or micrograms per liter (ug/l)

NTU Nephelometric Turbidity Units, a measure of the cloudiness of water

N/A Not applicable

RAA Running Annual Average.

LRAA Locational Running Annual Average.

TT Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Other Water Quality Parameters of Interest

At the plant we routinely perform other water quality tests. These tests are not for official reporting, but are useful when describing the quality of our drinking water.

Parameter	2016Average	2016 Range	Units
Chlorine	1.86	1.37 to 3.14	Mg/L as free Cl-
PH	7.67	7.3to 8.2	pH units
Total Alkalinity	105	93 to 133	Mg/L as CaCO3
Total Hardness	166	112 to 208	Mg/L as CaCO3
Calcium Hardness	48	30 to 67	Mg/L as Ca
Magnesium Hardness	11	2 to 18	Mg/L as Mg
Chloride	26.1	22.5 to 32.5	Mg/L as Cl-
Fluoride as F-ion	0.73	0.23 to 1.07	Mg/L as F-ion

- For Customers owning a new dishwasher the Benton Harbor average water hardness is *8-10 grains per gallon.*

APPENDIX E

SYSTEM ANALYSIS MAPS

Water Main Age

Remaining Useful Life

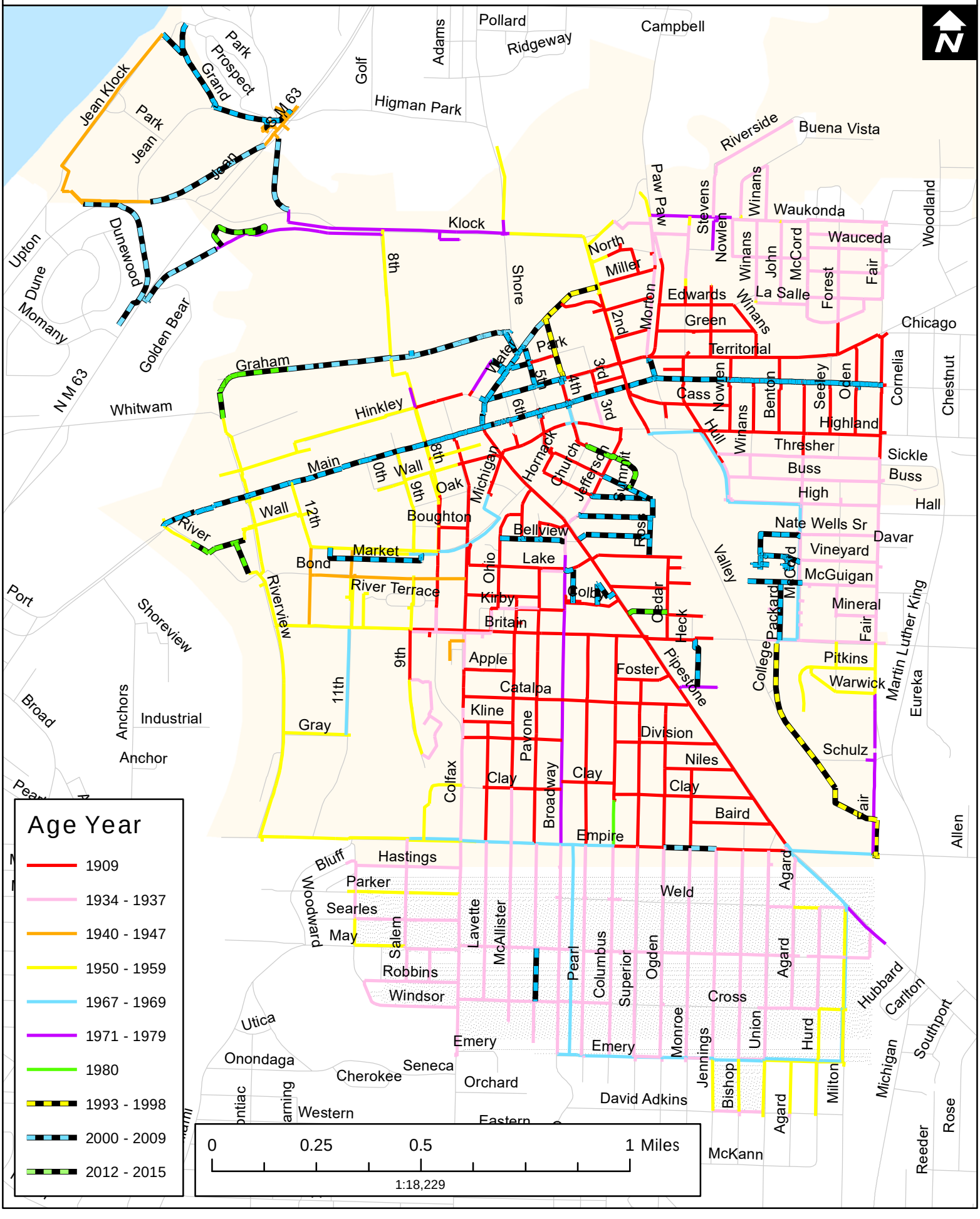
Probability of Failure

Consequence of Failure

Business Risk Evaluation Scores

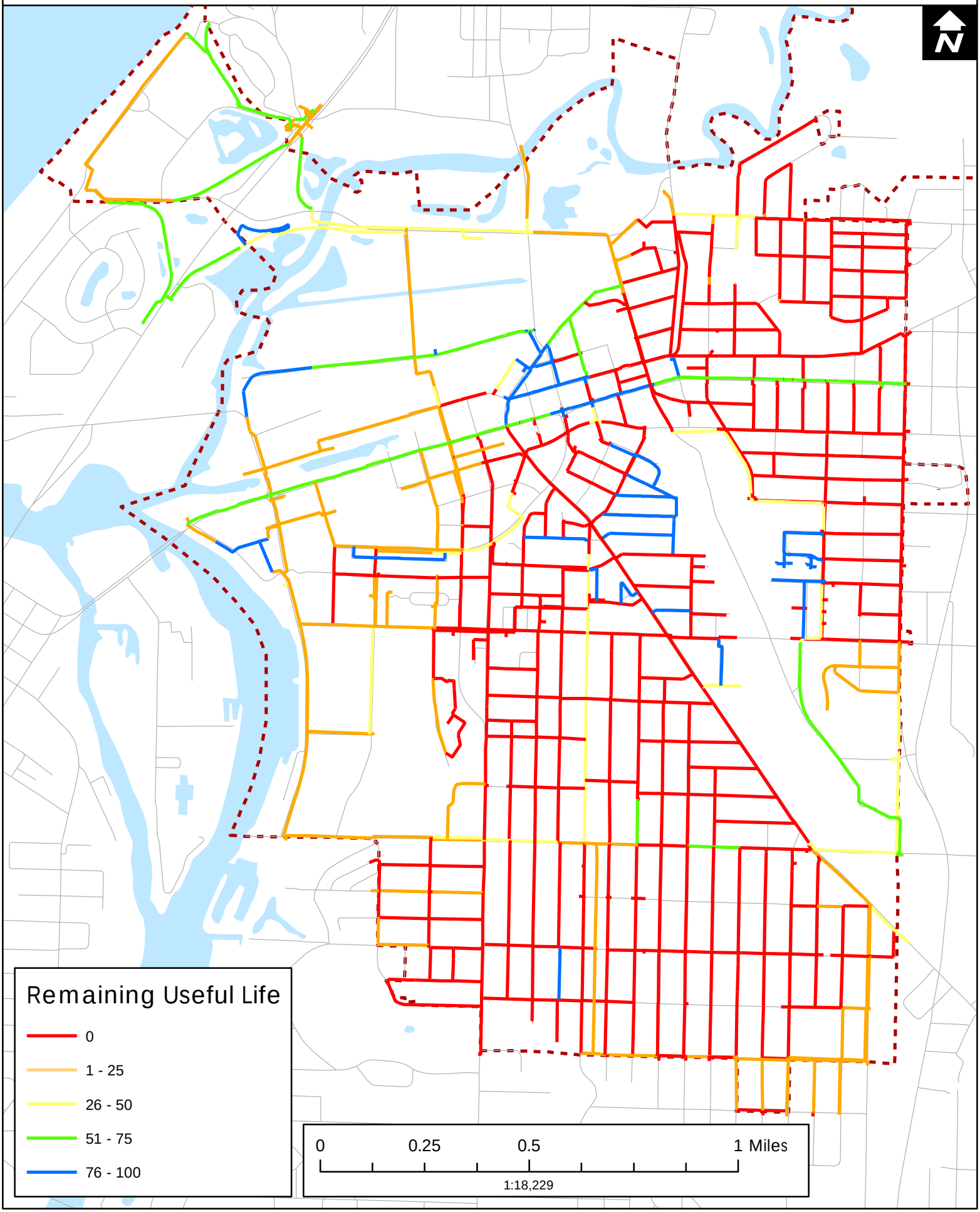
Water Mains

Benton Harbor, MI



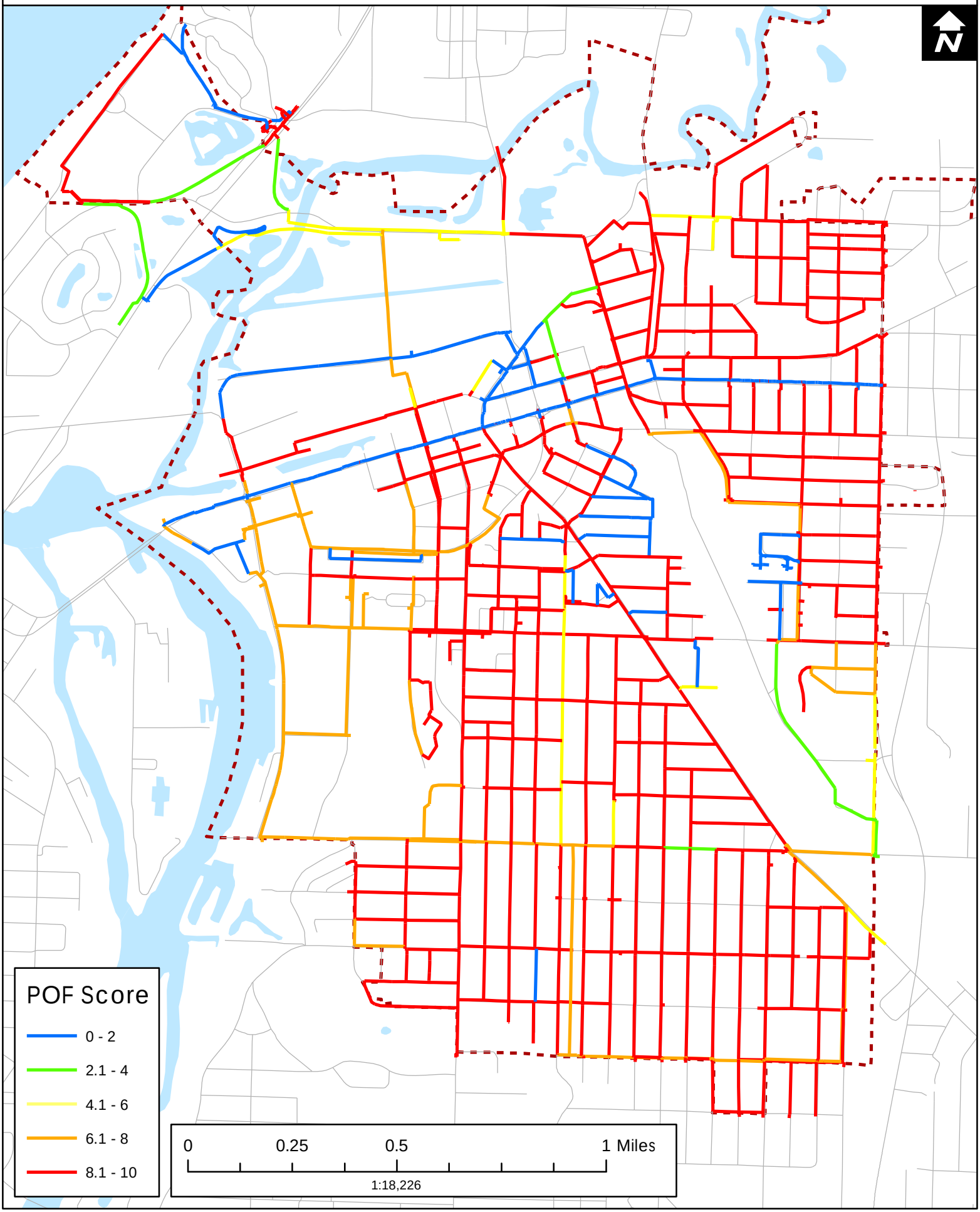
Water Mains

Benton Harbor, MI



Water Mains

Benton Harbor, MI



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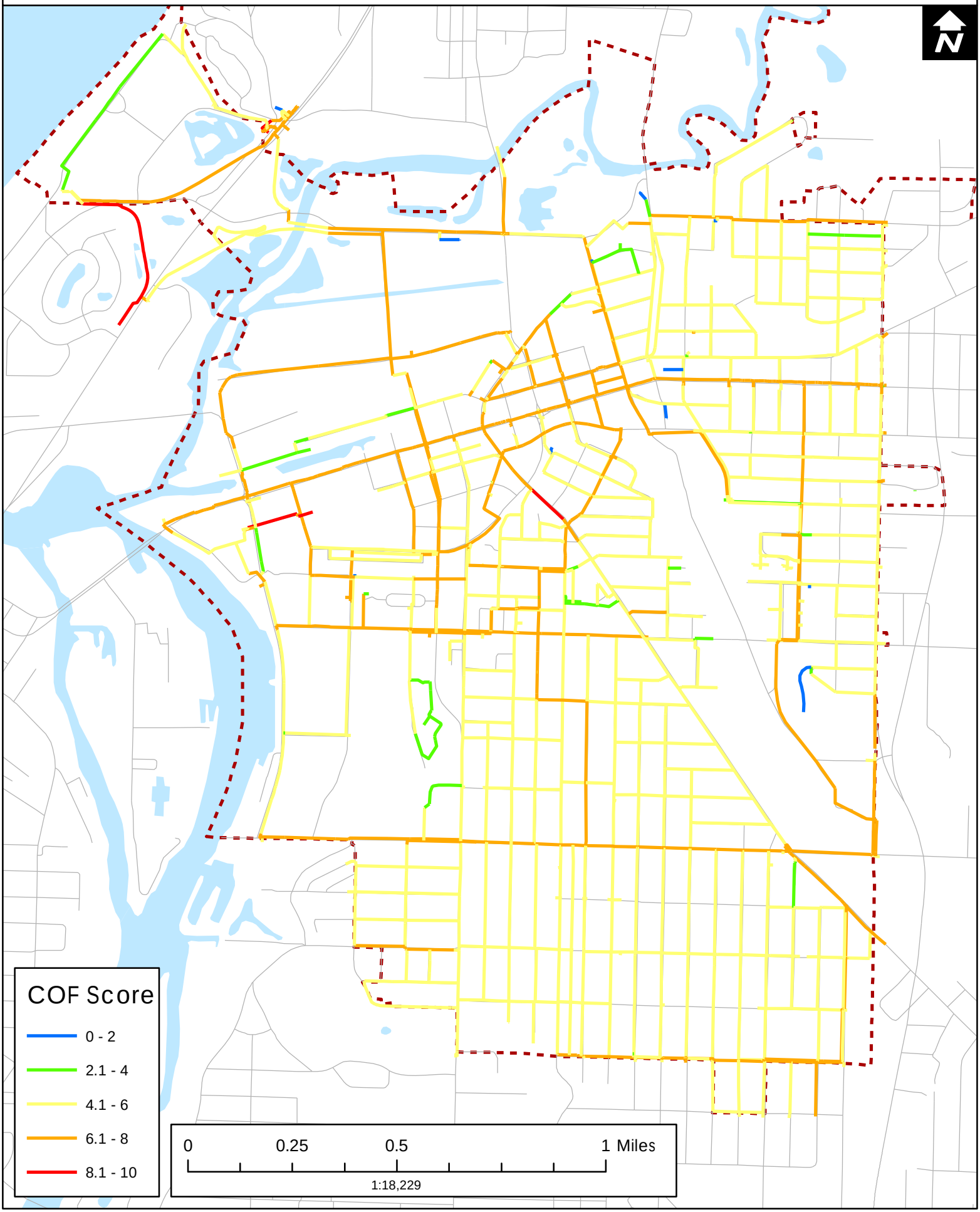
Benton Harbor, MI



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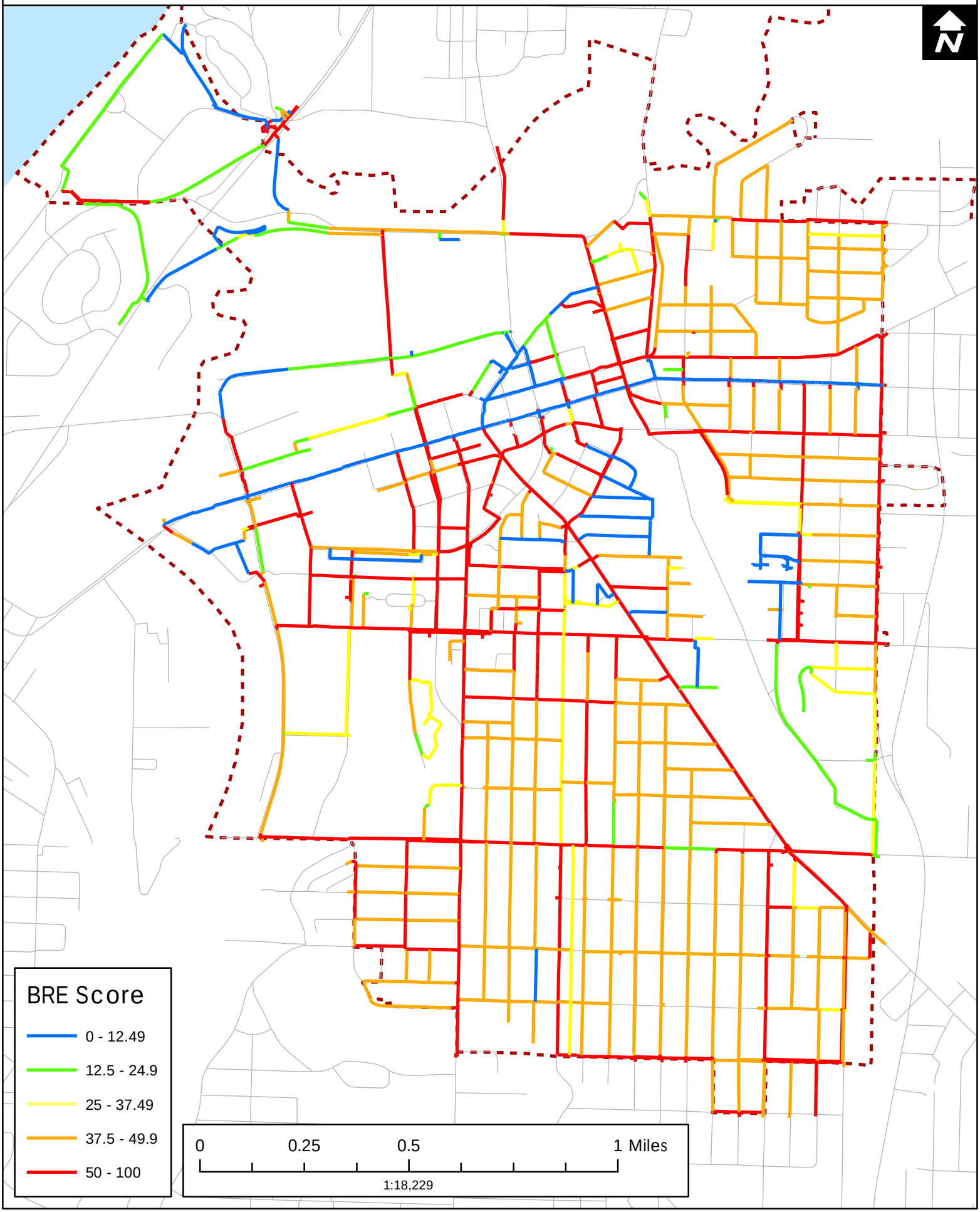
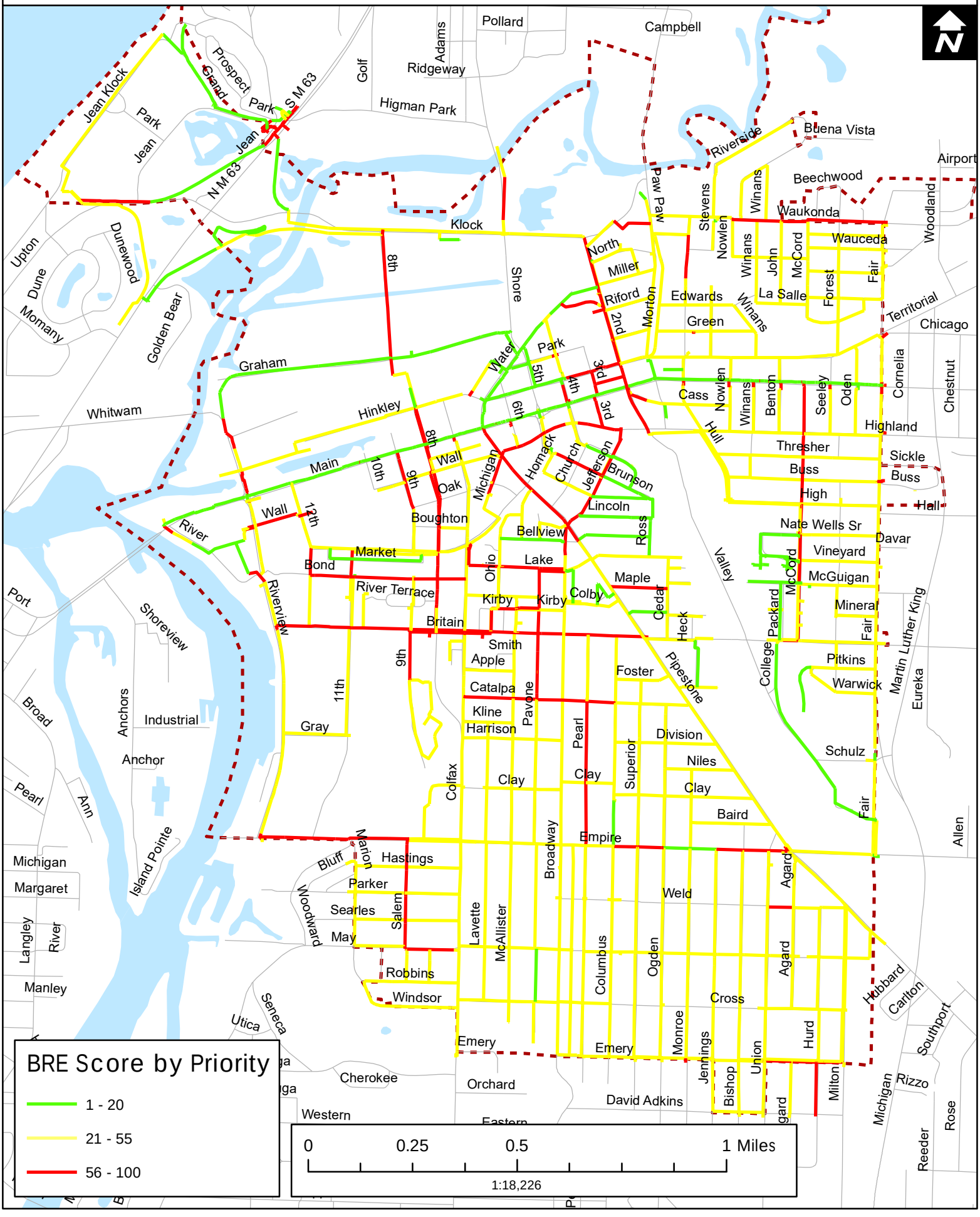
Benton Harbor, MI



Water Mains

Benton Harbor, MI



APPENDIX F

CIP PLAN ESTIMATES

5-Year CIP

20-Year CIP

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Britain Avenue (Riverview to Pipestone)
Prepared By: Aaron Townley, EIT

Britain Avenue (Riverview to Pipestone)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 203,600.00	$ 203,600.00
2	Traffic Control	LSum	1	$ 97,000.00	$ 97,000.00
3	Machine Grading	Sta	59.1	$ 1,200.00	$ 70,920.00
4	Pavt, Rem, Modified	Syd	7224	$ 9.00	$ 65,016.00
5	Aggregate Base, 8 inch	Syd	7224	$ 9.00	$ 65,016.00
6	Subbase, CIP (12 Inches)	Cyd	2408	$ 13.50	$ 32,508.00
7	HMA Surface	Ton	2086	$ 80.00	$ 166,880.00
8	Fire Hydrant Assembly	Ea	15	$ 4,000.00	$ 60,000.00
9	Gate Valve & Box, 16 Inch	Ea	17	$ 6,500.00	$ 110,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	5910	$ 200.00	$ 1,182,000.00
11	Water Service	Ea	79	$ 1,750.00	$ 138,250.00
12	Curb Stop and Box	Ea	79	$ 500.00	$ 39,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	1580	$ 5.00	$ 7,900.00
Britain Avenue (Riverview to Pipestone) Estimate					$ 2,239,090.00
Contingency				**15%**	$ 335,900.00
Engineering & Construction Administration				**20%**	$ 447,900.00
Total Estimated Water Main Construction Costs					$ 3,022,890.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 8th Street (Hinkley to Britain)
Prepared By: Aaron Townley, EIT

8th Street (Hinkley to Britain)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 119,300.00	$ 119,300.00
2	Traffic Control	LSum	1	$ 56,800.00	$ 56,800.00
3	Machine Grading	Sta	46.73	$ 1,200.00	$ 56,076.00
4	Pavt, Rem, Modified	Syd	5712	$ 9.00	$ 51,408.00
5	Aggregate Base, 8 inch	Syd	5712	$ 9.00	$ 51,408.00
6	Subbase, CIP (12 Inches)	Cyd	1904	$ 13.50	$ 25,704.00
7	HMA Surface	Ton	1650	$ 80.00	$ 132,000.00
8	Fire Hydrant Assembly	Ea	12	$ 4,000.00	$ 48,000.00
9	Gate Valve & Box, 12 Inch	Ea	14	$ 2,750.00	$ 38,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	4673	$ 125.00	$ 584,125.00
11	Water Service	Ea	63	$ 1,750.00	$ 110,250.00
12	Curb Stop and Box	Ea	63	$ 500.00	$ 31,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	1260	$ 5.00	$ 6,300.00
8th Street (Hinkley to Britain) Estimate					$ 1,311,371.00
Contingency				**15%**	$ 196,800.00
Engineering & Construction Administration				**20%**	$ 262,300.00
Total Estimated Water Main Construction Costs					$ 1,770,471.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Pipestone Rd (Main Street to Washington Street)
Prepared By: Aaron Townley, EIT

Pipestone Rd (Main Street to Washington Street)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 48,500.00	$ 48,500.00
2	Traffic Control	LSum	1	$ 23,100.00	$ 23,100.00
3	Machine Grading	Sta	18.86	$ 1,200.00	$ 22,632.00
4	Pavt, Rem, Modified	Syd	2306	$ 9.00	$ 20,754.00
5	Aggregate Base, 8 inch	Syd	2306	$ 9.00	$ 20,754.00
6	Subbase, CIP (12 Inches)	Cyd	769	$ 13.50	$ 10,381.50
7	HMA Surface	Ton	666	$ 80.00	$ 53,280.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1886	$ 125.00	$ 235,750.00
11	Water Service	Ea	26	$ 1,750.00	$ 45,500.00
12	Curb Stop and Box	Ea	26	$ 500.00	$ 13,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	520	$ 5.00	$ 2,600.00
Pipestone Rd (Main Street to Washington Street) Estimate					$ 532,751.50
Contingency				**15%**	$ 80,000.00
Engineering & Construction Administration				**20%**	$ 106,600.00
Total Estimated Water Main Construction Costs					$ 719,351.50

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Project Name:Benton Harbor Water Asset Management Plan
Project Location: Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson)
Prepared By: Aaron Townley, EIT

Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 50,800.00	$ 50,800.00
2	Traffic Control	LSum	1	$ 24,200.00	$ 24,200.00
3	Machine Grading	Sta	19.89	$ 1,200.00	$ 23,868.00
4	Pavt, Rem, Modified	Syd	2431	$ 9.00	$ 21,879.00
5	Aggregate Base, 8 inch	Syd	2431	$ 9.00	$ 21,879.00
6	Subbase, CIP (12 Inches)	Cyd	811	$ 13.50	$ 10,948.50
7	HMA Surface	Ton	702	$ 80.00	$ 56,160.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1989	$ 125.00	$ 248,625.00
11	Water Service	Ea	27	$ 1,750.00	$ 47,250.00
12	Curb Stop and Box	Ea	27	$ 500.00	$ 13,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	540	$ 5.00	$ 2,700.00
Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson) Estimate					$ 558,309.50
Contingency				**15%**	$ 83,800.00
Engineering & Construction Administration				**20%**	$ 111,700.00
Total Estimated Water Main Construction Costs					$ 753,809.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Whitwam-Riverview Dr (Main Street to Whitwam Dr)
Prepared By: Aaron Townley, EIT

Whitwam-Riverview Dr (Main Street to Whitwam Dr)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 19,700.00	$ 19,700.00
2	Traffic Control	LSum	1	$ 9,400.00	$ 9,400.00
3	Machine Grading	Sta	7.54	$ 1,200.00	$ 9,048.00
4	Pavt, Rem, Modified	Syd	922	$ 9.00	$ 8,298.00
5	Aggregate Base, 8 inch	Syd	922	$ 9.00	$ 8,298.00
6	Subbase, CIP (12 Inches)	Cyd	308	$ 13.50	$ 4,158.00
7	HMA Surface	Ton	267	$ 80.00	$ 21,360.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	754	$ 125.00	$ 94,250.00
11	Water Service	Ea	11	$ 1,750.00	$ 19,250.00
12	Curb Stop and Box	Ea	11	$ 500.00	$ 5,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	220	$ 5.00	$ 1,100.00
Whitwam-Riverview Dr (Main Street to Whitwam Dr) Estimate					$ 216,612.00
Contingency				**15%**	$ 32,500.00
Engineering & Construction Administration				**20%**	$ 43,400.00
Total Estimated Water Main Construction Costs					$ 292,512.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Empire Ave (Riverview Dr to Salem Ave)
Prepared By: Aaron Townley, EIT

Empire Ave (Riverview Dr to Salem Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 49,600.00	$ 49,600.00
2	Traffic Control	LSum	1	$ 23,600.00	$ 23,600.00
3	Machine Grading	Sta	19.42	$ 1,200.00	$ 23,304.00
4	Pavt, Rem, Modified	Syd	2374	$ 9.00	$ 21,366.00
5	Aggregate Base, 8 inch	Syd	2374	$ 9.00	$ 21,366.00
6	Subbase, CIP (12 Inches)	Cyd	792	$ 13.50	$ 10,692.00
7	HMA Surface	Ton	686	$ 80.00	$ 54,880.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1942	$ 125.00	$ 242,750.00
11	Water Service	Ea	26	$ 1,750.00	$ 45,500.00
12	Curb Stop and Box	Ea	26	$ 500.00	$ 13,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	520	$ 5.00	$ 2,600.00
Empire Ave (Riverview Dr to Salem Ave) Estimate					$ 545,158.00
Contingency				**15%**	$ 81,800.00
Engineering & Construction Administration				**20%**	$ 109,100.00
Total Estimated Water Main Construction Costs					$ 736,058.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Empire Ave (Columbus Ave to Ogden Ave)
Prepared By: Aaron Townley, EIT

Empire Ave (Columbus Ave to Ogden Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 12,900.00	$ 12,900.00
2	Traffic Control	LSum	1	$ 6,200.00	$ 6,200.00
3	Machine Grading	Sta	6.28	$ 1,200.00	$ 7,536.00
4	Pavt, Rem, Modified	Syd	768	$ 9.00	$ 6,912.00
5	Aggregate Base, 8 inch	Syd	768	$ 9.00	$ 6,912.00
6	Subbase, CIP (12 Inches)	Cyd	256	$ 13.50	$ 3,456.00
7	HMA Surface	Ton	222	$ 80.00	$ 17,760.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	628	$ 75.00	$ 47,100.00
11	Water Service	Ea	9	$ 1,750.00	$ 15,750.00
12	Curb Stop and Box	Ea	9	$ 500.00	$ 4,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	180	$ 5.00	$ 900.00
Empire Ave (Columbus Ave to Ogden Ave) Estimate					$ 141,426.00
Contingency				**15%**	$ 21,300.00
Engineering & Construction Administration				**20%**	$ 28,300.00
Total Estimated Water Main Construction Costs					$ 191,026.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Empire Ave (Jennings Ave to Pipestone St)
Prepared By: Aaron Townley, EIT

Empire Ave (Jennings Ave to Pipestone St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 20,500.00	$ 20,500.00
2	Traffic Control	LSum	1	$ 9,800.00	$ 9,800.00
3	Machine Grading	Sta	10.09	$ 1,200.00	$ 12,108.00
4	Pavt, Rem, Modified	Syd	1234	$ 9.00	$ 11,106.00
5	Aggregate Base, 8 inch	Syd	1234	$ 9.00	$ 11,106.00
6	Subbase, CIP (12 Inches)	Cyd	412	$ 13.50	$ 5,562.00
7	HMA Surface	Ton	357	$ 80.00	$ 28,560.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 8 Inch	Ea	3	$ 1,750.00	$ 5,250.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	1009	$ 75.00	$ 75,675.00
11	Water Service	Ea	14	$ 1,750.00	$ 24,500.00
12	Curb Stop and Box	Ea	14	$ 500.00	$ 7,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	280	$ 5.00	$ 1,400.00
Empire Ave (Jennings Ave to Pipestone St) Estimate					$ 224,567.00
Contingency				**15%**	$ 33,700.00
Engineering & Construction Administration				**20%**	$ 45,000.00
Total Estimated Water Main Construction Costs					$ 303,267.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Salem Ave (Empire Ave to May St to Colfax Ave)
Prepared By: Aaron Townley, EIT

Salem Ave (Empire Ave to May St to Colfax Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 40,500.00	$ 40,500.00
2	Traffic Control	LSum	1	$ 19,300.00	$ 19,300.00
3	Machine Grading	Sta	20.13	$ 1,200.00	$ 24,156.00
4	Pavt, Rem, Modified	Syd	2461	$ 9.00	$ 22,149.00
5	Aggregate Base, 8 inch	Syd	2461	$ 9.00	$ 22,149.00
6	Subbase, CIP (12 Inches)	Cyd	821	$ 13.50	$ 11,083.50
7	HMA Surface	Ton	711	$ 80.00	$ 56,880.00
8	Fire Hydrant Assembly	Ea	6	$ 4,000.00	$ 24,000.00
9	Gate Valve & Box, 8 Inch	Ea	6	$ 1,750.00	$ 10,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	2013	$ 75.00	$ 150,975.00
11	Water Service	Ea	27	$ 1,750.00	$ 47,250.00
12	Curb Stop and Box	Ea	27	$ 500.00	$ 13,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	540	$ 5.00	$ 2,700.00
Salem Ave (Empire Ave to May St to Colfax Ave) Estimate					$ 445,142.50
Contingency				**15%**	$ 66,800.00
Engineering & Construction Administration				**20%**	$ 89,100.00
Total Estimated Water Main Construction Costs					$ 601,042.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Emery Ave (Union St to Milton and Hurd Ave south)
Prepared By: Aaron Townley, EIT

Emery Ave (Union St to Milton and Hurd Ave south)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 35,000.00	$ 35,000.00
2	Traffic Control	LSum	1	$ 16,700.00	$ 16,700.00
3	Machine Grading	Sta	17.36	$ 1,200.00	$ 20,832.00
4	Pavt, Rem, Modified	Syd	2122	$ 9.00	$ 19,098.00
5	Aggregate Base, 8 inch	Syd	2122	$ 9.00	$ 19,098.00
6	Subbase, CIP (12 Inches)	Cyd	708	$ 13.50	$ 9,558.00
7	HMA Surface	Ton	613	$ 80.00	$ 49,040.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 8 Inch	Ea	5	$ 1,750.00	$ 8,750.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	1736	$ 75.00	$ 130,200.00
11	Water Service	Ea	24	$ 1,750.00	$ 42,000.00
12	Curb Stop and Box	Ea	24	$ 500.00	$ 12,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	480	$ 5.00	$ 2,400.00
Emery Ave (Union St to Milton and Hurd Ave south) Estimate					$ 384,676.00
Contingency				**15%**	$ 57,800.00
Engineering & Construction Administration				**20%**	$ 77,000.00
Total Estimated Water Main Construction Costs					$ 519,476.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Pearl St (Catalpa Ave to Empire Ave)
Prepared By: Aaron Townley, EIT

Pearl St (Catalpa Ave to Empire Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 43,300.00	$ 43,300.00
2	Traffic Control	LSum	1	$ 20,600.00	$ 20,600.00
3	Machine Grading	Sta	18.21	$ 1,200.00	$ 21,852.00
4	Pavt, Rem, Modified	Syd	2226	$ 9.00	$ 20,034.00
5	Aggregate Base, 8 inch	Syd	2226	$ 9.00	$ 20,034.00
6	Subbase, CIP (12 Inches)	Cyd	742	$ 13.50	$ 10,017.00
7	HMA Surface	Ton	386	$ 80.00	$ 30,880.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1821	$ 125.00	$ 227,625.00
11	Water Service	Ea	19	$ 1,750.00	$ 33,250.00
12	Curb Stop and Box	Ea	19	$ 500.00	$ 9,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	380	$ 5.00	$ 1,900.00
Pearl St (Catalpa Ave to Empire Ave) Estimate					$ 475,492.00
Contingency				**15%**	$ 71,400.00
Engineering & Construction Administration				**20%**	$ 95,100.00
Total Estimated Water Main Construction Costs					$ 641,992.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Catalpa Ave (Colfax Ave to Columbus Ave)
Prepared By: Aaron Townley, EIT

Catalpa Ave (Colfax Ave to Columbus Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 45,400.00	$ 45,400.00
2	Traffic Control	LSum	1	$ 21,700.00	$ 21,700.00
3	Machine Grading	Sta	19.22	$ 1,200.00	$ 23,064.00
4	Pavt, Rem, Modified	Syd	2350	$ 9.00	$ 21,150.00
5	Aggregate Base, 8 inch	Syd	2350	$ 9.00	$ 21,150.00
6	Subbase, CIP (12 Inches)	Cyd	784	$ 13.50	$ 10,584.00
7	HMA Surface	Ton	407	$ 80.00	$ 32,560.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1922	$ 125.00	$ 240,250.00
11	Water Service	Ea	20	$ 1,750.00	$ 35,000.00
12	Curb Stop and Box	Ea	20	$ 500.00	$ 10,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	400	$ 5.00	$ 2,000.00
Catalpa Ave (Colfax Ave to Columbus Ave) Estimate					$ 499,358.00
Contingency				**15%**	$ 75,000.00
Engineering & Construction Administration				**20%**	$ 99,900.00
Total Estimated Water Main Construction Costs					$ 674,258.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Pavone St (Lake Ave to Catalpa Ave)
Prepared By: Aaron Townley, EIT

Pavone St (Lake Ave to Catalpa Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 39,300.00	$ 39,300.00
2	Traffic Control	LSum	1	$ 18,700.00	$ 18,700.00
3	Machine Grading	Sta	16.52	$ 1,200.00	$ 19,824.00
4	Pavt, Rem, Modified	Syd	2020	$ 9.00	$ 18,180.00
5	Aggregate Base, 8 inch	Syd	2020	$ 9.00	$ 18,180.00
6	Subbase, CIP (12 Inches)	Cyd	674	$ 13.50	$ 9,099.00
7	HMA Surface	Ton	350	$ 80.00	$ 28,000.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	5	$ 2,750.00	$ 13,750.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1652	$ 125.00	$ 206,500.00
11	Water Service	Ea	17	$ 1,750.00	$ 29,750.00
12	Curb Stop and Box	Ea	17	$ 500.00	$ 8,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	340	$ 5.00	$ 1,700.00
Pavone St (Lake Ave to Catalpa Ave) Estimate					$ 431,483.00
Contingency				**15%**	$ 64,800.00
Engineering & Construction Administration				**20%**	$ 86,300.00
Total Estimated Water Main Construction Costs					$ 582,583.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Ohio St Alleys (Britain Ave to Pavone St)
Prepared By: Aaron Townley, EIT

Ohio St Alleys (Britain Ave to Pavone St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 21,100.00	$ 21,100.00
2	Traffic Control	LSum	1	$ 10,100.00	$ 10,100.00
3	Machine Grading	Sta	8.78	$ 1,200.00	$ 10,536.00
4	Pavt, Rem, Modified	Syd	1074	$ 9.00	$ 9,666.00
5	Aggregate Base, 8 inch	Syd	1074	$ 9.00	$ 9,666.00
6	Subbase, CIP (12 Inches)	Cyd	358	$ 13.50	$ 4,833.00
7	HMA Surface	Ton	186	$ 80.00	$ 14,880.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	878	$ 125.00	$ 109,750.00
11	Water Service	Ea	9	$ 1,750.00	$ 15,750.00
12	Curb Stop and Box	Ea	9	$ 500.00	$ 4,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	180	$ 5.00	$ 900.00
Ohio St Alleys (Britain Ave to Pavone St) Estimate					$ 231,931.00
Contingency				**15%**	$ 34,800.00
Engineering & Construction Administration				**20%**	$ 46,400.00
Total Estimated Water Main Construction Costs					$ 313,131.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Lake Ave (Market St to Broadway Ave)
Prepared By: Aaron Townley, EIT

Lake Ave (Market St to Broadway Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 47,500.00	$ 47,500.00
2	Traffic Control	LSum	1	$ 22,700.00	$ 22,700.00
3	Machine Grading	Sta	18.51	$ 1,200.00	$ 22,212.00
4	Pavt, Rem, Modified	Syd	2263	$ 9.00	$ 20,367.00
5	Aggregate Base, 8 inch	Syd	2263	$ 9.00	$ 20,367.00
6	Subbase, CIP (12 Inches)	Cyd	755	$ 13.50	$ 10,192.50
7	HMA Surface	Ton	654	$ 80.00	$ 52,320.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1851	$ 125.00	$ 231,375.00
11	Water Service	Ea	25	$ 1,750.00	$ 43,750.00
12	Curb Stop and Box	Ea	25	$ 500.00	$ 12,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	500	$ 5.00	$ 2,500.00
Lake Ave (Market St to Broadway Ave) Estimate					$ 522,283.50
Contingency				**15%**	$ 78,400.00
Engineering & Construction Administration				**20%**	$ 104,500.00
Total Estimated Water Main Construction Costs					$ 705,183.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Broadway Ave / Jefferson St (Lake Ave to Highland Ave)
Prepared By: Aaron Townley, EIT

Broadway Ave / Jefferson St (Lake Ave to Highland Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 48,600.00	$ 48,600.00
2	Traffic Control	LSum	1	$ 23,100.00	$ 23,100.00
3	Machine Grading	Sta	18.9	$ 1,200.00	$ 22,680.00
4	Pavt, Rem, Modified	Syd	2310	$ 9.00	$ 20,790.00
5	Aggregate Base, 8 inch	Syd	2310	$ 9.00	$ 20,790.00
6	Subbase, CIP (12 Inches)	Cyd	770	$ 13.50	$ 10,395.00
7	HMA Surface	Ton	668	$ 80.00	$ 53,440.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1890	$ 125.00	$ 236,250.00
11	Water Service	Ea	26	$ 1,750.00	$ 45,500.00
12	Curb Stop and Box	Ea	26	$ 500.00	$ 13,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	520	$ 5.00	$ 2,600.00
Broadway Ave / Jefferson St (Lake Ave to Highland Ave) Estimate					$ 533,645.00
Contingency				**15%**	$ 80,100.00
Engineering & Construction Administration				**20%**	$ 106,800.00
Total Estimated Water Main Construction Costs					$ 720,545.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: McCord St (Main St to Britain Ave)
Prepared By: Aaron Townley, EIT

McCord St (Main St to Britain Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 89,000.00	$ 89,000.00
2	Traffic Control	LSum	1	$ 42,400.00	$ 42,400.00
3	Machine Grading	Sta	34.91	$ 1,200.00	$ 41,892.00
4	Pavt, Rem, Modified	Syd	4267	$ 9.00	$ 38,403.00
5	Aggregate Base, 8 inch	Syd	4267	$ 9.00	$ 38,403.00
6	Subbase, CIP (12 Inches)	Cyd	1423	$ 13.50	$ 19,210.50
7	HMA Surface	Ton	1233	$ 80.00	$ 98,640.00
8	Fire Hydrant Assembly	Ea	9	$ 4,000.00	$ 36,000.00
9	Gate Valve & Box, 12 Inch	Ea	10	$ 2,750.00	$ 27,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	3491	$ 125.00	$ 436,375.00
11	Water Service	Ea	47	$ 1,750.00	$ 82,250.00
12	Curb Stop and Box	Ea	47	$ 500.00	$ 23,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	940	$ 5.00	$ 4,700.00
McCord St (Main St to Britain Ave) Estimate					$ 978,273.50
Contingency				**15%**	$ 146,800.00
Engineering & Construction Administration				**20%**	$ 195,700.00
Total Estimated Water Main Construction Costs					$ 1,320,773.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 2nd St, Klock Rd to Highland Ave
Prepared By: Aaron Townley, EIT

2nd St, Klock Rd to Highland Ave					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 107,500.00	$ 107,500.00
2	Traffic Control	LSum	1	$ 51,200.00	$ 51,200.00
3	Machine Grading	Sta	31.16	$ 1,200.00	$ 37,392.00
4	Pavt, Rem, Modified	Syd	3809	$ 9.00	$ 34,281.00
5	Aggregate Base, 8 inch	Syd	3809	$ 9.00	$ 34,281.00
6	Subbase, CIP (12 Inches)	Cyd	1270	$ 13.50	$ 17,145.00
7	HMA Surface	Ton	1100	$ 80.00	$ 88,000.00
8	Fire Hydrant Assembly	Ea	8	$ 4,000.00	$ 32,000.00
9	Gate Valve & Box, 16 Inch	Ea	9	$ 6,500.00	$ 58,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	3116	$ 200.00	$ 623,200.00
11	Water Service	Ea	42	$ 1,750.00	$ 73,500.00
12	Curb Stop and Box	Ea	42	$ 500.00	$ 21,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	840	$ 5.00	$ 4,200.00
2nd St, Klock Rd to Highland Ave Estimate					$ 1,182,199.00
Contingency				**15%**	$ 177,400.00
Engineering & Construction Administration				**20%**	$ 236,500.00
Total Estimated Water Main Construction Costs					$ 1,596,099.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Waukonda Ave (Nowlen St to Fair Ave)
Prepared By: Aaron Townley, EIT

Waukonda Ave (Nowlen St to Fair Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 48,000.00	$ 48,000.00
2	Traffic Control	LSum	1	$ 22,900.00	$ 22,900.00
3	Machine Grading	Sta	20.23	$ 1,200.00	$ 24,276.00
4	Pavt, Rem, Modified	Syd	2473	$ 9.00	$ 22,257.00
5	Aggregate Base, 8 inch	Syd	2473	$ 9.00	$ 22,257.00
6	Subbase, CIP (12 Inches)	Cyd	825	$ 13.50	$ 11,137.50
7	HMA Surface	Ton	429	$ 80.00	$ 34,320.00
8	Fire Hydrant Assembly	Ea	6	$ 4,000.00	$ 24,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	2023	$ 125.00	$ 252,875.00
11	Water Service	Ea	21	$ 1,750.00	$ 36,750.00
12	Curb Stop and Box	Ea	21	$ 500.00	$ 10,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	420	$ 5.00	$ 2,100.00
Waukonda Ave (Nowlen St to Fair Ave) Estimate					$ 527,872.50
Contingency				**15%**	$ 79,200.00
Engineering & Construction Administration				**20%**	$ 105,600.00
Total Estimated Water Main Construction Costs					$ 712,672.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Bond St (Market St to Colfax Ave)
Prepared By: Aaron Townley, EIT

Bond St (Market St to Colfax Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 53,500.00	$ 53,500.00
2	Traffic Control	LSum	1	$ 25,500.00	$ 25,500.00
3	Machine Grading	Sta	26.77	$ 1,200.00	$ 32,124.00
4	Pavt, Rem, Modified	Syd	3272	$ 9.00	$ 29,448.00
5	Aggregate Base, 8 inch	Syd	3272	$ 9.00	$ 29,448.00
6	Subbase, CIP (12 Inches)	Cyd	1091	$ 13.50	$ 14,728.50
7	HMA Surface	Ton	945	$ 80.00	$ 75,600.00
8	Fire Hydrant Assembly	Ea	7	$ 4,000.00	$ 28,000.00
9	Gate Valve & Box, 8 Inch	Ea	8	$ 1,750.00	$ 14,000.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	2677	$ 75.00	$ 200,775.00
11	Water Service	Ea	36	$ 1,750.00	$ 63,000.00
12	Curb Stop and Box	Ea	36	$ 500.00	$ 18,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	720	$ 5.00	$ 3,600.00
Bond St (Market St to Colfax Ave) Estimate					$ 587,723.50
Contingency				**15%**	$ 88,200.00
Engineering & Construction Administration				**20%**	$ 117,600.00
Total Estimated Water Main Construction Costs					$ 793,523.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 9th St (Main St to Oak St)
Prepared By: Aaron Townley, EIT

9th St (Main St to Oak St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 19,800.00	$ 19,800.00
2	Traffic Control	LSum	1	$ 9,500.00	$ 9,500.00
3	Machine Grading	Sta	7.57	$ 1,200.00	$ 9,084.00
4	Pavt, Rem, Modified	Syd	926	$ 9.00	$ 8,334.00
5	Aggregate Base, 8 inch	Syd	926	$ 9.00	$ 8,334.00
6	Subbase, CIP (12 Inches)	Cyd	309	$ 13.50	$ 4,171.50
7	HMA Surface	Ton	268	$ 80.00	$ 21,440.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	757	$ 125.00	$ 94,625.00
11	Water Service	Ea	11	$ 1,750.00	$ 19,250.00
12	Curb Stop and Box	Ea	11	$ 500.00	$ 5,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	220	$ 5.00	$ 1,100.00
9th St (Main St to Oak St) Estimate					$ 217,388.50
Contingency				**15%**	$ 32,700.00
Engineering & Construction Administration				**20%**	$ 43,500.00
Total Estimated Water Main Construction Costs					$ 293,588.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Territorial Rd (4th St to 2nd St)
Prepared By: Aaron Townley, EIT

Territorial Rd (4th St to 2nd St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 19,300.00	$ 19,300.00
2	Traffic Control	LSum	1	$ 9,200.00	$ 9,200.00
3	Machine Grading	Sta	7.43	$ 1,200.00	$ 8,916.00
4	Pavt, Rem, Modified	Syd	909	$ 9.00	$ 8,181.00
5	Aggregate Base, 8 inch	Syd	909	$ 9.00	$ 8,181.00
6	Subbase, CIP (12 Inches)	Cyd	303	$ 13.50	$ 4,090.50
7	HMA Surface	Ton	263	$ 80.00	$ 21,040.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	743	$ 125.00	$ 92,875.00
11	Water Service	Ea	10	$ 1,750.00	$ 17,500.00
12	Curb Stop and Box	Ea	10	$ 500.00	$ 5,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	200	$ 5.00	$ 1,000.00
Territorial Rd (4th St to 2nd St) Estimate					$ 211,533.50
Contingency				**15%**	$ 31,800.00
Engineering & Construction Administration				**20%**	$ 42,400.00
Total Estimated Water Main Construction Costs					$ 285,733.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 3rd St / East Alley (Territorial to Highland Ave)
Prepared By: Aaron Townley, EIT

3rd St / East Alley (Territorial to Highland Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 28,200.00	$ 28,200.00
2	Traffic Control	LSum	1	$ 13,400.00	$ 13,400.00
3	Machine Grading	Sta	10.88	$ 1,200.00	$ 13,056.00
4	Pavt, Rem, Modified	Syd	1330	$ 9.00	$ 11,970.00
5	Aggregate Base, 8 inch	Syd	1330	$ 9.00	$ 11,970.00
6	Subbase, CIP (12 Inches)	Cyd	444	$ 13.50	$ 5,994.00
7	HMA Surface	Ton	384	$ 80.00	$ 30,720.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 12 Inch	Ea	4	$ 2,750.00	$ 11,000.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1088	$ 125.00	$ 136,000.00
11	Water Service	Ea	15	$ 1,750.00	$ 26,250.00
12	Curb Stop and Box	Ea	15	$ 500.00	$ 7,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	300	$ 5.00	$ 1,500.00
3rd St / East Alley (Territorial to Highland Ave) Estimate					$ 309,560.00
Contingency				**15%**	$ 46,500.00
Engineering & Construction Administration				**20%**	$ 62,000.00
Total Estimated Water Main Construction Costs					$ 418,060.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 8th St (Klock Rd to Graham Ave)
Prepared By: Aaron Townley, EIT

8th St (Klock Rd to Graham Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 64,400.00	$ 64,400.00
2	Traffic Control	LSum	1	$ 30,700.00	$ 30,700.00
3	Machine Grading	Sta	18.48	$ 1,200.00	$ 22,176.00
4	Pavt, Rem, Modified	Syd	2259	$ 9.00	$ 20,331.00
5	Aggregate Base, 8 inch	Syd	2259	$ 9.00	$ 20,331.00
6	Subbase, CIP (12 Inches)	Cyd	753	$ 13.50	$ 10,165.50
7	HMA Surface	Ton	653	$ 80.00	$ 52,240.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 16 Inch	Ea	6	$ 6,500.00	$ 39,000.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	1848	$ 200.00	$ 369,600.00
11	Water Service	Ea	25	$ 1,750.00	$ 43,750.00
12	Curb Stop and Box	Ea	25	$ 500.00	$ 12,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	500	$ 5.00	$ 2,500.00
8th St (Klock Rd to Graham Ave) Estimate					$ 707,693.50
Contingency				**15%**	$ 106,200.00
Engineering & Construction Administration				**20%**	$ 141,600.00
Total Estimated Water Main Construction Costs					$ 955,493.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Wall St (Riverview Dr to 12th St)
Prepared By: Aaron Townley, EIT

Wall St (Riverview Dr to 12th St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 33,900.00	$ 33,900.00
2	Traffic Control	LSum	1	$ 16,200.00	$ 16,200.00
3	Machine Grading	Sta	9.73	$ 1,200.00	$ 11,676.00
4	Pavt, Rem, Modified	Syd	1190	$ 9.00	$ 10,710.00
5	Aggregate Base, 8 inch	Syd	1190	$ 9.00	$ 10,710.00
6	Subbase, CIP (12 Inches)	Cyd	397	$ 13.50	$ 5,359.50
7	HMA Surface	Ton	344	$ 80.00	$ 27,520.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 16 Inch	Ea	3	$ 6,500.00	$ 19,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	973	$ 200.00	$ 194,600.00
11	Water Service	Ea	13	$ 1,750.00	$ 22,750.00
12	Curb Stop and Box	Ea	13	$ 500.00	$ 6,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	260	$ 5.00	$ 1,300.00
Wall St (Riverview Dr to 12th St) Estimate					$ 372,725.50
Contingency				**15%**	$ 56,000.00
Engineering & Construction Administration				**20%**	$ 74,600.00
Total Estimated Water Main Construction Costs					$ 503,325.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Hull Ave (Frank St to ~350 ft North of Edwards Ave)
Prepared By: Aaron Townley, EIT

Hull Ave (Frank St to ~350 ft North of Edwards Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 10,300.00	$ 10,300.00
2	Traffic Control	LSum	1	$ 4,900.00	$ 4,900.00
3	Machine Grading	Sta	5.5	$ 1,200.00	$ 6,600.00
4	Pavt, Rem, Modified	Syd	673	$ 9.00	$ 6,057.00
5	Aggregate Base, 8 inch	Syd	673	$ 9.00	$ 6,057.00
6	Subbase, CIP (12 Inches)	Cyd	225	$ 13.50	$ 3,037.50
7	HMA Surface	Ton	117	$ 80.00	$ 9,360.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	550	$ 75.00	$ 41,250.00
11	Water Service	Ea	6	$ 1,750.00	$ 10,500.00
12	Curb Stop and Box	Ea	6	$ 500.00	$ 3,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	120	$ 5.00	$ 600.00
Hull Ave (Frank St to ~350 ft North of Edwards Ave) Estimate					$ 113,161.50
Contingency				**15%**	$ 17,000.00
Engineering & Construction Administration				**20%**	$ 22,700.00
Total Estimated Water Main Construction Costs					$ 152,861.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Klock Rd, Water Plant to East
Prepared By: Aaron Townley, EIT

Klock Rd, Water Plant to East					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 31,100.00	$ 31,100.00
2	Traffic Control	LSum	1	$ 14,800.00	$ 14,800.00
3	Machine Grading	Sta	8.8	$ 1,200.00	$ 10,560.00
4	Pavt, Rem, Modified	Syd	1076	$ 9.00	$ 9,684.00
5	Aggregate Base, 8 inch	Syd	1076	$ 9.00	$ 9,684.00
6	Subbase, CIP (12 Inches)	Cyd	359	$ 13.50	$ 4,846.50
7	HMA Surface	Ton	311	$ 80.00	$ 24,880.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 16 Inch	Ea	3	$ 6,500.00	$ 19,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	880	$ 200.00	$ 176,000.00
11	Water Service	Ea	12	$ 1,750.00	$ 21,000.00
12	Curb Stop and Box	Ea	12	$ 500.00	$ 6,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	240	$ 5.00	$ 1,200.00
Klock Rd, Water Plant to East Estimate					$ 341,254.50
Contingency				**15%**	$ 51,200.00
Engineering & Construction Administration				**20%**	$ 68,300.00
Total Estimated Water Main Construction Costs					$ 460,754.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: North Shore Dr, Klock Rd to North
Prepared By: Aaron Townley, EIT

North Shore Dr, Klock Rd to North					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 11,300.00	$ 11,300.00
2	Traffic Control	LSum	1	$ 5,400.00	$ 5,400.00
3	Machine Grading	Sta	5.41	$ 1,200.00	$ 6,492.00
4	Pavt, Rem, Modified	Syd	662	$ 9.00	$ 5,958.00
5	Aggregate Base, 8 inch	Syd	662	$ 9.00	$ 5,958.00
6	Subbase, CIP (12 Inches)	Cyd	221	$ 13.50	$ 2,983.50
7	HMA Surface	Ton	191	$ 80.00	$ 15,280.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	541	$ 75.00	$ 40,575.00
11	Water Service	Ea	8	$ 1,750.00	$ 14,000.00
12	Curb Stop and Box	Ea	8	$ 500.00	$ 4,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	160	$ 5.00	$ 800.00
North Shore Dr, Klock Rd to North Estimate					$ 124,246.50
Contingency				**15%**	$ 18,700.00
Engineering & Construction Administration				**20%**	$ 24,900.00
Total Estimated Water Main Construction Costs					$ 167,846.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Paw Paw Ave, West of Paw Paw Ave between Waukonda Ave and Frank St
Prepared By: Aaron Townley, EIT

Paw Paw Ave, West of Paw Paw Ave between Waukonda Ave and Frank St					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 18,000.00	$ 18,000.00
2	Traffic Control	LSum	1	$ 8,600.00	$ 8,600.00
3	Machine Grading	Sta	5.3	$ 1,200.00	$ 6,360.00
4	Pavt, Rem, Modified	Syd	648	$ 9.00	$ 5,832.00
5	Aggregate Base, 8 inch	Syd	648	$ 9.00	$ 5,832.00
6	Subbase, CIP (12 Inches)	Cyd	216	$ 13.50	$ 2,916.00
7	HMA Surface	Ton	113	$ 80.00	$ 9,040.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 16 Inch	Ea	2	$ 6,500.00	$ 13,000.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	530	$ 200.00	$ 106,000.00
11	Water Service	Ea	6	$ 1,750.00	$ 10,500.00
12	Curb Stop and Box	Ea	6	$ 500.00	$ 3,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	120	$ 5.00	$ 600.00
Paw Paw Ave, West of Paw Paw Ave between Waukonda Ave and Frank St Estimate					$ 197,680.00
Contingency				**15%**	$ 29,700.00
Engineering & Construction Administration				**20%**	$ 39,600.00
Total Estimated Water Main Construction Costs					$ 266,980.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Building Lot (Water St to 2nd St)
Prepared By: Aaron Townley, EIT

Building Lot (Water St to 2nd St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 12,000.00	$ 12,000.00
2	Traffic Control	LSum	1	$ 5,700.00	$ 5,700.00
3	Machine Grading	Sta	4.88	$ 1,200.00	$ 5,856.00
4	Pavt, Rem, Modified	Syd	597	$ 9.00	$ 5,373.00
5	Aggregate Base, 8 inch	Syd	597	$ 9.00	$ 5,373.00
6	Subbase, CIP (12 Inches)	Cyd	199	$ 13.50	$ 2,686.50
7	HMA Surface	Ton	104	$ 80.00	$ 8,320.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	2	$ 2,750.00	$ 5,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	488	$ 125.00	$ 61,000.00
11	Water Service	Ea	5	$ 1,750.00	$ 8,750.00
12	Curb Stop and Box	Ea	5	$ 500.00	$ 2,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	100	$ 5.00	$ 500.00
Building Lot (Water St to 2nd St) Estimate					$ 131,558.50
Contingency				**15%**	$ 19,800.00
Engineering & Construction Administration				**20%**	$ 26,400.00
Total Estimated Water Main Construction Costs					$ 177,758.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Maple St (Pipestone St to Cedar St)
Prepared By: Aaron Townley, EIT

Maple St (Pipestone St to Cedar St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 13,500.00	$ 13,500.00
2	Traffic Control	LSum	1	$ 6,500.00	$ 6,500.00
3	Machine Grading	Sta	7.32	$ 1,200.00	$ 8,784.00
4	Pavt, Rem, Modified	Syd	895	$ 9.00	$ 8,055.00
5	Aggregate Base, 8 inch	Syd	895	$ 9.00	$ 8,055.00
6	Subbase, CIP (12 Inches)	Cyd	299	$ 13.50	$ 4,036.50
7	HMA Surface	Ton	156	$ 80.00	$ 12,480.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	3	$ 1,750.00	$ 5,250.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	732	$ 75.00	$ 54,900.00
11	Water Service	Ea	8	$ 1,750.00	$ 14,000.00
12	Curb Stop and Box	Ea	8	$ 500.00	$ 4,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	160	$ 5.00	$ 800.00
Maple St (Pipestone St to Cedar St) Estimate					$ 148,360.50
Contingency				**15%**	$ 22,300.00
Engineering & Construction Administration				**20%**	$ 29,700.00
Total Estimated Water Main Construction Costs					$ 200,360.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Riverview Dr and River St
Prepared By: Aaron Townley, EIT

Riverview Dr and River St					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 9,700.00	$ 9,700.00
2	Traffic Control	LSum	1	$ 4,600.00	$ 4,600.00
3	Machine Grading	Sta	2.67	$ 1,200.00	$ 3,204.00
4	Pavt, Rem, Modified	Syd	327	$ 9.00	$ 2,943.00
5	Aggregate Base, 8 inch	Syd	327	$ 9.00	$ 2,943.00
6	Subbase, CIP (12 Inches)	Cyd	109	$ 13.50	$ 1,471.50
7	HMA Surface	Ton	95	$ 80.00	$ 7,600.00
8	Fire Hydrant Assembly	Ea	1	$ 4,000.00	$ 4,000.00
9	Gate Valve & Box, 16 Inch	Ea	1	$ 6,500.00	$ 6,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	267	$ 200.00	$ 53,400.00
11	Water Service	Ea	4	$ 1,750.00	$ 7,000.00
12	Curb Stop and Box	Ea	4	$ 500.00	$ 2,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	80	$ 5.00	$ 400.00
Riverview Dr and River St Estimate					$ 105,761.50
Contingency				**15%**	$ 15,900.00
Engineering & Construction Administration				**20%**	$ 21,200.00
Total Estimated Water Main Construction Costs					$ 142,861.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 9th St, Britain Ave to South
Prepared By: Aaron Townley, EIT

9th St, Britain Ave to South					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 15,400.00	$ 15,400.00
2	Traffic Control	LSum	1	$ 7,300.00	$ 7,300.00
3	Machine Grading	Sta	6.39	$ 1,200.00	$ 7,668.00
4	Pavt, Rem, Modified	Syd	781	$ 9.00	$ 7,029.00
5	Aggregate Base, 8 inch	Syd	781	$ 9.00	$ 7,029.00
6	Subbase, CIP (12 Inches)	Cyd	261	$ 13.50	$ 3,523.50
7	HMA Surface	Ton	136	$ 80.00	$ 10,880.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	2	$ 2,750.00	$ 5,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	639	$ 125.00	$ 79,875.00
11	Water Service	Ea	7	$ 1,750.00	$ 12,250.00
12	Curb Stop and Box	Ea	7	$ 500.00	$ 3,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	140	$ 5.00	$ 700.00
9th St, Britain Ave to South Estimate					$ 168,654.50
Contingency				**15%**	$ 25,300.00
Engineering & Construction Administration				**20%**	$ 33,800.00
Total Estimated Water Main Construction Costs					$ 227,754.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Brunson Ave (Hornack Rd to Jefferson St)
Prepared By: Aaron Townley, EIT

Brunson Ave (Hornack Rd to Jefferson St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 12,100.00	$ 12,100.00
2	Traffic Control	LSum	1	$ 5,800.00	$ 5,800.00
3	Machine Grading	Sta	6.57	$ 1,200.00	$ 7,884.00
4	Pavt, Rem, Modified	Syd	803	$ 9.00	$ 7,227.00
5	Aggregate Base, 8 inch	Syd	803	$ 9.00	$ 7,227.00
6	Subbase, CIP (12 Inches)	Cyd	268	$ 13.50	$ 3,618.00
7	HMA Surface	Ton	140	$ 80.00	$ 11,200.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	657	$ 75.00	$ 49,275.00
11	Water Service	Ea	7	$ 1,750.00	$ 12,250.00
12	Curb Stop and Box	Ea	7	$ 500.00	$ 3,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	140	$ 5.00	$ 700.00
Brunson Ave (Hornack Rd to Jefferson St) Estimate					$ 132,281.00
Contingency				**15%**	$ 19,900.00
Engineering & Construction Administration				**20%**	$ 26,500.00
Total Estimated Water Main Construction Costs					$ 178,681.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Weld St (Union St to Agard Ave)
Prepared By: Aaron Townley, EIT

Weld St (Union St to Agard Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 6,200.00	$ 6,200.00
2	Traffic Control	LSum	1	$ 3,000.00	$ 3,000.00
3	Machine Grading	Sta	3.3	$ 1,200.00	$ 3,960.00
4	Pavt, Rem, Modified	Syd	404	$ 9.00	$ 3,636.00
5	Aggregate Base, 8 inch	Syd	404	$ 9.00	$ 3,636.00
6	Subbase, CIP (12 Inches)	Cyd	135	$ 13.50	$ 1,822.50
7	HMA Surface	Ton	70	$ 80.00	$ 5,600.00
8	Fire Hydrant Assembly	Ea	1	$ 4,000.00	$ 4,000.00
9	Gate Valve & Box, 8 Inch	Ea	1	$ 1,750.00	$ 1,750.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	330	$ 75.00	$ 24,750.00
11	Water Service	Ea	4	$ 1,750.00	$ 7,000.00
12	Curb Stop and Box	Ea	4	$ 500.00	$ 2,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	80	$ 5.00	$ 400.00
Weld St (Union St to Agard Ave) Estimate					$ 67,754.50
Contingency				**15%**	$ 10,200.00
Engineering & Construction Administration				**20%**	$ 13,600.00
Total Estimated Water Main Construction Costs					$ 91,554.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 4th St (Territorial Rd to Main St)
Prepared By: Aaron Townley, EIT

4th St (Territorial Rd to Main St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 6,700.00	$ 6,700.00
2	Traffic Control	LSum	1	$ 3,200.00	$ 3,200.00
3	Machine Grading	Sta	2.45	$ 1,200.00	$ 2,940.00
4	Pavt, Rem, Modified	Syd	300	$ 9.00	$ 2,700.00
5	Aggregate Base, 8 inch	Syd	300	$ 9.00	$ 2,700.00
6	Subbase, CIP (12 Inches)	Cyd	100	$ 13.50	$ 1,350.00
7	HMA Surface	Ton	87	$ 80.00	$ 6,960.00
8	Fire Hydrant Assembly	Ea	1	$ 4,000.00	$ 4,000.00
9	Gate Valve & Box, 12 Inch	Ea	1	$ 2,750.00	$ 2,750.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	245	$ 125.00	$ 30,625.00
11	Water Service	Ea	4	$ 1,750.00	$ 7,000.00
12	Curb Stop and Box	Ea	4	$ 500.00	$ 2,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	80	$ 5.00	$ 400.00
4th St (Territorial Rd to Main St) Estimate					$ 73,325.00
Contingency				**15%**	$ 11,000.00
Engineering & Construction Administration				**20%**	$ 14,700.00
Total Estimated Water Main Construction Costs					$ 99,025.00

APPENDIX G

BENTON HARBOR WATER SYSTEM

CASH FLOW

City of Benton Harbor, Michigan

Historical and Projected Water System Operating Cash Flow and Debt Service Coverage
Fiscal Years Ended or Ending June 30, 2014 Through 2037

	2014 (1)	2015 (1)	2016 (1)	Preliminary 2017 (2)	Projected 2018 (2)	Projected 2019 (3)	Projected 2020 (3)	Projected 2021 (3)	Projected 2022 (3)	Projected 2023 (3)	Projected 2024
Operating Revenues											
Water RTS/Commodity	$ 1,854,525	$ 2,028,776	$ 1,970,829	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024
Water Capital Charge		-	-	253,385	253,385	253,385	253,385	253,385	253,385	253,385	253,385
Sprinkler, Hydrant, Fire		-	-	37,333	37,333	37,333	37,333	37,333	37,333	37,333	37,333
Other		-	-	32,540	32,540	32,540	32,540	32,540	32,540	32,540	32,540
Fines	17,160	177	-	20,340	20,340	20,340	20,340	20,340	20,340	20,340	20,340
Total Operating Revenues	$ 1,871,685	$ 2,028,953	$ 1,970,829	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622
Operating Expenses (4)											
Utility Administration	$ 564,359	$ 416,835	$ 487,463	$ 570,662	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Customer Service	178,106	63,627	54,432	51,079	-	-	-	-	-	-	-
Water Treatment	721,683	414,240	457,036	408,751	-	-	-	-	-	-	-
Water Distribution	893,856	554,709	585,567	622,208	-	-	-	-	-	-	-
Other	8,994	5,138	5,336	-	-	-	-	-	-	-	-
Depreciation	306,949	296,727	299,373	-	-	-	-	-	-	-	-
Total Operating Expenses	$ 2,673,947	$ 1,751,275	$ 1,889,207	$ 1,652,700	$ 1,702,281	$ 1,753,349	$ 1,805,950	$ 1,860,128	$ 1,915,932	$ 1,915,932	$ 1,915,932
Operating Income (Loss)	$ (802,262)	$ 277,678	$ 81,623	$ 321,922	$ 272,341	$ 221,273	$ 168,672	$ 114,494	$ 58,690	$ 58,690	$ 58,690
Non-Operating Revenues (Expenses)											
Interest Income	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Grants/FDCVT Proceeds	-	185,108	194,777	300,000	-	-	-	-	-	-	-
Gain from sale of capital assets	-	-	2,309	-	-	-	-	-	-	-	-
Repayment of federal debt previously forgiven	(141,358)	-	-	-	-	-	-	-	-	-	-
Income From Joint Venture	153,247	172,888	(40,562)	-	-	-	-	-	-	-	-
Depreciation	306,949	296,727	299,373	-	-	-	-	-	-	-	-
Total Non-Operating Revenues (Expenses)	$ 318,838	$ 654,722	$ 455,896	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NET INCOME AVAILABLE FOR DEBT SERVICE	$ (483,425)	$ 932,400	$ 537,519	$ 621,922	$ 272,341	$ 221,273	$ 168,672	$ 114,494	$ 58,690	$ 58,690	$ 58,690
Debt Service Requirements											
Drinking Water Revolving Fund Revenue Bonds, Series 2009	$ 11,125	$ 8,105	$ 7,980	$ 7,855	$ 7,730	$ 7,605	$ 7,480	$ 7,335	$ 7,230	$ 7,105	$ 6,980
Drinking Water Revolving Fund Revenue Bonds, Series 2010	410,375	410,250	410,000	409,625	414,125	413,375	412,500	411,500	410,375	414,125	412,625
Water Storage Projects						15,279 #	15,279 #	15,279 #	15,279 #	15,279 #	15,279
Water Supply Projects							47,777	47,777 #	47,777 #	47,777 #	47,777
Water Distribution Projects							-			691,765	691,765
Water Supply System Revenue Bonds, Series 2018, for SAW	-	-	-	-	-	41,600	41,243	45,887	45,412	44,937	44,462
Water Supply System Revenue Bonds, Series 2023, for SAW						-	-	-	-	-	50,875
Total	$ 421,500	$ 418,355	$ 417,980	$ 417,480	$ 421,855	$ 477,859	$ 524,279	$ 527,778	$ 526,073	$ 1,220,988	$ 1,269,763
Debt Service Coverage Ratio	**(1.15x)**	**2.23x**	**1.29x**	**1.49x**	**0.65x**	**0.46x**	**0.32x**	**0.22x**	**0.11x**	**0.05x**	**0.05x**

Utilities Revenue and SRF Bonds

Annual Excess with 1.2x Coverage.	**# $ 84,370**	**$ 95,571**	**$ 104,855**	**$ 105,554**	**$ 105,213**	**$ 244,196**	**$ 253,951**		
Cumulative Excess with 1.2x Coverage.	**# $ 84,370**	**$ 179,941**	**$ 284,795**	**$ 390,350**	**$ 495,563**	**$ 739,759**	**$ 993,711**		
Annual Increase in Revenue Necessary for 1.2x Coverage.	**$233,884**	**$118,273**	**$108,304**	**$58,377**	**$53,758**	**$833,898**	**$58,530**		
Annual Increase Necessary to Produce 1.2x Coverage.	**14.34%**	**6.34%**	**5.46%**	**2.79%**	**2.50%**	**37.84%**	**1.93%**		

(1) Actual.
(2) As projected, pursuant to the May 2017 Revenue Test Update.
(3) Operating revenues for the fiscal years ending June 30, 2018 and thereafter are not assumed to change.
Projected rate increases applied only to RTS and Commodity Charges.
(4) Operating expenditures, excluding depreciation, as projected for the fiscal years ending June 30, 2018 through 2022 are assumed to grow 3% annually.

Source: City of Benton Harbor

(3)	Projected 2025	(3)	Projected 2026	(3)	Projected 2027	(3)	Projected 2028	(3)	Projected 2029	(3)	Projected 2030	(3)	Projected 2031	(3)	Projected 2032	(3)	Projected 2033	(3)	Projected 2034	(3)	Projected 2035	(3)	Projected 2036	(3)	Projected 2037	(3)
	$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024	
	253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385	
	37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333	
	32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540	
	20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340	
	$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622	
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	$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932	
	$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690	
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	$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690	
	$ 6,855		$ 6,730		$ 6,605		$ 6,480		$ 6,355		$ 6,230		$ 6,105		$ 5,980		$ 5,855		$ 5,730		$ 5,605		$ 5,480		$ 5,355	
	411,000		409,250		412,375		410,250		413,000		410,500		412,875		410,000		412,000		413,750		410,250		411,625		412,750	
#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	158,610	#	158,610	#	158,610	#	158,610	#	158,610	
#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	71,665	#	71,665	#	71,665	#	71,665	#	71,665	
#	691,765	#	691,765	#	691,765	#	691,765	#	691,765	#	691,765	#	691,765	#	691,765		2,219,336		2,219,336	#	2,219,336	#	2,219,336	#	2,219,336	
	43,987		43,512		43,037		42,562		42,087		41,612		46,137		45,544		44,950		44,356		43,762		43,169		42,575	
	50,400		49,925		49,450		48,975		48,500		53,025		52,431		51,837		51,244		50,650		50,056		49,462		48,868	
	$ 1,267,063		$ 1,264,238		$ 1,266,288		$ 1,263,088		$ 1,264,763		$ 1,266,188		$ 1,272,369		$ 1,268,182		$ 2,963,660		$ 2,964,097		$ 2,959,284		$ 2,959,347		$ 2,959,159	
	0.05x		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.02x**		**0.02x**		**0.02x**		**0.02x**		**0.02x**	
	$ 256,651		**$ 259,476**		**$ 257,426**		**$ 260,626**		**$ 258,951**		**$ 257,526**		**$ 254,473**		**$ 258,660**		**$ 592,731**		**$ 592,818**		**$ 597,631**		**$ 597,568**		**$ 597,756**	
	$ 1,250,362		**$ 1,509,839**		**$ 1,767,265**		**$ 2,027,892**		**$ 2,286,843**		**$ 2,544,370**		**$ 2,798,842**		**$ 3,057,502**		**$ 3,650,233**		**$ 4,243,051**		**$ 4,840,682**		**$ 5,438,251**		**$ 6,036,007**	
	$0		**$0**		**$0**		**$0**		**$0**		**$0**		**$3,127**		**$0**		**$2,029,549**		**$524**		**$0**		**$0**		**$0**	
	0.00%		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.10%**		**0.00%**		**65.49%**		**0.01%**		**0.00%**		**0.00%**		**0.00%**	

WATER ASSET MANAGEMENT PLAN

December 2017

Prepared by:

ABONMARCHE

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Contents

1 Executive Summary 1

1.0 Introduction 1

1.1 Mission Statement 1

1.2 Asset Management Team 2

2 Asset Inventory 2

2.0 Introduction 2

2.1 Water System Inventory 2

2.1.1 Water Plant 3

2.1.2 Distribution Piping 4

2.1.3 Water Meters 7

2.1.4 Fire Hydrants 7

2.1.5 Water Tower 8

2.1.6 Drinking Water Source 8

2.2 Condition Assessment, Remaining Life and Value 8

3 Level of Service 9

3.0 Introduction 9

3.1 Level of Service Goals 11

4 Asset Criticality 11

4.0 Introduction 11

4.1 Probability of Failure (POF) 12

4.2 Consequence of Failure (COF) 13

4.3 Criticality & Business Risk Evaluation 14

5 Revenue Structure 16

5.0 Introduction 16

5.1 Operation & Maintenance Budget and Staff Structure 16

5.2 Replacement Fund 17

6 Capital Improvement Project Plan 18

6.0 Introduction 18

6.1 Water System Reliability Study 18

6.2 Recommended CIP Projects 18

6.2.1 Five (5) Year CIP Plan 18

6.2.2 Twenty (20) Year CIP Plan 21
6.3 CIP Plan Summary 24
7 Conclusions 24

Summary of Tables

Table 1: City of Benton Harbor Water AMP Team 2
Table 2: Summary of Water Assets 3
Table 3: Water Distribution Network Summary 5
Table 4: Water Distribution Network Summary (By Age) 6
Table 5: Summary of Existing Water Meters by Use 7
Table 6: Distribution Pipe Service Life Summary 9
Table 7: Water Distribution Replacement Values 9
Table 8: Consequence of Failure Levels 13
Table 9: Business Risk Evaluation Score Priority Matrix 15
Table 10: City of Benton Harbor Public Services Department Staff Structure 17
Table 11: Water Supply 5 Year CIP (2020) 19
Table 12: Water Storage 5 Year CIP (2018-2019) 19
Table 13: Water Distribution 5 Year CIP from Criticality Ratings (2023) 20
Table 14: Water Distribution 5 Year CIP from Reliability Study (2023) 20
Table 15: Water Supply 20 Year CIP (2033) 21
Table 16: Water Storage 20 Year CIP (2033) 21
Table 17: Water Distribution 20 Year CIP from Criticality Ratings (2033-2037) 21
Table 18: Water Distribution 20 Year CIP from Reliability Study (2033-2037) 22
Table 19: 5 Year Water CIP Plan Summary 24
Table 20: 20 Year Water CIP Plan Summary 24

Summary of Figures

Figure 1: Water Distribution Network Summary (By Size) 5
Figure 2: Network Pipe Material and Size Distribution 6
Figure 3: Water Distribution Network Summary (By Age) 7
Figure 4: Network Probability of Failure Distribution 12
Figure 5: Network Consequence of Failure Distribution 14
Figure 6: Network BRE Score Distribution 15

Appendices

Appendix A: Benton Harbor Water Distribution Pipe Condition Summary Table
Appendix B: 2017 Hydrant Classification Map
Appendix C: 2008 Water Tower Inspection Report
Appendix D: 2011 - 2016 Annual Water Quality Reports
Appendix E: System Analysis Maps
Appendix F: 5 Year and 20 Year CIP Estimates
Appendix G: Benton Harbor Water System Cash Flow

1 Executive Summary

1.0 Introduction

The Michigan Department of Environmental Quality (MDEQ), through Michigan's Safe Drinking Water Act, has implemented the requirement that community water supplies servicing more than 1,000 people, prepare and execute an Asset Management Plan (AMP) for their water system. The City of Benton Harbor with a population of 10,038 per the 2010 census, meets the requirements for implementation of an AMP for their water infrastructure.

The goal of the AMP process is to provide the municipality with a comprehensive understanding of the quantity and condition of their existing system to ensure proper measures are being taken to provide a safe and reliable supply of water to consumers. Asset Management Plans analyze life cycle costing to develop a long term plan that associates the needed funding to projects that will be done in the future that include repairing, replacing or rehabilitating particular assets. This ensures that the water system will deliver the desired level of service perpetually.

The AMP consist of five core components as described in the MDEQ document, "Asset Management Guidance for Water Systems" these include:

- Asset Inventory
- Level of Service
- Critical Assets
- Revenue Structure
- Capital Improvement Project Plan

This Water Asset Management Plan was structured to follow the format suggested in the MDEQ "Asset Management Guidance for Water Systems."

1.1 Mission Statement

The Michigan Department of Environmental Quality requires that for an AMP to be approved there must be a mission statement. A Mission Statement is developed to represent the purpose and goals of the water department. The Mission Statement defines the asset management program. The following is a derivation of the standard mission statement recommended by the MDEQ in lieu of a formal statement by the municipality:

We commit to protecting public health, and maintaining and improving performance of our drinking water plant and distribution system assets, while minimizing the long-term cost of operating those assets. We strive to make the most cost-effective renewal and replacement investments and provide the highest-quality customer service possible.

1.2 Asset Management Team

The MDEQ also requires an Asset Management Team be established to oversee the asset management program. The team will also ensure that the mission statement is being fulfilled. When assembling an Asset Management Team, it is important to consider current and past municipal staff (officials, board members, clerks, accountants, and engineers), current and past utility staff (operators and other service workers), and any other stakeholders that can help in assembling the information to develop this Asset Management Plan. Provided below in Table 1 is a summary of the AMP Team. As the AMP is updated, these contacts may be updated and reviewed to determine if additional members are required or other changes are needed to best complete the stated goals of the AMP.

Table 1: City of Benton Harbor Water AMP Team

Member Role	*Current Member*
City Manager	Darwin Watson
Public Services Director	Michael O'Malley
Water Treatment Superintendent	Michael O'Malley
Engineer	Abonmarche

2 Asset Inventory

2.0 Introduction

The first core component of asset management, according to MDEQ, is the asset inventory. The following questions are a guideline for developing an inventory:

- What do I own?
- Where is it?
- What condition is it in?
- What is its remaining useful life?
- What is its value?

Developing the initial inventory on what assets the city owns can be one of the most difficult steps. The majority of the assets for a water system are underground and hidden from view. Therefore, it is difficult to keep track of what is there and what condition it is in. To develop the initial inventory, as-built drawings, invoices, staff knowledge, visual observation, interviews with residents and consultants are all resources that were used. Asset inventory is an ongoing process that should be updated when changes are made to the water system.

2.1 Water System Inventory

The first step in the asset management plan is to determine what assets are owned and maintained by the municipality. These assets for the water utility include not only the

physical pipes that transport water to users but also the water plant, storage facilities, pumps, and fire hydrants. A summary of owned water facilities can be seen in Table 2.

Table 2: Summary of Water Assets

Asset	*Measure*
Water Plant	Renovated 2010-2011
Water Distribution (Pipes)	347,645 Feet (65.8 miles)
Water Meters	2,844
Fire Hydrants	509
Water Tower	1 @ 650,000 Gallon Capacity

Maintenance of these assets is critical to meeting the city's goal of providing safe and reliable drinking water to its users. To complete an accurate and useful asset management plan it is important to gather as much data on the existing age and condition of all assets related to a utility. A more detailed summary of the above listed assets is provided in the following sections.

2.1.1 Water Plant

The Benton Harbor Water Plant is located at 601 Ridgeway, St. Joseph, MI, in the southwest corner of Jean Klock Park near the Lake Michigan shoreline. Built around 1955 by Pearson Construction Co., it is rated by the Michigan Department of Environmental Quality (MDEQ) as an F-1 Complete Treatment Surface Water Treatment Plant and is regulated by the Michigan Safe Drinking Water Act 399 in accordance with the Surface Water Treatment Rules (SWTR). From 2010-2011, the water plant was refurbished and expanded using Michigan's Drinking Water Revolving Loan Funds (DWRLF). Operation was restored to 16 million gallons of water per day (MGD) and technology improvements included: chemical treatment, safer and easier disinfection, particulate matter removal, waste treatment, and other operational equipment.

The current process of the water plant starts with raw Lake Michigan water conveyed via one or more of five low lift pumps at a typical rate of 2-5 MGD from an intake structure located 5,000 feet from the plant in Lake Michigan though a 30-inch diameter pipe to a raw water lift station and wet well. Liquid sodium hypochlorite, in 15% solution, is added as a disinfectant. Liquid aluminum sulfate, in 48% solution, is added to facilitate the chemical binding and settling process of coagulation. Hydrofluorosilicic acid (HFSA) is also added but will soon be switched to a granular sodium fluoride. The pumped raw water that has been chemically treated is discharged into the mixing portion of the two plate settler basins where the flow is mixed in five stages: in the pipeline, in the rapid mixer, and in three successively slower flocculation mixers. During this mixing, the alum destabilizes the particles and then acts as a binding chemical that forms a piece of insoluble floc. The water then enters a plate settler chamber where the floc is settled to the bottom and clear water is drawn off the upper levels. More than 95% of the suspended solids are removed in the flocculation/settling process. The water then flows

to the filters where additional suspended solids are removed before flowing to two underground reservoirs.

2.1.2 Distribution Piping

The existing water distribution system includes over 65 miles of 2" through 20" water main. The mains adjacent to the water treatment plant are 20" and main transmission lines are 8-20" in size. Many residential areas are served by 4"-8" mains. A significant portion of the city (23.7%) is served by mains 2" and 4" in diameter, inadequate for distribution systems with fire protection. Water is pumped from the reservoirs at the water plant via one or two of five high lift (HS) pumps at a rate of either 2 MGD or 4 MGD to the system at 70 to 90 psi. One 2 MGD pump is used during normal consumption to maintain a safe level in the Britain Avenue water tower. A second pump, with a capacity of 4 MGD, is used during emergency situations when the safe level is not maintained. Two 20-inch pipes carry the water from the plant to the city; 12-16-inch pipes distribute the water and 4, 6, & 8-inch pipes deliver water to homes and small businesses.

Improper and lack of looping water mains also causes reduced pressures, stagnant water and increased maintenance. The system is generally well looped, except at the now unused connection with Benton Charter Township on Pipestone and at the City borders. Improper sizing can also be detrimental to the overall pressure in the system, much of the residential areas are fed with 4" main which are too small to generate suitable fire flows.

The system was designed to distribute water to a much larger area than it currently supplies: Benton Charter Township now receives water from the Benton Charter Township Water Plant, St. Joseph Township now receives water from the St. Joseph Water Plant. The City of Benton Harbor distribution system still consists of the large mains that were necessary to distribute water to those further areas, but now only distributes water within the City limits. Therefore, large mains are feeding 4" mains in neighborhoods.

The current 10 State Standards for Water Works recommend water main diameters six (6) inches or greater with most typical applications calling for an eight (8) inch water main as a minimum diameter in order to provide adequate fire protection while maintaining acceptable residual pressures in the system. A breakdown of the City's water distribution system by pipe diameter can be seen in Table 3 and Figure 1. This breakdown shows 83,081 feet of the city's water distribution piping, 23.9% of the system, falls below the 6 inch minimum standard with a further 116,839 feet, or 33.6%, right at the 6 inch minimum diameter.

Table 3: Water Distribution Network Summary

Pipe Diameter (Inches)	*Length of Pipe (Feet)*	*% of System*
2	771	0.2%
4	82,310	23.7%
6	116,839	33.6%
8	44,398	12.8%
10	6,964	2.0%
12	57,054	16.4%
16	10,135	2.9%
18	1,181	0.3%
20	27,993	8.1%
Total	**347,645**	**100%**

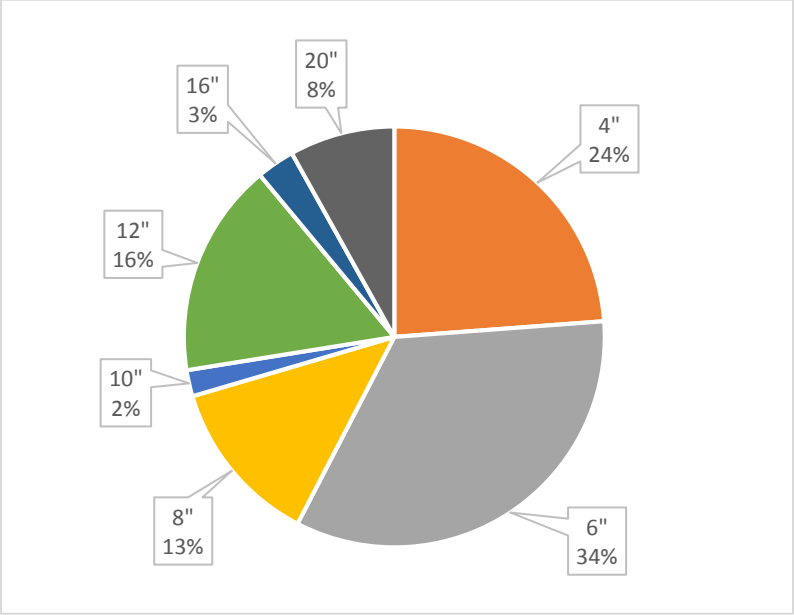

Figure 1: Water Distribution Network Summary (By Size)

A further breakdown of the existing distribution network, showing both piping materials and sizes is presented in Figure 2. An overall listing of all mains owned by the city can be found in Appendix A following this report.

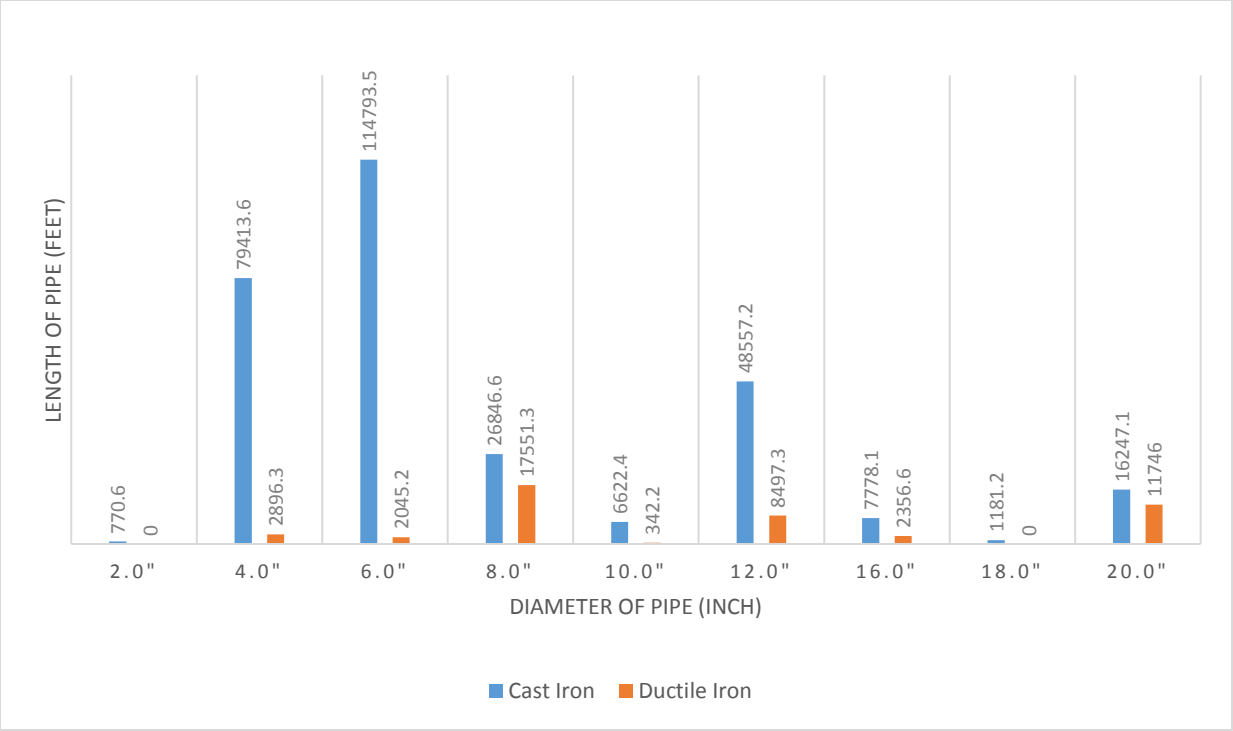

Figure 2: Network Pipe Material and Size Distribution

Table 4 and Figure 3 show the age ranges within the system. 75% of the system is greater than 50 years of age. Underground pipes have an effective life based on the pipe material and installation practices used during their installation. Galvanized pipes generally have an estimated effective life less than 50 years while cast iron pipes can last 75 years, and new ductile iron or plastic pipe materials are capable of lasting 90 years or longer with modern construction practices. The advanced age of the water distribution network is a significant factor in the condition assessment and probability of failure discussed later in the report.

Table 4: Water Distribution Network Summary (By Age)

Age Range	Length of Pipe, feet	%
0 - 25	49,440	14.2%
26 - 50	36,664	10.5%
51 +	261,541	75.2%
Total	**347,645**	**100%**

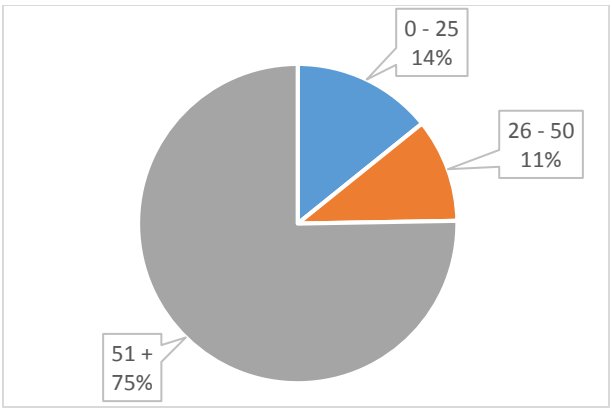

Figure 3: Water Distribution Network Summary (By Age)

2.1.3 Water Meters

The city currently utilizes 3,476 total service connections, 2,844 of these are metered. 2,612 of the meters were recently replaced as part of the SAW grant to provide more accurate readings. Water service connections that are not metered include; City Hall, the police station, the fire station, and several parks, with more being discovered. Water meters measure water usage for residential, commercial, industrial, and governmental customers. The current estimated breakdown of meter usage can be seen below in Table 5.

Table 5: Summary of Existing Water Meters by Use

User Type	*Number of Meters*	*% of System*
Residential	2,474	87%
Commercial	199	7%
Industrial	114	4%
Mixed Use	57	2%
Total	**2,844**	**100%**

2.1.4 Fire Hydrants

509 fire hydrants are connected to many strategically placed points on the system. The placement varies based upon the number and types of structures that may catch fire and the availability of water in the water mains around these structures. The ISO Criteria generally requires a flow of 1,000 to 1,500 gpm in residential areas (1- and 2- family dwellings not exceeding two stories in height) and up to 2,500 gpm in commercial areas. The minimum residual pressure at the fire flow is commonly required, by the National Board of Fire Insurance Underwriters, to be 20 psi. A detailed summary of improvements recommended based on increasing fire flows can be found in the reliability study recently completed. A map showing the location and classification of the hydrants as of 2017 can be found in Appendix B. 4" and 2" pipes throughout the City should be generally replaced with 8" to improve fire flows throughout the City. A minimum of 8" Ductile Iron

should be the standard used in any water system replacements or improvements throughout the City. We suggest further investigation via a hydrant flow testing program to best determine where localized hydrant and valve issues are present. A valve turning program is also recommended to better understand the system and improve faults.

2.1.5 Water Tower

A single pedestal elevated storage tank provides the City with water storage for fire protection and to improve system pressure. The water tower is located at Britain and 8th Street. The elevated tank was constructed in 1962 by Pittsburg Steel Company and has a storage capacity of 650,000 gallons. The elevation of the water tower provides 70-75 psi of pressure for the nearby water system. The water tower was last painted in 1990 and the last full inspection was performed by Dixon Engineering in 2008. A copy of this report can be found in Appendix C. In 2013, a partial inspection was performed by Dixon to look for damages relating to an overflow event.

2.1.6 Drinking Water Source

The drinking water source for the City of Benton Harbor is Lake Michigan. 5,000 feet of 36" piping that extends into the lake to an intake structure. In regards to the drinking water source quality, the City of Benton Harbor performs yearly water quality analysis and reporting to inform the public about drinking water quality. Water Quality Reports are created annually and made available to the public via the city's website. Water Quality Reports from 2011, 2012, 2014, 2015, and 2016 can be found in Appendix D.

2.2 Condition Assessment, Remaining Life and Value

Once an inventory of assets to be included in the asset management plan has been collected and reviewed, the next step is determining what the current condition of these assets are, how much remaining life they have, and what their overall value is. Determining the condition of the asset can help estimate what its remaining life will be. Knowing this information will help the city in setting budgeting priorities in the short and long term. Assets are hidden underground so it is difficult to determine their current condition through physical examination. Therefore, record documents are often the easiest way to estimate age.

To determine the anticipated condition of the water system in the City of Benton Harbor, historical mapping and as-built drawings from previous projects were collected and reviewed. As records for the water system have not been consistently updated, we had to make assumptions of the current approximate age of the pipe network. Any pipes installed prior to 1970 were assumed to be cast iron unless otherwise noted and pipes less than thee (3) inches in diameter were assumed to be galvanized unless otherwise noted. Appendix A provides a complete listing of the distribution network in the city which shows the assumed age, size, and length of distribution piping along with other related information.

In regards to anticipated life of the distribution network, Table 6 shows the service life values that were assumed for a given material.

Table 6: Distribution Pipe Service Life Summary

Material	*Service Life (Years)*
Galvanized	40
Cast Iron	75
PVC	90
Ductile Iron	90

It is important to have an order of magnitude understanding of the present value of assets owned so that maintenance and rehabilitation costs can be justified. In plain terms, more overall assets means more money needs to be allocated to their maintenance. Table 7 below summarizes and approximate value of the water distribution asset (water main, hydrants and valves) in the City.

Table 7: Water Distribution Replacement Values

Pipe Diameter (Inches)	*Length of Pipe (Feet)*	*Unit Replacement Cost ($/Foot)*	*Current Replacement Value ($)*
2.0*	771	$320	$246,720
4.0*	82,310	$320	$26,339,200
6.0*	116,839	$320	$37,388,480
8.0	44,398	$335	$14,873,330
10.0	6,964	$395	$2,750,780
12.0	57,054	$405	$23,106,870
16.0	10,135	$450	$4,560,750
18.0	1,181	$485	$572,785
20.0	27,993	$525	$14,696,325
Total	**347,645**		**$124,535,240**

*Assumed that mains 6 inches and under would be sized to the new 8 inch standard
** - Unit costs include removal and replacement of water main, installation of control valves, hydrants, and water services as well as replacement of pavement/surface improvements associated with a 10 foot wide trench.

3 Level of Service

3.0 Introduction

As described in the MDEQ Guidance Document, Level of Service (LOS) defines the way in which the utility stakeholders want the utility to perform over the long term. The LOS can include any technical, managerial, or financial components the utility wishes, as long as all regulatory requirements are met. The LOS will become a fundamental part of how the utility is operated.

All utilities must operate within the state and federal regulations and requirements. These regulations are generally specified in the Safe Drinking Water Act for water systems but there are additional rules and regulations at the state and federal level. Although the state and federal regulations set bare minimum standards of operation in the LOS, these standards will not adequately address all areas of operation and should not be the sole factor of the LOS. Utilities should include many other factors to delineate important areas of the utility's operation.

Within the range of the minimum (regulations) and maximum (absolute capabilities of assets), there are numerous items a utility could include within its LOS. Items may be included so the utility can communicate its intentions with its customers, measure its performance, and determine critical assets. Understanding what LOS to choose will help in developing an Asset Management Plan that truly captures the utility's performance and how to accomplish future goals.

Defining the LOS sets the goals for the utility. These goals allow the operations staff to have a better understanding of what is desired from them, and give management a better understanding of how to use staff and other resources more efficiently and effectively. Reviewing how the utility is meeting LOS also allows the management to shift resources if needed from one task to another to meet all the goals most effectively. Understanding the desired LOS will help to prioritize and characterize the system's assets, as well as how to manage finances to reach the LOS goals.

There is a direct link between the LOS provided and the cost to the customer. When a higher LOS is provided, costs to provide that level will likely increase. This direct link demands that the utility have an open dialogue with its customers regarding the LOS desired and the amount the customers are willing to pay for this LOS or increased services.

Typical questions to consider when developing the LOS for the system:

1) What is the LOS goal for health, safety, and security?

2) How often is the system out of compliance with regulations?

3) Are the operators properly certified?

4) How does the utility stay aware of and prepare for new regulations?

5) Do you share your LOS statement with your customers?

6) How do you track and respond to customer needs/complaints?

7) Can the current process be improved?

8) How quickly does the utility respond to customer issues?

9) Is maintenance being deferred to save money?

10) How much will the improvements cost and how will they be funded?

11) Are assets being properly maintained to insure they are in reliable working condition?

12) What areas within the system are most important to insure the best LOS possible?

13) When considering a preferred LOS, are asset age and life cycles, asset conditions, funding availability, etc. being factored in?

14) How often will the LOS statement be reviewed in order to capture changes such as funding availability (growth and decline), regulatory requirements, demand of customers (increases/decreases in customers), and physical deterioration of assets (addressing maintenance)?

15) Are O&M activities being maximized to meet the LOS goals?

3.1 Level of Service Goals

Upon review with the City, the following general LOS goals were selected as a guide to managing their water system.

- Deliver safe drinking water to all users
  - Meet State and Federal requirements for contaminants
- Ensure that taste and appearance are acceptable to all users
  - Meet selected secondary standards for taste, clarity, and color
  - City can track user feedback on water quality issues through City Works
  - Compliance tracked with laboratory testing and Monthly Operating Reports
- Provide adequate fire flows to ensure safety of community
  - "AA" (>1,500 gpm) flows to all commercial, industrial, and educational uses
  - "A" (>1,000 gpm) flows to all residential areas with City limits
  - Track with annual hydrant testing and 5-year computer modeling
- Undertake all necessary preventative maintenance and corrective actions on the system
  - Ensure that assets are meeting or exceeding their lifespans in good condition
  - Minimize cost of ownership
  - Minimize user interruptions due to unscheduled repairs and breaks
  - Record water line breaks so that trends can be identified and priorities can be adjusted

4 Asset Criticality

4.0 Introduction

The criticality of an asset is related to its probability of failure and its consequence of failure. Assets will have different criticality ratings. Criticality ratings are important in determining what assets need attention first. Assets with a higher criticality rating should receive priority first and should be outlined in the city's Asset Management Plan as being

a future project. This allows the city to start budgeting for the work that needs to be done. The two components of assessing criticality, Probability of Failure and Consequence of Failure, are described below.

4.1 Probability of Failure (POF)

Probability of Failure is estimating the likelihood that an asset will fail in the future. A ranking system to compare the probability of failure of multiple assets must be developed first before assigning a rating to each asset. By using the service life values defined in Table 6, and taking the assumed age of the pipes in the distribution network we are able to determine the anticipated probability of failure using equation (1) below. The result of this ratio is multiplied by 10 for use in criticality analysis of the network which is discussed in detail further in the report. In regards to probability of failure, a newly installed pipe will have a POF value of 0 which indicates very low to no probability of failure. A POF value of 10 indicates that the asset has reached or exceeded its intended service life and failure is likely imminent or that the reliability of the asset is severely degraded.

Equation (1): $$Probability\ of\ Failure\ (POF) = \frac{Age\ of\ Asset\ (Years)}{Service\ Life\ (Years)} * 10$$

If Age of Asset > Service Life, POF = 10

Figure 4 below shows a breakdown of the distribution network based on the POF rankings. Much of the system has aged to or beyond its maximum life as indicated by the large amount of the network in the 9-10 rating category. However, recent improvements to the water network have been completed, which is seen by the fair amount of pipes in the 0-2 rating category.

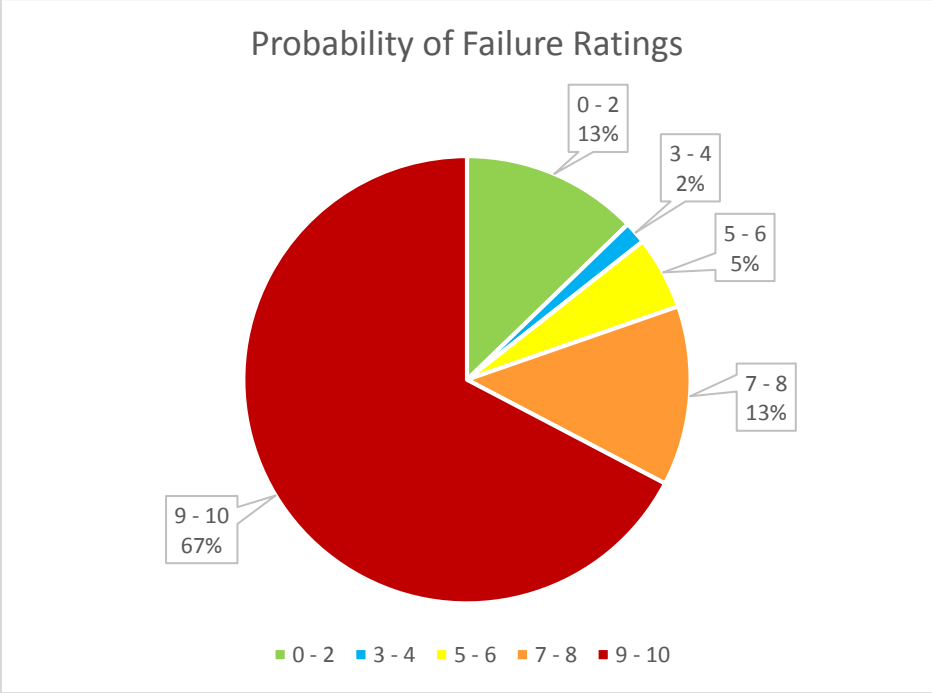

Figure 4: Network Probability of Failure Distribution

4.2 Consequence of Failure (COF)

Consequence of Failure is estimating all of the potential costs that will occur when there is failure to the asset. There are multiple costs to consider and often it tends to be a chain effect and accumulation of multiple different costs. Examples of the potential costs include: cost of repair; social cost associated with the loss of the asset; repair/replacement costs related to collateral damage caused by the failure; legal costs related to additional damage caused by the failure; environmental costs created by the failure; loss of business revenue to the community and any other associated costs or asset losses.

Table 8 below outlines the Consequence of Failure Levels that were developed and applied for this Asset Management Plan. It provides a summary of the selected factors and the ranges that were used to weight a given factor. As certain parameters, such a pipe size, play a larger role in determining consequence these factors were given greater overall weight in the scoring process.

Table 8: Consequence of Failure Levels

Factor & Weight	*Range of Value*	*Multiplier*
Size of Pipe (Inches) W: 5	< 4	0.1
	4 - 6	0.4
	8 - 10	0.7
	≥ 12	1.0
Proximity to Buildings W: 2	X ≥ 10	0
	5 < X < 10	0.5
	≤ 5	0.8
	0	1.0
Proximity to Roadways W: 3	Outside ROW	0
	In ROW Alley/Minor Road (Not Under)	0.2
	IN ROW Major Road (Not Under)	0.5
	Under Alley/Minor Road	0.8
	Under Major Road	1.0

The formula for determining COF has a value range of 0.5 to 10 with a lower score indicating the lowest criticality (small pipe, far away from buildings, outside of the ROW) and a 10 indicating the most critical situation (large pipe, under a building, under a major roadway). Equation 2 presented below was used in the calculation of criticality as previously discussed.

Equation (2): $Consequence\ of\ Failure\ (COF) = S * 5 + Prox_B * 2 + Prox_R * 3$

Where:
S = Size of Pipe
$Prox_B$ = Proximity to Buildings
$Prox_R$ = Proximity to Roadways

Figure 5 below shows a breakdown of the distribution network based on the COF rankings.

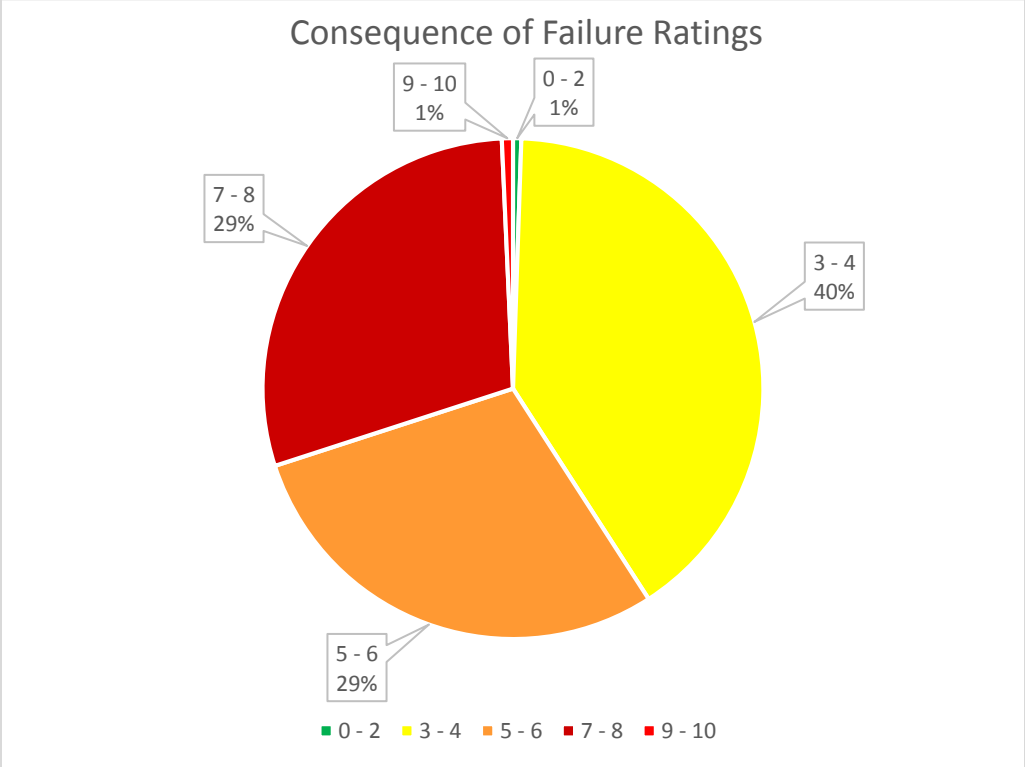

Figure 5: Network Consequence of Failure Distribution

4.3 Criticality & Business Risk Evaluation

Multiplying the Probability of Failure (POF) and the Consequence of Failure (COF) together results in determining the criticality, also referred to as the Business Risk Evaluation (BRE). The assets that have the greatest probability of failure along with the greatest consequence of failure will be the most critical. The equation for calculating the BRE can be seen below.

Equation (3): $BRE = POF * COF$

Where:
BRE = Business Risk Evaluation
POF = Probability of Failure
COF = Consequence of Failure

The product of multiplying the probability of failure with the consequence of failure produces a BRE score of 1 to 100. A BRE score of 1-20 is considered low priority, 21-55 are medium priority, and 56-100 are high priority. Table 9 shows the criticality matrix used for analyzing the assets. Assets with the highest BRE scores should be considered candidates for the 5-year or 20-year Capital Improvement Project list. Appendix A shows all the BRE scores for the Benton Harbor Water System. Appendix E provides mapping based on a variety of factors including remaining useful life, probability of failure, consequence of failure and criticality.

Table 9: Business Risk Evaluation Score Priority Matrix

Consequence of Failure (COF)											
	10	10	20	30	40	50	60	70	80	90	100
	9	9	18	27	36	45	54	63	72	81	90
	8	8	16	24	32	40	48	56	64	72	80
	7	7	14	21	28	35	42	49	56	63	70
	6	6	12	18	24	30	36	42	48	54	60
	5	5	10	15	20	25	30	35	40	45	50
	4	4	8	12	16	20	24	28	32	36	40
	3	3	6	9	12	15	18	21	24	27	30
	2	2	4	6	8	10	12	14	16	18	20
	1	1	2	3	4	5	6	7	8	9	10
		1	2	3	4	5	6	7	8	9	10
	Probability of Failure (POF)										

Figure 6 breaks down the current system by BRE ranking (low, medium, or high). More than 85% of the system is in a medium or high risk category from a BRE perspective. Projects will be selected from the 17% of the network that is currently in the high risk category.

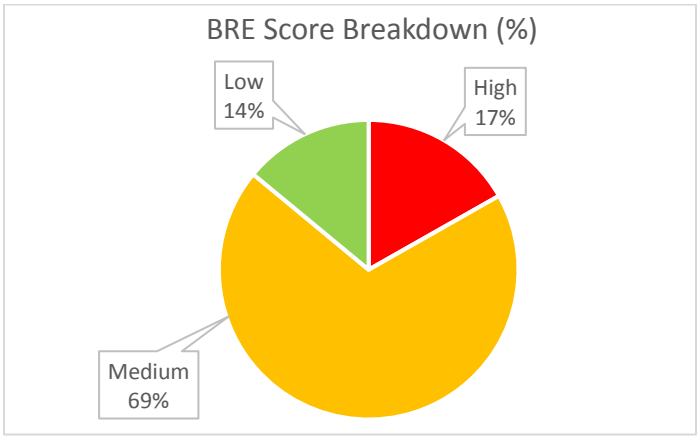

Figure 6: Network BRE Score Distribution

5 Revenue Structure

5.0 Introduction

To help fund rehabilitation or replacement of assets, methodologies are used to determine how revenue is generated. First, the fixed rate methodology can be utilized. Fixed rate methodology is a tool used to determine rates and charges to provide sufficient revenues to cover generally fixed costs that usually occur like the operation, maintenance, and replacement of assets. Next is billable flow methodology which generates revenue through a commodity rate based on consumer usage to address variable costs based upon flow, such as utility consumption. A fixed and variable methodology is typically used. In this method, revenue is generated from two sources, the fixed unit for the source and a commodity rate.

Once total expenses have been determined, the rates and charges for the user can be reviewed to ensure that there is sufficient revenue to cover expenses. If a shortfall exists, then the users are not paying for the cost of service and the difference must be addressed. Occasionally, temporary subsidies are necessary to cover unexpected expenses. However, a continuous use of subsidies will result in rate increases in the future or a deficit in the budget.

The City of Benton Harbor owns and operates the Drinking Water System and has the authority to establish rates to be charged for services as needed.

5.1 Operation & Maintenance Budget and Staff Structure

The annual operation and maintenance (O&M) budget includes typical costs associated with operating and maintaining the system for a year. Excluded from this budget are any major capital improvements that are needed to increase capacity or replace items with a useful life of more than 20 years. Included in the budget are the costs associated with personnel, energy use, supplies, etc. Budgetary projections assume an annual 3% increase in expenses to account for inflation and other factors.

The budget needs to account for the inflation of cost, wages, and utility charges. Efficiency within the City water distribution system is dependent on an adequate and qualified staffing structure. Table 10 is an outline of the existing city staffing that contributes to maintaining the water distribution system. That is, all employees from the department of public services including those who work specifically for the water department. The City will be facing the retirement of several key personnel within the 20 year planning period. Therefore, after the initial 5-year planning horizon, operating expenses are expected to remain flat.

In 2011, the emergency City manager set up a schedule for rates to increase to cover the cost of inflation, operations, maintenance and replacements to the system, and debt service cost on bonds. In 2013, a different emergency City manager approved a 5% reduction in this rate to reduce the financial burden placed on the residents who were facing economic hardships as the City was in a fiscal position to reduce the rates. The city currently operates with a water department budget of $2 million which provides

funding sufficient to address operations but may fall short of the funds needed to cover current debt payments. It appears that a 15% rate increase may be necessary in the next 6 months to close the funding gap for current debt. Annual increases of 2.5% -6.5% will also be needed until 2022. A larger rate increase, grant, or other mechanism of funding will be required to pay off debt necessary to complete all of the projects outlined in this report in 2023. More detail on this is included in Appendix G.

Table 10: City of Benton Harbor Public Services Department Staff Structure

Name	Title	DOB	DOH	License(s)
Michael O'Malley	Superintendent of Water Plant	9/27/1957	7/18/2016	S1 / F1 Certificate
Denny Edwards	Utility Service Operator I	10/20/1967	9/13/1994	F4 / S4 Certificate
Douglas Vanderploeg	Utility Service Operator I	5/20/1956	2/27/1992	F3 / S3 Certificate
Henry Clayton	General Labor	7/24/1978	9/15/2014	N/A
Eddie Davis	Heavy Equipment Operator	6/17/1973	10/20/2003	CDL Certificate
Shawn Echols	General Labor	7/4/1969	3/20/2017	N/A
Steve Forbear	Mechanic	11/17/1965	5/11/2015	CDL Certificate
Micah Goss	General Labor	2/18/1997	1/19/2016	N/A
Dennis Hudson	Heavy Equipment Operator	7/15/1965	11/25/2002	CDL Certificate
Floyd Johnson	Utility Service Technician I	10/1/1981	7/7/2016	CDL Certificate
Dimetrius Meeks	Supervisor Dept. of Public Works	8/15/1972	5/13/1997	N/A
Patrick Patterson	Heavy Equipment Operator	8/30/1963	5/2/2015	CDL Certificate
Richard Woods	Utility Service Technician I	8/20/1960	5/29/2013	CDL Certificate
Thomas Woodson	General Labor	9/19/1954	11/24/2014	CDL Certificate
Eddie Ellis	Utility Service Technician II	9/4/1969	11/30/2001	N/A

5.2 Replacement Fund

The rate methodology should include a replacement schedule for short-lived assets. The breakdown will identify items owned by the utility that have a useful life of 20 years or less

and contain moving parts. The replacement items will appear in the asset inventory, but should have a dedicated funding source due to their limited useful life and importance. On an annual basis, replacement funds are set aside and saved until needed. Once a particular item fails, money is drawn from the replacement fund to replace the failed item without having to disrupt the normal operating budget.

Most of the time, it is not known when any asset will need to be repaired or replaced, but their end of life has been estimated in this plan. The amount should be set aside each year, so that when a repair is needed, the funds are available without having to borrow money for the expense. The replacement schedule can be reviewed and amended annually for budgeting purposes.

6 Capital Improvement Project Plan

6.0 Introduction

A long-term Capital Improvement Plan (CIP) should look at the utility's needs for the future. Ideally, the planning period would be at least 20 years, with a 5 year plan identifying more pressing needs. It should be understood that the specific expenditures and needs of the utility in the latter years, 15 to 20 years, are more speculative than the needs for the first 5 to 10 years, particularly the first 5 years. However, the inclusion of the needs for this longer time period will provide a better opportunity for the water system to plan for its capital needs. Capital improvement projects are projects that the utility has an extended period of time to plan for and are projects that usually cover high cost, non-recurring items.

After the city has determined the projects it will include in its Capital Improvement Project Plan the next step is to associate an estimated cost to these projects. Once an estimated cost is developed, then is it important to think about how the project will be funded in the future. The city should plan on funding the majority of the capital improvement projects from its Water System revenue. Additionally, the city may look for outside sources of funding for projects. Grants and low interest loans should be explored to reduce the impact on rate payers. The city must budget and adjust their rates annually to address operational and capital improvement costs.

6.1 Water System Reliability Study

In 2017, Abonmarche completed another report related to the water distribution system in Benton Harbor. This was a Water System Reliability Study that focused on computer modeling the pressure in the system with reference to the desired fire flows in certain areas. The recommended project upgrade areas can be found in Tables 14 & 18. The full report can be found under the cover, "Water System Reliability Study."

6.2 Recommended CIP Projects

6.2.1 Five (5) Year CIP Plan

Presented on the following pages are the five (5) year projects for the water supply, storage, and distribution systems. To complete all the listed projects an estimated $15,798,790 would be required, which works out to approximately $750,000 per year

assuming a 30-year low interest loan is utilized for funding. Appendix F provides a detailed breakdown of the estimated costs for performing the water distribution 5 year CIP Plan.

Table 11: Water Supply 5 Year CIP (2020)

#	Project Description
1	Backwash & Waste Lagoon Improvements
2	High Service Pump #5 Soft Starter
3	New High Service Pump with VFD
4	Repair Roof over Offices
5	Software for Operations Computer
6	Zebra Mussel Pretreatment & Control
7	Alum Treatment
8	Overflow Protection
9	SCADA System Improvements
10	Pump Overhauls
5 Year Water Supply CIP Estimate	**$1,000,000**

Table 12: Water Storage 5 Year CIP (2018-2019)

#	Project Description	Estimated Cost
1	Exterior High Pressure Water Jet & Acrylic Recoat (Year 1)	$195,000
2	Cathodic Protection System Repair	$3,800
3	Adjust Sway Rods	$3,000
4	Install 30" Diameter Manway in Riser	$7,000
5	Install 30" Roof Hatch	$3,000
6	Install Roof Railing with Painter's Rail	$12,000
7	Paint Pit Piping	$5,000
8	Install Wet Interior Ladder with Fall Prevention	$8,000
9	Replace Sidewall Ladder with Vertical Ladder	$10,000
10	Weld Cathodic Caps and Hole in Roof Vent	$3,000
11	Repair & Replace Roof Beams and Plug Holes	$20,000
12	Repaint Interior	$50,000
5 Year Water Storage CIP Estimate		**$319,800**

Table 13: Water Distribution 5 Year CIP from Criticality Ratings (2023)

#	Location Description	Estimated Construction Cost
1	Britain Avenue (Riverview to Pipestone)	$3,022,890
2	8th Street (Hinkley to Britain)	$1,770,471
3	Pipestone Rd (Main Street to Washington Street)	$719,352
4	Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson)	$753,810
5	Whitwam-Riverview Dr (Main Street to Whitwam Dr)	$292,512
5 Year Water Distribution CIP from Criticality Estimate		**$6,559,035**

Table 14: Water Distribution 5 Year CIP from Reliability Study (2023)

#	Location Description	Estimated Construction Cost
1	Stevens (Riverside to Waukonda) Riverside (McCord to Stevens) Buena Vista (Winans to Waukonda) Winans (Buena Vista to Waukonda)	$1,604,025
2	Edwards (Winans to Morton)	$664,950
3	Morton (Green to Territorial) Green (Winans to Morton)	$740,100
4	Washington (Ross to Pipestone) Vineyard (East End to Ross)	$922,650
5	Britain Avenue (Seeley to McCord) Seeley (Britain to Pitkins) Pitkins (Fair to Warwick) Warwick (Fair to Pitkins)	$1,885,845
6	Robbins (Colfax to Windsor) Windsor (Colfax to Robbins) Salem (May to Robbins)	$1,571,685
7	Monroe (Cross to Emery)	$530,700
5 Year Water Distribution CIP from Reliability Study Estimate		**$7,919,955**

6.2.2 Twenty (20) Year CIP Plan

Presented on the following pages are the twenty (20) year projects for the water supply, storage, and distribution system. To complete all the listed projects an estimated $35,472,668 would be required, which works out to approximately $1.7 million per year if completed all at once with a 30-year low interest loan (assuming today's dollars for construction cost estimates). Appendix F provides a detailed breakdown of the estimated costs for performing the water distribution 20 year CIP Plan.

Table 15: Water Supply 20 Year CIP (2033)

#	Project Description
1	Repair Filters
2	Pump Replacement
3	Other Miscellaneous Needs
4	SCADA System Improvements
5	Pump Overhauls
20 Year Water Supply CIP Estimate	**$500,000**

Table 16: Water Storage 20 Year CIP (2033)

#	Project Description	Estimated Cost
1	Replacement of Water Tower	$3,000,000
20 Year Water Storage CIP Estimate		**$3,000,000**

Table 17: Water Distribution 20 Year CIP from Criticality Ratings (2033-2037)

#	Location Description	Estimated Construction Cost
1	Empire Ave (Riverview Dr to Salem Ave)	$736,058
2	Empire Ave (Columbus Ave to Ogden Ave)	$191,026
3	Empire Ave (Jennings Ave to Pipestone St)	$303,267
4	Salem Ave (Empire Ave to May St to Colfax Ave)	$601,043
5	Emery Ave (Union St to Milton and Hurd Ave south)	$519,476
6	Pearl St (Catalpa Ave to Empire Ave)	$641,992
7	Catalpa Ave (Colfax Ave to Columbus Ave)	$674,258
8	Pavone St (Lake Ave to Catalpa Ave)	$582,583
9	Ohio St Alleys (Britain Ave to Pavone St)	$313,131

10	Lake Ave (Market St to Broadway Ave)	$705,184
11	Broadway Ave / Jefferson St (Lake Ave to Highland Ave)	$720,545
12	McCord St (Main St to Britain Ave)	$1,320,774
13	2nd St (Klock Rd to Highland Ave)	$1,596,099
14	Waukonda Ave (Nowlen St to Fair Ave)	$712,673
15	Bond St (Market St to Colfax Ave)	$793,524
16	9th St (Main St to Oak St)	$293,589
17	Territorial Rd (4th St to 2nd St)	$285,734
18	3rd St / East Alley (Territorial to Highland Ave)	$418,060
19	8th St (Klock Rd to Graham Ave)	$955,494
20	Wall St (Riverview Dr to 12th St)	$503,326
21	Hull Ave (Frank St to ~350 ft North of Edwards Ave)	$152,862
22	Klock Rd (Water Plant to East)	$460,755
23	North Shore Dr (Klock Rd to North)	$167,847
24	West of Paw Paw Ave between Waukonda Ave and Frank St	$266,980
25	Building Lot (Water St to 2nd St)	$177,759
26	Maple St (Pipestone St to Cedar St)	$200,361
27	Riverview Dr and River St	$142,862
28	9th St, Britain Ave to South	$227,755
29	Brunson Ave (Hornack Rd to Jefferson St)	$178,681
30	Weld St (Union St to Agard Ave)	$91,555
31	4th St (Territorial Rd to Main St)	$99,025
20 Year Water Distribution CIP from Criticality Estimate		**$15,034,278**

Table 18: Water Distribution 20 Year CIP from Reliability Study (2033-2037)

#	Location Description	Estimated Construction Cost
1	Jean Klock Blvd (Grand Blvd to Hydrant) Grand Blvd (Hydrant to End)	$2,583,465
2	Waukonda (Loop 12" with 6" far E end)	$18,375
3	Nowlen (Waukonda to Madison) Madison (N McCord to Nowlen) Winans (Madison to LaSalle)	$1,514,235
4	N Fair (Wauceda to LaSalle)	$492,720
5	Hull (1st Hydrant)	$126,525

6	NE Whirlpool Hydrant (Hinkley to Benton Harbor Tech Center)*	$0
7	Hinkley (8th to Bend)	$493,500
8	N Seeley (76' S of Main to hydrant)*	$0
9	N Fair (100' S of Main to hydrant)*	$0
10	Highland (Cass to Winans) Nowlen (Highland to Cass)	$458,070
11	Highland (Seeley to 37' N on Fair)	$582,465
12	Thresher (Hull to McCord) S Winans (Thresher to Buss)	$744,960
13	Fair (Thresher to Vineyard) High (McCord to Fair)	$1,715,355
14	Ohio (Bellview to Hydrant)	$157,500
15	Pleasant (Bellview to Pipestone)	$488,550
16	Thayer Ct (Bellview to Hydrant)	$100,800
17	Colby (Pipestone to Hydrant)	$132,675
18	Ohio (W Britain to Hydrant)*	$0
19	Cedar (Cherry to Britain)	$207,900
20	Apple (Hydrant to McAllister)	$249,540
21	Foster (Superior to Columbus)	$193,200
22	Plummer Ct (Pipestone to Heck)	$167,670
23	Catalpa (Columbus to Pipestone)	$748,335
24	Kline (Colfax to McAllister)	$604,800
25	9th St (2nd Hydrant to Apartment Complex)	$576,450
26	Harrison (Colfax to Broadway)	$561,660
27	Division (Pipestone to Columbus) Columbus (Empire to Division)	$1,842,840
28	Niles (Pipestone to Monroe)	$473,355
29	Clay (Lavette to Broadway)	$654,015
30	Clay (Colfax to End)	$15,750
31	Agard (Loop onto Pipestone)	$84,000
32	Weld (Union to Hurd)*	$0
33	Cross (Colfax to McAllister)	$574,200
34	Colfax (Windsor to Emery)	$375,480
20 Year Water Distribution CIP from Reliability Estimate		**$16,938,390**

**Cost omitted because already part of Criticality CIP Costs*

6.3 CIP Plan Summary

In summary, as seen below in Tables 19 & 20, for both the five (5) and twenty (20) year CIP plans, an estimated total in excess of $51 million dollars will be needed to address issues with the water system, particularly to replace aging materials that are reaching the end of their useful life.

Table 19: 5 Year Water CIP Plan Summary

Overall 5 Year Water CIP Plan Summary	Estimated Construction Cost
Water Supply	$1,000,000
Water Storage	$319,800
Water Distribution – Criticality Ratings	$6,559,035
Water Distribution - Reliability Study	$7,919,955
Overall 5 Year Water CIP Estimate Summary	**$15,798,790**

Table 20: 20 Year Water CIP Plan Summary

Overall 20 Year Water CIP Plan Summary	Estimated Construction Cost
Water Supply	$500,000
Water Storage	$3,000,000
Water Distribution – Criticality Ratings	$15,034,278
Water Distribution - Reliability Study	$16,938,390
Overall 20 Year Water CIP Estimate Summary	**$35,472,668**

7 Conclusions

Overall, the City of Benton Harbor has an aging water infrastructure network, similar to many other communities, which will require continual investment to ensure that it meets both State and Federal requirements as well as the City's specific operating goals. The level of investment for both the five (5) year and twenty (20) year CIP plans should be implemented to ensure that the existing water quality and reliability is maintained and improved within the network. These projects should be coordinated with sewer and roadway projects identified in the SAW funded - Sewer Asset Management Plan and the soon-to-be completed Street Asset Management Plan.

As stated in the MDEQ guidance document, asset management is a systematic process of operating, maintaining, and upgrading assets cost-effectively. It is an active, on-going

process that provides information to managers in order to make sound decisions about their capital assets and allows decision makers to better identify and manage needed investments in their utility's infrastructure. This asset management plan should be updated yearly to reflect changes to the asset inventory, criticality analysis and progress on the capital improvement projects. Thoroughly updating this document regularly is more efficient than trying to figure out what happened years ago and having to make large updates.

Once the most cost effective funding solution has been determined, the city can proceed with adjustments to rates to cover the necessary costs. In the short term it would be beneficial for the city to reinstate the 5% rate increase that was reduced in 2013. A 15% rate increase may be needed in early 2018 to cover current and expected debt service requirements. Due to the large amount of funding necessary to complete the improvements identified, it is expected that the city will complete large projects together and be required to finance them over a long-term with rates adjusted accordingly. Grants should be utilized to the maximum extent possible to minimize impact on users.

Once the improvements outlined in this plan are completed, it should be anticipated that other assets will be reaching the end of their expected effective life, requiring further investment. Benton Harbor is nearing the end of its first generation of water infrastructure with other generations following closely behind.

APPENDIX A

BENTON HARBOR WATER DISTRIBUTION PIPE CONDITION SUMMARY TABLE

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00144	Cast Iron, Assumed	2"	24.0	1909	108	1	0	0.1	75	3.5	10.0	35.0	1.0	0
WMAIN-00146	Cast Iron, Assumed	2"	234.8	1909	108	1	0	0.1	75	3.5	10.0	35.0	1.0	0
WMAIN-00272	Cast Iron, Assumed	2"	293.7	1909	108	0.8	0.8	0.1	75	4.5	10.0	45.0	1.0	0
WMAIN-00512	Cast Iron, Assumed	2"	22.0	1909	108	1	0	0.1	75	3.5	10.0	35.0	1.0	0
WMAIN-00513	Cast Iron, Assumed	2"	31.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01088	Cast Iron, Assumed	2"	164.3	1909	108	0.8	0	0.1	75	2.9	10.0	29.0	1.0	0
WMAIN-00003	Cast Iron, Assumed	4"	279.6	1956	61	0.8	0	0.4	75	4.4	8.1	35.8	0.8	14
WMAIN-00005	Cast Iron, Assumed	4"	563.4	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00006	Cast Iron, Assumed	4"	611.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00010	Cast Iron, Assumed	4"	327.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00024	Cast Iron, Assumed	4"	485.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00025	Cast Iron, Assumed	4"	344.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00026	Cast Iron, Assumed	4"	404.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00027	Cast Iron, Assumed	4"	4.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00028	Cast Iron, Assumed	4"	326.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00029	Cast Iron, Assumed	4"	327.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00030	Cast Iron, Assumed	4"	979.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00035	Cast Iron, Assumed	4"	6.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00036	Cast Iron, Assumed	4"	71.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00037	Cast Iron, Assumed	4"	311.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00039	Cast Iron, Assumed	4"	452.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00042	Cast Iron, Assumed	4"	249.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00053	Cast Iron, Assumed	4"	546.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00054	Cast Iron, Assumed	4"	314.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00055	Cast Iron, Assumed	4"	657.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00069	Cast Iron, Assumed	4"	299.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00070	Cast Iron, Assumed	4"	543.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00071	Cast Iron, Assumed	4"	918.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00076	Cast Iron, Assumed	4"	39.2	1940	77	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00090	Cast Iron, Assumed	4"	366.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00118	Cast Iron, Assumed	4"	24.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00119	Cast Iron, Assumed	4"	79.7	1909	108	0.2	1	0.4	75	4.6	10.0	46.0	1.0	0
WMAIN-00120	Cast Iron, Assumed	4"	105.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00121	Cast Iron, Assumed	4"	5.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00131	Cast Iron, Assumed	4"	266.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00141	Cast Iron, Assumed	4"	636.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00142	Cast Iron, Assumed	4"	5.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00143	Cast Iron, Assumed	4"	281.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00159	Cast Iron, Assumed	4"	56.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00161	Cast Iron, Assumed	4"	33.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00162	Cast Iron, Assumed	4"	445.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00165	Cast Iron, Assumed	4"	495.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00166	Cast Iron, Assumed	4"	332.8	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00169	Cast Iron, Assumed	4"	328.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00175	Cast Iron, Assumed	4"	162.1	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00176	Cast Iron, Assumed	4"	15.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00179	Cast Iron, Assumed	4"	40.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00180	Cast Iron, Assumed	4"	14.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00188	Cast Iron, Assumed	4"	254.4	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00189	Cast Iron, Assumed	4"	310.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00197	Cast Iron, Assumed	4"	327.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00198	Cast Iron, Assumed	4"	336.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00199	Cast Iron, Assumed	4"	309.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00200	Cast Iron, Assumed	4"	317.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00205	Cast Iron, Assumed	4"	70.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00208	Cast Iron, Assumed	4"	305.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00219	Cast Iron, Assumed	4"	5.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00222	Cast Iron, Assumed	4"	357.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00223	Cast Iron, Assumed	4"	43.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00224	Cast Iron, Assumed	4"	705.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00225	Cast Iron, Assumed	4"	425.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00229	Cast Iron, Assumed	4"	7.0	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00230	Cast Iron, Assumed	4"	46.0	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00231	Cast Iron, Assumed	4"	298.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00232	Cast Iron, Assumed	4"	637.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00235	Cast Iron, Assumed	4"	287.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00239	Cast Iron, Assumed	4"	335.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00240	Cast Iron, Assumed	4"	377.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00241	Cast Iron, Assumed	4"	594.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00249	Cast Iron, Assumed	4"	186.2	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00250	Cast Iron, Assumed	4"	3.0	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00251	Cast Iron, Assumed	4"	455.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00255	Cast Iron, Assumed	4"	585.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00258	Cast Iron, Assumed	4"	311.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00259	Cast Iron, Assumed	4"	95.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00264	Cast Iron, Assumed	4"	128.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00265	Cast Iron, Assumed	4"	299.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00266	Cast Iron, Assumed	4"	120.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00268	Cast Iron, Assumed	4"	18.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00269	Cast Iron, Assumed	4"	1058.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00270	Cast Iron, Assumed	4"	398.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00271	Cast Iron, Assumed	4"	358.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00273	Cast Iron, Assumed	4"	732.3	1909	108	1	0.5	0.4	75	6	10.0	60.0	1.0	0
WMAIN-00275	Cast Iron, Assumed	4"	452.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00279	Cast Iron, Assumed	4"	42.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00280	Cast Iron, Assumed	4"	640.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00282	Cast Iron, Assumed	4"	196.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00283	Cast Iron, Assumed	4"	1313.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00284	Cast Iron, Assumed	4"	196.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00285	Cast Iron, Assumed	4"	631.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00286	Cast Iron, Assumed	4"	697.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00287	Cast Iron, Assumed	4"	665.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00289	Cast Iron, Assumed	4"	214.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00290	Cast Iron, Assumed	4"	523.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00291	Cast Iron, Assumed	4"	453.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00292	Cast Iron, Assumed	4"	28.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00293	Cast Iron, Assumed	4"	785.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00294	Cast Iron, Assumed	4"	334.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00295	Cast Iron, Assumed	4"	328.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00296	Cast Iron, Assumed	4"	310.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00297	Cast Iron, Assumed	4"	654.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00298	Cast Iron, Assumed	4"	660.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00299	Cast Iron, Assumed	4"	653.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00300	Cast Iron, Assumed	4"	344.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00301	Cast Iron, Assumed	4"	344.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00309	Cast Iron, Assumed	4"	297.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00310	Cast Iron, Assumed	4"	316.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00311	Cast Iron, Assumed	4"	627.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00312	Cast Iron, Assumed	4"	895.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00313	Cast Iron, Assumed	4"	74.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00317	Cast Iron, Assumed	4"	610.7	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00333	Cast Iron, Assumed	4"	633.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00334	Cast Iron, Assumed	4"	294.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00337	Cast Iron, Assumed	4"	312.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00338	Cast Iron, Assumed	4"	184.4	1940	77	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00339	Cast Iron, Assumed	4"	918.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00347	Cast Iron, Assumed	4"	349.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00354	Cast Iron, Assumed	4"	41.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00356	Cast Iron, Assumed	4"	59.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00361	Cast Iron, Assumed	4"	644.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00362	Cast Iron, Assumed	4"	329.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00363	Cast Iron, Assumed	4"	309.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00364	Cast Iron, Assumed	4"	546.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00367	Cast Iron, Assumed	4"	264.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00368	Cast Iron, Assumed	4"	522.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00375	Cast Iron, Assumed	4"	45.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00376	Cast Iron, Assumed	4"	1293.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00380	Cast Iron, Assumed	4"	102.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00381	Cast Iron, Assumed	4"	659.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00392	Cast Iron, Assumed	4"	60.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00394	Cast Iron, Assumed	4"	300.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00402	Cast Iron, Assumed	4"	200.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00403	Cast Iron, Assumed	4"	411.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00405	Cast Iron, Assumed	4"	9.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00406	Cast Iron, Assumed	4"	540.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00407	Cast Iron, Assumed	4"	28.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00408	Cast Iron, Assumed	4"	330.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00409	Cast Iron, Assumed	4"	607.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00410	Cast Iron, Assumed	4"	240.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00411	Cast Iron, Assumed	4"	909.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00412	Cast Iron, Assumed	4"	3.0	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00413	Cast Iron, Assumed	4"	389.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00414	Cast Iron, Assumed	4"	73.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00422	Cast Iron, Assumed	4"	697.6	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00424	Cast Iron, Assumed	4"	658.1	1950	67	1	0.5	0.4	75	6	8.9	53.6	0.9	8
WMAIN-00430	Cast Iron, Assumed	4"	8.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00452	Cast Iron, Assumed	4"	11.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00486	Cast Iron, Assumed	4"	145.1	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00487	Cast Iron, Assumed	4"	310.7	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00510	Cast Iron, Assumed	4"	546.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00522	Cast Iron, Assumed	4"	108.2	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00526	Cast Iron, Assumed	4"	918.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00527	Cast Iron, Assumed	4"	294.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00530	Cast Iron, Assumed	4"	37.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00531	Cast Iron, Assumed	4"	599.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00533	Cast Iron, Assumed	4"	31.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00540	Cast Iron, Assumed	4"	813.2	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00546	Cast Iron, Assumed	4"	388.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00548	Cast Iron, Assumed	4"	461.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00557	Cast Iron, Assumed	4"	140.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00561	Cast Iron, Assumed	4"	468.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00562	Cast Iron, Assumed	4"	418.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00563	Cast Iron, Assumed	4"	46.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00564	Cast Iron, Assumed	4"	282.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00565	Cast Iron, Assumed	4"	28.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00566	Cast Iron, Assumed	4"	11.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00568	Cast Iron, Assumed	4"	67.7	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00571	Cast Iron, Assumed	4"	1.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00572	Cast Iron, Assumed	4"	357.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00574	Cast Iron, Assumed	4"	44.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00575	Cast Iron, Assumed	4"	546.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00576	Cast Iron, Assumed	4"	217.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00577	Cast Iron, Assumed	4"	465.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00578	Cast Iron, Assumed	4"	29.8	1909	108	0.8	1	0.4	75	6.4	10.0	64.0	1.0	0
WMAIN-00579	Cast Iron, Assumed	4"	288.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00581	Cast Iron, Assumed	4"	155.6	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00590	Cast Iron, Assumed	4"	495.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00601	Cast Iron, Assumed	4"	90.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00602	Cast Iron, Assumed	4"	575.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00603	Cast Iron, Assumed	4"	583.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00609	Cast Iron, Assumed	4"	576.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00610	Cast Iron, Assumed	4"	16.1	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00617	Cast Iron, Assumed	4"	36.3	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00620	Cast Iron, Assumed	4"	453.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00630	Cast Iron, Assumed	4"	125.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00631	Cast Iron, Assumed	4"	12.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00636	Cast Iron, Assumed	4"	293.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00638	Cast Iron, Assumed	4"	294.4	1909	108	0.2	1	0.4	75	4.6	10.0	46.0	1.0	0
WMAIN-00641	Cast Iron, Assumed	4"	80.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00642	Cast Iron, Assumed	4"	2.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00643	Cast Iron, Assumed	4"	9.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00644	Cast Iron, Assumed	4"	9.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00647	Cast Iron, Assumed	4"	9.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00650	Cast Iron, Assumed	4"	316.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00661	Cast Iron, Assumed	4"	189.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00662	Cast Iron, Assumed	4"	97.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00666	Cast Iron, Assumed	4"	1009.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00669	Cast Iron, Assumed	4"	201.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00672	Cast Iron, Assumed	4"	319.2	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00682	Cast Iron, Assumed	4"	13.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00685	Cast Iron, Assumed	4"	41.5	1934	83	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00686	Cast Iron, Assumed	4"	68.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00691	Cast Iron, Assumed	4"	258.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00699	Cast Iron, Assumed	4"	5.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00704	Cast Iron, Assumed	4"	47.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00705	Cast Iron, Assumed	4"	9.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00709	Cast Iron, Assumed	4"	43.7	1909	108	0.8	0.5	0.4	75	5.4	10.0	54.0	1.0	0
WMAIN-00717	Cast Iron, Assumed	4"	874.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00727	Cast Iron, Assumed	4"	257.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00728	Cast Iron, Assumed	4"	426.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00730	Cast Iron, Assumed	4"	162.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00739	Cast Iron, Assumed	4"	817.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00764	Cast Iron, Assumed	4"	27.1	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00765	Cast Iron, Assumed	4"	39.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00766	Cast Iron, Assumed	4"	9.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00777	Cast Iron, Assumed	4"	504.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00788	Cast Iron, Assumed	4"	31.6	1909	108	0.8	0.5	0.4	75	5.4	10.0	54.0	1.0	0
WMAIN-00789	Cast Iron, Assumed	4"	164.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00806	Cast Iron, Assumed	4"	300.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00807	Cast Iron, Assumed	4"	194.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00808	Cast Iron, Assumed	4"	189.6	1969	48	1	0	0.4	75	5	6.4	32.0	0.6	27
WMAIN-00836	Cast Iron, Assumed	4"	229.8	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00845	Cast Iron, Assumed	4"	426.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00850	Cast Iron, Assumed	4"	99.5	Pre-1969	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00851	Cast Iron, Assumed	4"	52.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00852	Cast Iron, Assumed	4"	256.3	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00912	Cast Iron, Assumed	4"	242.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00913	Cast Iron, Assumed	4"	61.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00914	Cast Iron, Assumed	4"	444.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00944	Cast Iron, Assumed	4"	257.0	1940	77	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00980	Cast Iron, Assumed	4"	345.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00982	Cast Iron, Assumed	4"	371.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00997	Cast Iron, Assumed	4"	225.9	1950	67	0.3	0	0.4	75	2.9	8.9	25.9	0.9	8
WMAIN-01020	Cast Iron, Assumed	4"	298.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01021	Cast Iron, Assumed	4"	389.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01022	Cast Iron, Assumed	4"	92.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01023	Cast Iron, Assumed	4"	85.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01028	Cast Iron, Assumed	4"	156.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01029	Cast Iron, Assumed	4"	461.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01049	Cast Iron, Assumed	4"	161.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01050	Cast Iron, Assumed	4"	46.3	1909	108	0.3	1	0.4	75	4.9	10.0	49.0	1.0	0
WMAIN-01077	Cast Iron, Assumed	4"	278.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01078	Cast Iron, Assumed	4"	130.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01089	Cast Iron, Assumed	4"	689.4	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01090	Cast Iron, Assumed	4"	302.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01100	Cast Iron, Assumed	4"	335.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01108	Cast Iron, Assumed	4"	3.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01110	Cast Iron, Assumed	4"	26.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01111	Cast Iron, Assumed	4"	67.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01171	Cast Iron, Assumed	4"	24.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01247	Cast Iron, Assumed	4"	206.4	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01265	Cast Iron, Assumed	4"	22.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01315	Cast Iron, Assumed	4"	227.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01325	Cast Iron, Assumed	4"	675.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01326	Cast Iron, Assumed	4"	32.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01327	Cast Iron, Assumed	4"	45.8	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01328	Cast Iron, Assumed	4"	35.2	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01329	Cast Iron, Assumed	4"	250.5	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01350	Cast Iron, Assumed	4"	35.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01474	Cast Iron, Assumed	4"	20.9	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01475	Cast Iron, Assumed	4"	22.5	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01476	Cast Iron, Assumed	4"	23.2	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01493	Cast Iron, Assumed	4"	45.7	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01519	Cast Iron, Assumed	4"	25.7	1909	108	0.8	0.5	0.4	75	5.4	10.0	54.0	1.0	0
WMAIN-01545	Cast Iron, Assumed	4"	5.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01546	Cast Iron, Assumed	4"	3.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01618	Cast Iron, Assumed	4"	11.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01620	Cast Iron, Assumed	4"	7.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01621	Cast Iron, Assumed	4"	10.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01628	Cast Iron, Assumed	4"	32.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01630	Cast Iron, Assumed	4"	41.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01632	Cast Iron, Assumed	4"	39.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01638	Cast Iron, Assumed	4"	17.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01639	Cast Iron, Assumed	4"	38.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01640	Cast Iron, Assumed	4"	3.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01643	Cast Iron, Assumed	4"	2.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01654	Cast Iron, Assumed	4"	131.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01655	Cast Iron, Assumed	4"	4.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01660	Cast Iron, Assumed	4"	46.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01662	Cast Iron, Assumed	4"	428.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01664	Cast Iron, Assumed	4"	46.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01667	Cast Iron, Assumed	4"	306.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01668	Cast Iron, Assumed	4"	54.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01669	Cast Iron, Assumed	4"	11.0	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01672	Cast Iron, Assumed	4"	37.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01673	Cast Iron, Assumed	4"	30.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01677	Cast Iron, Assumed	4"	144.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01682	Cast Iron, Assumed	4"	29.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01684	Cast Iron, Assumed	4"	8.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01685	Cast Iron, Assumed	4"	5.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01686	Cast Iron, Assumed	4"	26.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01687	Cast Iron, Assumed	4"	4.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01688	Cast Iron, Assumed	4"	5.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01693	Cast Iron, Assumed	4"	189.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01701	Cast Iron, Assumed	4"	30.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01721	Cast Iron, Assumed	4"	26.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01723	Cast Iron, Assumed	4"	157.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01724	Cast Iron, Assumed	4"	178.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01726	Cast Iron, Assumed	4"	115.0	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01727	Cast Iron, Assumed	4"	97.9	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01728	Cast Iron, Assumed	4"	22.6	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01730	Cast Iron, Assumed	4"	51.6	Pre-1952	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01737	Cast Iron, Assumed	4"	80.7	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01738	Cast Iron, Assumed	4"	7.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00221	Cast Iron, Assumed	4"	35.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01742	Ductile Iron	4"	22.6	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
WMAIN-01743	Ductile Iron	4"	20.3	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
WMAIN-01745	Ductile Iron	4"	15.6	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
<Null>	Ductile Iron	4"	5.9	2015	2	1	0	0.4	90	5	0.2	1.1	0.0	88
WMAIN-00046	Ductile Iron, Assumed	4"	124.2	2008	9	1	0	0.4	90	5	1.0	5.0	0.1	81
WMAIN-00211	Ductile Iron, Assumed	4"	442.5	2006	11	0.8	0	0.4	90	4.4	1.2	5.4	0.1	79
WMAIN-00350	Ductile Iron, Assumed	4"	578.9	1980	37	0.8	0	0.4	90	4.4	4.1	18.1	0.4	53
WMAIN-00586	Ductile Iron, Assumed	4"	448.2	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00744	Ductile Iron, Assumed	4"	45.6	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00746	Ductile Iron, Assumed	4"	3.8	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00748	Ductile Iron, Assumed	4"	807.6	2008	9	0.8	0	0.4	90	4.4	1.0	4.4	0.1	81
WMAIN-00760	Ductile Iron, Assumed	4"	377.9	1971	46	1	0	0.4	90	5	5.1	25.6	0.5	44
WMAIN-01692	Ductile Iron, Assumed	4"	3.1	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00007	Cast Iron, Assumed	6"	662.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00008	Cast Iron, Assumed	6"	51.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00009	Cast Iron, Assumed	6"	281.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00011	Cast Iron, Assumed	6"	16.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00012	Cast Iron, Assumed	6"	332.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00013	Cast Iron, Assumed	6"	354.4	1956	61	0.8	0	0.4	75	4.4	8.1	35.8	0.8	14
WMAIN-00018	Cast Iron, Assumed	6"	680.7	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00019	Cast Iron, Assumed	6"	44.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00021	Cast Iron, Assumed	6"	9.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00022	Cast Iron, Assumed	6"	69.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00023	Cast Iron, Assumed	6"	489.0	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00031	Cast Iron, Assumed	6"	3.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00032	Cast Iron, Assumed	6"	3.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00033	Cast Iron, Assumed	6"	412.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00034	Cast Iron, Assumed	6"	88.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00047	Cast Iron, Assumed	6"	269.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00050	Cast Iron, Assumed	6"	241.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00051	Cast Iron, Assumed	6"	613.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00052	Cast Iron, Assumed	6"	295.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00056	Cast Iron, Assumed	6"	1273.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00057	Cast Iron, Assumed	6"	336.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00058	Cast Iron, Assumed	6"	332.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00059	Cast Iron, Assumed	6"	664.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00060	Cast Iron, Assumed	6"	656.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00061	Cast Iron, Assumed	6"	329.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00067	Cast Iron, Assumed	6"	634.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00068	Cast Iron, Assumed	6"	60.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00078	Cast Iron, Assumed	6"	39.5	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00083	Cast Iron, Assumed	6"	10.7	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00092	Cast Iron, Assumed	6"	432.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00093	Cast Iron, Assumed	6"	826.6	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00094	Cast Iron, Assumed	6"	1362.1	1969	48	0.8	0	0.4	75	4.4	6.4	28.2	0.6	27
WMAIN-00108	Cast Iron, Assumed	6"	295.9	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00109	Cast Iron, Assumed	6"	14.3	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00113	Cast Iron, Assumed	6"	450.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00122	Cast Iron, Assumed	6"	173.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00123	Cast Iron, Assumed	6"	21.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00124	Cast Iron, Assumed	6"	100.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00129	Cast Iron, Assumed	6"	12.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00136	Cast Iron, Assumed	6"	220.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00138	Cast Iron, Assumed	6"	149.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00139	Cast Iron, Assumed	6"	384.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00140	Cast Iron, Assumed	6"	179.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00148	Cast Iron, Assumed	6"	207.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00163	Cast Iron, Assumed	6"	58.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00164	Cast Iron, Assumed	6"	72.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00168	Cast Iron, Assumed	6"	220.1	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00170	Cast Iron, Assumed	6"	334.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0

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WMAIN-00171	Cast Iron, Assumed	6"	494.4	1979	38	1	0	0.4	75	5	5.1	25.3	0.5	37
WMAIN-00182	Cast Iron, Assumed	6"	10.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00183	Cast Iron, Assumed	6"	19.0	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00184	Cast Iron, Assumed	6"	15.0	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00185	Cast Iron, Assumed	6"	27.7	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00186	Cast Iron, Assumed	6"	29.9	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-00187	Cast Iron, Assumed	6"	192.2	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00190	Cast Iron, Assumed	6"	806.7	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00191	Cast Iron, Assumed	6"	296.3	1979	38	1	0	0.4	75	5	5.1	25.3	0.5	37
WMAIN-00192	Cast Iron, Assumed	6"	1313.0	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00193	Cast Iron, Assumed	6"	514.3	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00194	Cast Iron, Assumed	6"	25.1	1978	39	1	0	0.4	75	5	5.2	26.0	0.5	36
WMAIN-00202	Cast Iron, Assumed	6"	1341.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00203	Cast Iron, Assumed	6"	672.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00204	Cast Iron, Assumed	6"	80.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00206	Cast Iron, Assumed	6"	308.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00207	Cast Iron, Assumed	6"	181.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00218	Cast Iron, Assumed	6"	253.8	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00233	Cast Iron, Assumed	6"	491.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00234	Cast Iron, Assumed	6"	479.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00247	Cast Iron, Assumed	6"	188.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00252	Cast Iron, Assumed	6"	869.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00253	Cast Iron, Assumed	6"	11.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00256	Cast Iron, Assumed	6"	259.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00263	Cast Iron, Assumed	6"	55.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00267	Cast Iron, Assumed	6"	1240.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00276	Cast Iron, Assumed	6"	20.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00277	Cast Iron, Assumed	6"	589.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00278	Cast Iron, Assumed	6"	168.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00288	Cast Iron, Assumed	6"	22.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00302	Cast Iron, Assumed	6"	330.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00303	Cast Iron, Assumed	6"	331.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00304	Cast Iron, Assumed	6"	306.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00305	Cast Iron, Assumed	6"	412.9	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00306	Cast Iron, Assumed	6"	211.3	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00307	Cast Iron, Assumed	6"	100.4	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00308	Cast Iron, Assumed	6"	542.7	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00314	Cast Iron, Assumed	6"	8.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00315	Cast Iron, Assumed	6"	39.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00316	Cast Iron, Assumed	6"	47.6	Pre-1949	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00318	Cast Iron, Assumed	6"	61.4	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00320	Cast Iron, Assumed	6"	301.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00321	Cast Iron, Assumed	6"	1306.7	Pre-1947	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00322	Cast Iron, Assumed	6"	625.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00323	Cast Iron, Assumed	6"	1322.3	Pre-1949	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00332	Cast Iron, Assumed	6"	708.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00335	Cast Iron, Assumed	6"	173.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00336	Cast Iron, Assumed	6"	10.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00340	Cast Iron, Assumed	6"	730.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00341	Cast Iron, Assumed	6"	207.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00342	Cast Iron, Assumed	6"	295.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00343	Cast Iron, Assumed	6"	341.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00346	Cast Iron, Assumed	6"	668.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00348	Cast Iron, Assumed	6"	691.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00349	Cast Iron, Assumed	6"	673.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00351	Cast Iron, Assumed	6"	655.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00352	Cast Iron, Assumed	6"	297.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00353	Cast Iron, Assumed	6"	281.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00355	Cast Iron, Assumed	6"	120.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00365	Cast Iron, Assumed	6"	671.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00366	Cast Iron, Assumed	6"	679.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00370	Cast Iron, Assumed	6"	684.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00371	Cast Iron, Assumed	6"	427.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00372	Cast Iron, Assumed	6"	1285.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00373	Cast Iron, Assumed	6"	627.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00374	Cast Iron, Assumed	6"	657.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00377	Cast Iron, Assumed	6"	832.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00378	Cast Iron, Assumed	6"	650.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00379	Cast Iron, Assumed	6"	669.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00382	Cast Iron, Assumed	6"	664.9	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00387	Cast Iron, Assumed	6"	660.6	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00393	Cast Iron, Assumed	6"	180.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00395	Cast Iron, Assumed	6"	366.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00396	Cast Iron, Assumed	6"	561.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00397	Cast Iron, Assumed	6"	327.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00398	Cast Iron, Assumed	6"	10.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00399	Cast Iron, Assumed	6"	37.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00400	Cast Iron, Assumed	6"	23.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00401	Cast Iron, Assumed	6"	39.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00404	Cast Iron, Assumed	6"	84.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00425	Cast Iron, Assumed	6"	145.5	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00433	Cast Iron, Assumed	6"	366.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00434	Cast Iron, Assumed	6"	6.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00435	Cast Iron, Assumed	6"	207.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00436	Cast Iron, Assumed	6"	7.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00437	Cast Iron, Assumed	6"	26.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00439	Cast Iron, Assumed	6"	5.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00440	Cast Iron, Assumed	6"	10.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00441	Cast Iron, Assumed	6"	13.3	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00442	Cast Iron, Assumed	6"	59.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00443	Cast Iron, Assumed	6"	3.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00444	Cast Iron, Assumed	6"	9.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00445	Cast Iron, Assumed	6"	4.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00446	Cast Iron, Assumed	6"	0.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00447	Cast Iron, Assumed	6"	9.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00448	Cast Iron, Assumed	6"	56.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00450	Cast Iron, Assumed	6"	333.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00454	Cast Iron, Assumed	6"	658.8	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00455	Cast Iron, Assumed	6"	2.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00456	Cast Iron, Assumed	6"	11.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00457	Cast Iron, Assumed	6"	10.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00462	Cast Iron, Assumed	6"	6.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00464	Cast Iron, Assumed	6"	722.7	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00474	Cast Iron, Assumed	6"	4.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00475	Cast Iron, Assumed	6"	3.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00477	Cast Iron, Assumed	6"	5.2	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00478	Cast Iron, Assumed	6"	9.8	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00482	Cast Iron, Assumed	6"	660.7	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00484	Cast Iron, Assumed	6"	58.6	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00485	Cast Iron, Assumed	6"	8.5	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00490	Cast Iron, Assumed	6"	1294.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00492	Cast Iron, Assumed	6"	1301.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00493	Cast Iron, Assumed	6"	1329.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00494	Cast Iron, Assumed	6"	1347.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00495	Cast Iron, Assumed	6"	670.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00496	Cast Iron, Assumed	6"	1314.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00498	Cast Iron, Assumed	6"	125.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00499	Cast Iron, Assumed	6"	1026.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00500	Cast Iron, Assumed	6"	55.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00503	Cast Iron, Assumed	6"	37.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00511	Cast Iron, Assumed	6"	588.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00514	Cast Iron, Assumed	6"	36.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00515	Cast Iron, Assumed	6"	29.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00516	Cast Iron, Assumed	6"	7.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00519	Cast Iron, Assumed	6"	237.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00520	Cast Iron, Assumed	6"	69.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00521	Cast Iron, Assumed	6"	6.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00523	Cast Iron, Assumed	6"	70.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00524	Cast Iron, Assumed	6"	179.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00525	Cast Iron, Assumed	6"	323.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00532	Cast Iron, Assumed	6"	478.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00534	Cast Iron, Assumed	6"	981.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00535	Cast Iron, Assumed	6"	303.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00536	Cast Iron, Assumed	6"	379.1	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00537	Cast Iron, Assumed	6"	64.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00538	Cast Iron, Assumed	6"	502.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00539	Cast Iron, Assumed	6"	336.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00541	Cast Iron, Assumed	6"	493.0	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00542	Cast Iron, Assumed	6"	9.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00543	Cast Iron, Assumed	6"	301.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00544	Cast Iron, Assumed	6"	170.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00545	Cast Iron, Assumed	6"	163.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00547	Cast Iron, Assumed	6"	13.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00549	Cast Iron, Assumed	6"	419.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00550	Cast Iron, Assumed	6"	326.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00551	Cast Iron, Assumed	6"	370.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00552	Cast Iron, Assumed	6"	285.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00553	Cast Iron, Assumed	6"	296.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00554	Cast Iron, Assumed	6"	351.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00555	Cast Iron, Assumed	6"	2.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00556	Cast Iron, Assumed	6"	114.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00558	Cast Iron, Assumed	6"	432.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00559	Cast Iron, Assumed	6"	153.9	Pre-1969	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00560	Cast Iron, Assumed	6"	34.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00567	Cast Iron, Assumed	6"	53.8	1909	108	0.2	1	0.4	75	4.6	10.0	46.0	1.0	0
WMAIN-00570	Cast Iron, Assumed	6"	120.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00580	Cast Iron, Assumed	6"	12.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00587	Cast Iron, Assumed	6"	105.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00588	Cast Iron, Assumed	6"	45.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00589	Cast Iron, Assumed	6"	876.7	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00597	Cast Iron, Assumed	6"	10.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00599	Cast Iron, Assumed	6"	36.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00600	Cast Iron, Assumed	6"	279.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00604	Cast Iron, Assumed	6"	12.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00611	Cast Iron, Assumed	6"	451.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00616	Cast Iron, Assumed	6"	1067.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00618	Cast Iron, Assumed	6"	89.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00619	Cast Iron, Assumed	6"	98.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00622	Cast Iron, Assumed	6"	626.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00623	Cast Iron, Assumed	6"	304.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00624	Cast Iron, Assumed	6"	257.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00632	Cast Iron, Assumed	6"	1035.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00633	Cast Iron, Assumed	6"	4.4	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00634	Cast Iron, Assumed	6"	23.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00637	Cast Iron, Assumed	6"	649.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00657	Cast Iron, Assumed	6"	11.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00658	Cast Iron, Assumed	6"	9.9	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00659	Cast Iron, Assumed	6"	16.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00660	Cast Iron, Assumed	6"	610.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00663	Cast Iron, Assumed	6"	1297.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00664	Cast Iron, Assumed	6"	311.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00665	Cast Iron, Assumed	6"	27.9	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-00667	Cast Iron, Assumed	6"	417.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00668	Cast Iron, Assumed	6"	145.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00674	Cast Iron, Assumed	6"	312.1	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00675	Cast Iron, Assumed	6"	321.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00678	Cast Iron, Assumed	6"	654.8	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00680	Cast Iron, Assumed	6"	9.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00683	Cast Iron, Assumed	6"	480.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00687	Cast Iron, Assumed	6"	388.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00688	Cast Iron, Assumed	6"	84.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00689	Cast Iron, Assumed	6"	98.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00690	Cast Iron, Assumed	6"	104.7	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00692	Cast Iron, Assumed	6"	144.7	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00693	Cast Iron, Assumed	6"	50.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00696	Cast Iron, Assumed	6"	45.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00697	Cast Iron, Assumed	6"	55.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00707	Cast Iron, Assumed	6"	7.0	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00708	Cast Iron, Assumed	6"	13.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00710	Cast Iron, Assumed	6"	743.6	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00711	Cast Iron, Assumed	6"	409.8	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00715	Cast Iron, Assumed	6"	39.9	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00718	Cast Iron, Assumed	6"	287.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00721	Cast Iron, Assumed	6"	10.0	Pre-1967	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00722	Cast Iron, Assumed	6"	7.7	1967	50	1	0	0.4	75	5	6.7	33.3	0.7	25
WMAIN-00723	Cast Iron, Assumed	6"	10.4	1967	50	1	0	0.4	75	5	6.7	33.3	0.7	25
WMAIN-00724	Cast Iron, Assumed	6"	3.0	1967	50	1	0	0.4	75	5	6.7	33.3	0.7	25
WMAIN-00725	Cast Iron, Assumed	6"	205.1	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00729	Cast Iron, Assumed	6"	50.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00731	Cast Iron, Assumed	6"	501.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00732	Cast Iron, Assumed	6"	593.1	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-00733	Cast Iron, Assumed	6"	319.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00736	Cast Iron, Assumed	6"	8.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00737	Cast Iron, Assumed	6"	8.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00740	Cast Iron, Assumed	6"	615.1	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00741	Cast Iron, Assumed	6"	300.1	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00743	Cast Iron, Assumed	6"	86.4	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-00745	Cast Iron, Assumed	6"	211.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00749	Cast Iron, Assumed	6"	10.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00754	Cast Iron, Assumed	6"	9.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00755	Cast Iron, Assumed	6"	11.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00756	Cast Iron, Assumed	6"	391.5	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-00757	Cast Iron, Assumed	6"	148.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00759	Cast Iron, Assumed	6"	13.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00775	Cast Iron, Assumed	6"	1122.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00776	Cast Iron, Assumed	6"	96.8	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00778	Cast Iron, Assumed	6"	57.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00794	Cast Iron, Assumed	6"	84.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00799	Cast Iron, Assumed	6"	24.0	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00800	Cast Iron, Assumed	6"	29.9	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00801	Cast Iron, Assumed	6"	16.5	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00802	Cast Iron, Assumed	6"	19.4	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00803	Cast Iron, Assumed	6"	23.4	1909	108	0	0	0.4	75	2	10.0	20.0	1.0	0
WMAIN-00834	Cast Iron, Assumed	6"	373.3	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-00835	Cast Iron, Assumed	6"	850.0	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00838	Cast Iron, Assumed	6"	518.7	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00842	Cast Iron, Assumed	6"	116.2	1947	70	1	0	0.4	75	5	9.3	46.7	0.9	5
WMAIN-00844	Cast Iron, Assumed	6"	246.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00849	Cast Iron, Assumed	6"	87.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00853	Cast Iron, Assumed	6"	118.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00854	Cast Iron, Assumed	6"	25.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00855	Cast Iron, Assumed	6"	352.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00899	Cast Iron, Assumed	6"	10.4	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17
WMAIN-00900	Cast Iron, Assumed	6"	375.1	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17

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WMAIN-00915	Cast Iron, Assumed	6"	129.8	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17
WMAIN-00916	Cast Iron, Assumed	6"	64.8	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00938	Cast Iron, Assumed	6"	21.4	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00939	Cast Iron, Assumed	6"	21.6	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00950	Cast Iron, Assumed	6"	62.3	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-00956	Cast Iron, Assumed	6"	277.9	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-00957	Cast Iron, Assumed	6"	96.0	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00958	Cast Iron, Assumed	6"	186.4	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00959	Cast Iron, Assumed	6"	79.9	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00960	Cast Iron, Assumed	6"	40.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00961	Cast Iron, Assumed	6"	128.6	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00962	Cast Iron, Assumed	6"	20.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00963	Cast Iron, Assumed	6"	166.6	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00964	Cast Iron, Assumed	6"	19.7	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00965	Cast Iron, Assumed	6"	61.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00966	Cast Iron, Assumed	6"	246.6	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00967	Cast Iron, Assumed	6"	99.3	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00968	Cast Iron, Assumed	6"	6.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00969	Cast Iron, Assumed	6"	57.7	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00970	Cast Iron, Assumed	6"	25.4	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-00971	Cast Iron, Assumed	6"	71.4	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00972	Cast Iron, Assumed	6"	109.5	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00973	Cast Iron, Assumed	6"	132.8	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00974	Cast Iron, Assumed	6"	4.4	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-00977	Cast Iron, Assumed	6"	367.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00978	Cast Iron, Assumed	6"	355.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00979	Cast Iron, Assumed	6"	343.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-00981	Cast Iron, Assumed	6"	203.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-00984	Cast Iron, Assumed	6"	857.3	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00988	Cast Iron, Assumed	6"	8.5	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00989	Cast Iron, Assumed	6"	4.0	1947	70	0.2	0	0.4	75	2.6	9.3	24.3	0.9	5
WMAIN-00992	Cast Iron, Assumed	6"	7.1	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-00994	Cast Iron, Assumed	6"	98.9	1947	70	0	0	0.4	75	2	9.3	18.7	0.9	5
WMAIN-00995	Cast Iron, Assumed	6"	107.5	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00996	Cast Iron, Assumed	6"	23.8	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-00998	Cast Iron, Assumed	6"	3.0	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01002	Cast Iron, Assumed	6"	15.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01006	Cast Iron, Assumed	6"	225.6	1998	19	0.2	0	0.4	75	2.6	2.5	6.6	0.3	56
WMAIN-01007	Cast Iron, Assumed	6"	140.7	1998	19	0.2	0	0.4	75	2.6	2.5	6.6	0.3	56
WMAIN-01008	Cast Iron, Assumed	6"	349.2	1998	19	0.2	1	0.4	75	4.6	2.5	11.7	0.3	56
WMAIN-01016	Cast Iron, Assumed	6"	323.3	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01017	Cast Iron, Assumed	6"	141.0	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01018	Cast Iron, Assumed	6"	148.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01019	Cast Iron, Assumed	6"	48.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01035	Cast Iron, Assumed	6"	184.8	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01037	Cast Iron, Assumed	6"	368.6	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01038	Cast Iron, Assumed	6"	8.7	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01039	Cast Iron, Assumed	6"	82.8	1909	108	1	0.8	0.4	75	6.6	10.0	66.0	1.0	0
WMAIN-01044	Cast Iron, Assumed	6"	11.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01047	Cast Iron, Assumed	6"	215.1	1909	108	1	0.5	0.4	75	6	10.0	60.0	1.0	0
WMAIN-01048	Cast Iron, Assumed	6"	21.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01051	Cast Iron, Assumed	6"	13.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01068	Cast Iron, Assumed	6"	131.9	1950	67	0.2	1	0.4	75	4.6	8.9	41.1	0.9	8
WMAIN-01069	Cast Iron, Assumed	6"	738.2	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01070	Cast Iron, Assumed	6"	290.0	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01073	Cast Iron, Assumed	6"	174.8	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01079	Cast Iron, Assumed	6"	805.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01080	Cast Iron, Assumed	6"	11.3	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01081	Cast Iron, Assumed	6"	63.3	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-01083	Cast Iron, Assumed	6"	156.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01086	Cast Iron, Assumed	6"	4.3	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

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WMAIN-01087	Cast Iron, Assumed	6"	562.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01092	Cast Iron, Assumed	6"	672.1	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01093	Cast Iron, Assumed	6"	50.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01094	Cast Iron, Assumed	6"	84.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01095	Cast Iron, Assumed	6"	413.8	1959	58	1	0.5	0.4	75	6	7.7	46.4	0.8	17
WMAIN-01096	Cast Iron, Assumed	6"	77.4	1959	58	0	0.5	0.4	75	3	7.7	23.2	0.8	17
WMAIN-01103	Cast Iron, Assumed	6"	8.8	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01112	Cast Iron, Assumed	6"	137.9	1947	70	0.8	0	0.4	75	4.4	9.3	41.1	0.9	5
WMAIN-01113	Cast Iron, Assumed	6"	600.7	1959	58	0.2	0.5	0.4	75	3.6	7.7	27.8	0.8	17
WMAIN-01114	Cast Iron, Assumed	6"	658.2	1950	67	0	0	0.4	75	2	8.9	17.9	0.9	8
WMAIN-01128	Cast Iron, Assumed	6"	10.9	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01147	Cast Iron, Assumed	6"	4.9	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01150	Cast Iron, Assumed	6"	70.7	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01164	Cast Iron, Assumed	6"	3.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01168	Cast Iron, Assumed	6"	15.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01173	Cast Iron, Assumed	6"	21.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01174	Cast Iron, Assumed	6"	34.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01212	Cast Iron, Assumed	6"	34.4	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01214	Cast Iron, Assumed	6"	166.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01249	Cast Iron, Assumed	6"	6.5	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01253	Cast Iron, Assumed	6"	204.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01254	Cast Iron, Assumed	6"	142.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01262	Cast Iron, Assumed	6"	5.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01271	Cast Iron, Assumed	6"	269.2	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01272	Cast Iron, Assumed	6"	643.7	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01273	Cast Iron, Assumed	6"	694.1	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01309	Cast Iron, Assumed	6"	395.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01316	Cast Iron, Assumed	6"	197.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01321	Cast Iron, Assumed	6"	19.5	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-01352	Cast Iron, Assumed	6"	85.2	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01353	Cast Iron, Assumed	6"	181.9	1909	108	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01354	Cast Iron, Assumed	6"	212.7	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01355	Cast Iron, Assumed	6"	24.5	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01358	Cast Iron, Assumed	6"	2007.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01360	Cast Iron, Assumed	6"	661.9	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01362	Cast Iron, Assumed	6"	30.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01391	Cast Iron, Assumed	6"	52.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01393	Cast Iron, Assumed	6"	7.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01421	Cast Iron, Assumed	6"	3.8	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01422	Cast Iron, Assumed	6"	0.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01442	Cast Iron, Assumed	6"	2.2	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01450	Cast Iron, Assumed	6"	52.6	1937	80	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01452	Cast Iron, Assumed	6"	7.4	1934	83	0.2	0.5	0.4	75	3.6	10.0	36.0	1.0	0
WMAIN-01453	Cast Iron, Assumed	6"	5.2	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01454	Cast Iron, Assumed	6"	45.9	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01458	Cast Iron, Assumed	6"	21.3	1959	58	0.2	0	0.4	75	2.6	7.7	20.1	0.8	17
WMAIN-01470	Cast Iron, Assumed	6"	640.6	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01471	Cast Iron, Assumed	6"	53.0	Pre-1951	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01477	Cast Iron, Assumed	6"	24.5	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01478	Cast Iron, Assumed	6"	20.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01479	Cast Iron, Assumed	6"	24.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01480	Cast Iron, Assumed	6"	625.0	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01481	Cast Iron, Assumed	6"	623.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01482	Cast Iron, Assumed	6"	51.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01483	Cast Iron, Assumed	6"	55.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01484	Cast Iron, Assumed	6"	25.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01485	Cast Iron, Assumed	6"	39.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01486	Cast Iron, Assumed	6"	280.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01487	Cast Iron, Assumed	6"	49.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01488	Cast Iron, Assumed	6"	39.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01489	Cast Iron, Assumed	6"	190.6	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01490	Cast Iron, Assumed	6"	38.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01492	Cast Iron, Assumed	6"	38.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01494	Cast Iron, Assumed	6"	99.8	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01495	Cast Iron, Assumed	6"	52.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01496	Cast Iron, Assumed	6"	48.3	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01497	Cast Iron, Assumed	6"	3.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01498	Cast Iron, Assumed	6"	51.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01501	Cast Iron, Assumed	6"	103.3	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01502	Cast Iron, Assumed	6"	266.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01504	Cast Iron, Assumed	6"	5.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01505	Cast Iron, Assumed	6"	4.2	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01506	Cast Iron, Assumed	6"	8.7	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01507	Cast Iron, Assumed	6"	27.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01508	Cast Iron, Assumed	6"	141.5	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01509	Cast Iron, Assumed	6"	26.4	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01510	Cast Iron, Assumed	6"	56.0	1959	58	0.3	0	0.4	75	2.9	7.7	22.4	0.8	17
WMAIN-01511	Cast Iron, Assumed	6"	56.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01512	Cast Iron, Assumed	6"	83.8	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01527	Cast Iron, Assumed	6"	113.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01540	Cast Iron, Assumed	6"	4.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01541	Cast Iron, Assumed	6"	4.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01548	Cast Iron, Assumed	6"	113.9	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01562	Cast Iron, Assumed	6"	49.6	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01624	Cast Iron, Assumed	6"	141.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01625	Cast Iron, Assumed	6"	117.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01627	Cast Iron, Assumed	6"	2.7	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01631	Cast Iron, Assumed	6"	0.2	1909	108	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01633	Cast Iron, Assumed	6"	2.2	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-01634	Cast Iron, Assumed	6"	7.3	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-01635	Cast Iron, Assumed	6"	11.9	1909	108	0.3	0	0.4	75	2.9	10.0	29.0	1.0	0
WMAIN-01636	Cast Iron, Assumed	6"	11.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01641	Cast Iron, Assumed	6"	4.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01642	Cast Iron, Assumed	6"	55.6	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01644	Cast Iron, Assumed	6"	31.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01645	Cast Iron, Assumed	6"	20.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01647	Cast Iron, Assumed	6"	3.4	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01648	Cast Iron, Assumed	6"	36.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01649	Cast Iron, Assumed	6"	4.6	1950	67	1	0	0.4	75	5	8.9	44.7	0.9	8
WMAIN-01650	Cast Iron, Assumed	6"	173.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01651	Cast Iron, Assumed	6"	77.4	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01652	Cast Iron, Assumed	6"	15.0	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01653	Cast Iron, Assumed	6"	36.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01659	Cast Iron, Assumed	6"	3.9	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01663	Cast Iron, Assumed	6"	37.0	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01666	Cast Iron, Assumed	6"	97.3	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01674	Cast Iron, Assumed	6"	7.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01675	Cast Iron, Assumed	6"	2.8	1950	67	0.8	0	0.4	75	4.4	8.9	39.3	0.9	8
WMAIN-01676	Cast Iron, Assumed	6"	20.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01678	Cast Iron, Assumed	6"	37.1	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01681	Cast Iron, Assumed	6"	36.5	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01683	Cast Iron, Assumed	6"	18.7	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01689	Cast Iron, Assumed	6"	572.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01690	Cast Iron, Assumed	6"	61.2	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01695	Cast Iron, Assumed	6"	20.0	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01698	Cast Iron, Assumed	6"	33.5	1909	108	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01704	Cast Iron, Assumed	6"	3.1	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01705	Cast Iron, Assumed	6"	4.5	2005	11	0.8	0	0.4	75	4.4	1.5	6.5	0.1	64
WMAIN-01706	Cast Iron, Assumed	6"	3.9	1950	67	0.2	0	0.4	75	2.6	8.9	23.2	0.9	8
WMAIN-01714	Cast Iron, Assumed	6"	5.6	1934	83	0.2	0	0.4	75	2.6	10.0	26.0	1.0	0
WMAIN-01715	Cast Iron, Assumed	6"	45.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01716	Cast Iron, Assumed	6"	56.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0

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WMAIN-01717	Cast Iron, Assumed	6"	29.2	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01718	Cast Iron, Assumed	6"	315.9	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01719	Cast Iron, Assumed	6"	55.0	Pre-1947	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01720	Cast Iron, Assumed	6"	9.4	1934	83	0.8	0	0.4	75	4.4	10.0	44.0	1.0	0
WMAIN-01722	Cast Iron, Assumed	6"	18.5	1934	83	1	0	0.4	75	5	10.0	50.0	1.0	0
WMAIN-01732	Cast Iron, Assumed	6"	23.5	1959	58	1	0	0.4	75	5	7.7	38.7	0.8	17
WMAIN-01733	Cast Iron, Assumed	6"	11.9	1959	58	0.8	0	0.4	75	4.4	7.7	34.0	0.8	17
WMAIN-01736	Cast Iron, Assumed	6"	97.4	1951	66	0.8	0	0.4	75	4.4	8.8	38.7	0.9	9
<Null>	Ductile Iron	6"	7.1	2015	2	1	0	0.4	90	5	0.2	1.1	0.0	88
WMAIN-00629	Ductile Iron, Assumed	6"	9.0	2006	11	0.2	0	0.4	90	2.6	1.2	3.2	0.1	79
WMAIN-00652	Ductile Iron, Assumed	6"	37.7	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00653	Ductile Iron, Assumed	6"	32.2	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00655	Ductile Iron, Assumed	6"	10.0	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00656	Ductile Iron, Assumed	6"	8.0	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-00742	Ductile Iron, Assumed	6"	51.1	2008	9	1	0	0.4	90	5	1.0	5.0	0.1	81
WMAIN-00761	Ductile Iron, Assumed	6"	47.0	1971	46	0	0	0.4	90	2	5.1	10.2	0.5	44
WMAIN-00762	Ductile Iron, Assumed	6"	45.0	1971	46	0.8	0	0.4	90	4.4	5.1	22.5	0.5	44
WMAIN-00779	Ductile Iron, Assumed	6"	116.1	1974	43	0.8	0	0.4	90	4.4	4.8	21.0	0.5	47
WMAIN-00793	Ductile Iron, Assumed	6"	6.6	1974	43	0	0	0.4	90	2	4.8	9.6	0.5	47
WMAIN-01003	Ductile Iron, Assumed	6"	102.5	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-01004	Ductile Iron, Assumed	6"	253.5	1974	43	0	0	0.4	90	2	4.8	9.6	0.5	47
WMAIN-01040	Ductile Iron, Assumed	6"	102.6	1974	43	0.2	0.8	0.4	90	4.2	4.8	20.1	0.5	47
WMAIN-01041	Ductile Iron, Assumed	6"	306.1	1974	43	0.2	0.8	0.4	90	4.2	4.8	20.1	0.5	47
WMAIN-01042	Ductile Iron, Assumed	6"	47.3	1974	43	0.2	0	0.4	90	2.6	4.8	12.4	0.5	47
WMAIN-01043	Ductile Iron, Assumed	6"	214.0	2007	10	1	0.8	0.4	90	6.6	1.1	7.3	0.1	80
WMAIN-01162	Ductile Iron, Assumed	6"	235.5	2008	8	1	0	0.4	90	5	0.9	4.4	0.1	82
WMAIN-01213	Ductile Iron, Assumed	6"	7.6	2007	10	0.3	0	0.4	90	2.9	1.1	3.2	0.1	80
WMAIN-01252	Ductile Iron, Assumed	6"	120.0	2008	8	1	0	0.4	90	5	0.9	4.4	0.1	82
WMAIN-01525	Ductile Iron, Assumed	6"	248.0	2007	10	1	0	0.4	90	5	1.1	5.6	0.1	80
WMAIN-01542	Ductile Iron, Assumed	6"	14.0	2008	9	1	0	0.4	90	5	1.0	5.0	0.1	81
WMAIN-01543	Ductile Iron, Assumed	6"	11.2	2008	8	1	0	0.4	90	5	0.9	4.4	0.1	82
WMAIN-01670	Ductile Iron, Assumed	6"	9.7	1974	43	1	0	0.4	90	5	4.8	23.9	0.5	47
WMAIN-01697	Ductile Iron, Assumed	6"	3.3	1974	43	0	0	0.4	90	2	4.8	9.6	0.5	47
WMAIN-00004	Cast Iron, Assumed	8"	330.1	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00017	Cast Iron, Assumed	8"	662.5	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00048	Cast Iron, Assumed	8"	22.6	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00049	Cast Iron, Assumed	8"	3.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00072	Cast Iron, Assumed	8"	357.9	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00073	Cast Iron, Assumed	8"	436.4	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00074	Cast Iron, Assumed	8"	349.1	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00079	Cast Iron, Assumed	8"	261.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00081	Cast Iron, Assumed	8"	69.4	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00082	Cast Iron, Assumed	8"	13.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00086	Cast Iron, Assumed	8"	279.8	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00087	Cast Iron, Assumed	8"	353.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00149	Cast Iron, Assumed	8"	187.5	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00156	Cast Iron, Assumed	8"	713.1	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00160	Cast Iron, Assumed	8"	7.9	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00172	Cast Iron, Assumed	8"	281.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00210	Cast Iron, Assumed	8"	3.3	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00236	Cast Iron, Assumed	8"	291.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00237	Cast Iron, Assumed	8"	301.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00238	Cast Iron, Assumed	8"	7.1	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00242	Cast Iron, Assumed	8"	36.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00243	Cast Iron, Assumed	8"	8.2	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00244	Cast Iron, Assumed	8"	36.7	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00245	Cast Iron, Assumed	8"	22.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00257	Cast Iron, Assumed	8"	925.8	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00281	Cast Iron, Assumed	8"	551.1	1909	108	1	0.8	0.7	75	8.1	10.0	81.0	1.0	0
WMAIN-00319	Cast Iron, Assumed	8"	305.4	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00324	Cast Iron, Assumed	8"	674.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00326	Cast Iron, Assumed	8"	197.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00357	Cast Iron, Assumed	8"	664.2	2000	17	1	0	0.7	75	6.5	2.3	14.7	0.2	58
WMAIN-00358	Cast Iron, Assumed	8"	305.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00359	Cast Iron, Assumed	8"	289.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00383	Cast Iron, Assumed	8"	688.1	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00384	Cast Iron, Assumed	8"	12.8	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00419	Cast Iron, Assumed	8"	333.2	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00453	Cast Iron, Assumed	8"	56.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00463	Cast Iron, Assumed	8"	363.3	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00479	Cast Iron, Assumed	8"	9.4	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00488	Cast Iron, Assumed	8"	325.5	Pre-1956	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00489	Cast Iron, Assumed	8"	6.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00497	Cast Iron, Assumed	8"	567.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00504	Cast Iron, Assumed	8"	27.7	1967	50	1	0	0.7	75	6.5	6.7	43.3	0.7	25
WMAIN-00506	Cast Iron, Assumed	8"	27.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00507	Cast Iron, Assumed	8"	3.6	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00517	Cast Iron, Assumed	8"	88.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00518	Cast Iron, Assumed	8"	4.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00569	Cast Iron, Assumed	8"	214.0	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00585	Cast Iron, Assumed	8"	334.3	Pre-1956	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00592	Cast Iron, Assumed	8"	35.0	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00593	Cast Iron, Assumed	8"	352.9	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00596	Cast Iron, Assumed	8"	18.4	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00605	Cast Iron, Assumed	8"	22.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00607	Cast Iron, Assumed	8"	262.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00608	Cast Iron, Assumed	8"	5.6	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00670	Cast Iron, Assumed	8"	292.6	Pre-1947	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-00671	Cast Iron, Assumed	8"	640.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00695	Cast Iron, Assumed	8"	627.5	1934	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00702	Cast Iron, Assumed	8"	578.2	1909	108	1	0.5	0.7	75	7.5	10.0	75.0	1.0	0
WMAIN-00769	Cast Iron, Assumed	8"	649.8	1959	58	1	0.8	0.7	75	8.1	7.7	62.6	0.8	17
WMAIN-00771	Cast Iron, Assumed	8"	355.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00772	Cast Iron, Assumed	8"	33.1	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00773	Cast Iron, Assumed	8"	38.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00774	Cast Iron, Assumed	8"	193.0	1959	58	1	0.8	0.7	75	8.1	7.7	62.6	0.8	17
WMAIN-00804	Cast Iron, Assumed	8"	47.7	1937	80	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00805	Cast Iron, Assumed	8"	298.6	1937	80	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00829	Cast Iron, Assumed	8"	743.6	1940	77	0.2	0.8	0.7	75	5.7	10.0	57.0	1.0	0
WMAIN-00846	Cast Iron, Assumed	8"	201.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01001	Cast Iron, Assumed	8"	541.3	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01010	Cast Iron, Assumed	8"	159.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01025	Cast Iron, Assumed	8"	207.0	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01026	Cast Iron, Assumed	8"	128.7	1934	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01027	Cast Iron, Assumed	8"	96.7	1950	67	0.8	0	0.7	75	5.9	8.9	52.7	0.9	8
WMAIN-01036	Cast Iron, Assumed	8"	1051.4	1950	67	0.2	0	0.7	75	4.1	8.9	36.6	0.9	8
WMAIN-01074	Cast Iron, Assumed	8"	7.4	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17
WMAIN-01075	Cast Iron, Assumed	8"	80.4	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17
WMAIN-01076	Cast Iron, Assumed	8"	260.2	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01115	Cast Iron, Assumed	8"	238.7	1947	70	1	0.5	0.7	75	7.5	9.3	70.0	0.9	5
WMAIN-01132	Cast Iron, Assumed	8"	63.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01136	Cast Iron, Assumed	8"	60.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01137	Cast Iron, Assumed	8"	92.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01138	Cast Iron, Assumed	8"	81.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01139	Cast Iron, Assumed	8"	108.6	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01140	Cast Iron, Assumed	8"	59.6	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01141	Cast Iron, Assumed	8"	143.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01145	Cast Iron, Assumed	8"	5.5	1937	80	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01146	Cast Iron, Assumed	8"	6.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01160	Cast Iron, Assumed	8"	83.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01170	Cast Iron, Assumed	8"	97.1	2008	9	1	0	0.7	75	6.5	1.2	7.8	0.1	66
WMAIN-01257	Cast Iron, Assumed	8"	10.1	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01258	Cast Iron, Assumed	8"	4.3	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01259	Cast Iron, Assumed	8"	61.6	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01266	Cast Iron, Assumed	8"	7.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01267	Cast Iron, Assumed	8"	2.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01268	Cast Iron, Assumed	8"	6.0	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01269	Cast Iron, Assumed	8"	19.1	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01310	Cast Iron, Assumed	8"	214.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01311	Cast Iron, Assumed	8"	14.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01317	Cast Iron, Assumed	8"	312.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01319	Cast Iron, Assumed	8"	148.5	1947	70	0.8	0.5	0.7	75	6.9	9.3	64.4	0.9	5
WMAIN-01320	Cast Iron, Assumed	8"	88.0	1947	70	0.8	1	0.7	75	7.9	9.3	73.7	0.9	5
WMAIN-01322	Cast Iron, Assumed	8"	793.2	2005	11	0.8	0	0.7	75	5.9	1.5	8.7	0.1	64
WMAIN-01323	Cast Iron, Assumed	8"	1179.3	2005	11	0.8	0	0.7	75	5.9	1.5	8.7	0.1	64
WMAIN-01330	Cast Iron, Assumed	8"	7.5	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01339	Cast Iron, Assumed	8"	296.4	Pre-2006	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01340	Cast Iron, Assumed	8"	360.9	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01367	Cast Iron, Assumed	8"	0.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01377	Cast Iron, Assumed	8"	18.9	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01378	Cast Iron, Assumed	8"	24.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01389	Cast Iron, Assumed	8"	16.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01427	Cast Iron, Assumed	8"	0.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01440	Cast Iron, Assumed	8"	111.8	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01441	Cast Iron, Assumed	8"	10.0	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01443	Cast Iron, Assumed	8"	9.1	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01444	Cast Iron, Assumed	8"	58.1	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01445	Cast Iron, Assumed	8"	70.1	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01446	Cast Iron, Assumed	8"	661.3	1940	77	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01468	Cast Iron, Assumed	8"	72.1	Pre-1956	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01469	Cast Iron, Assumed	8"	293.8	Pre-1956	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01472	Cast Iron, Assumed	8"	43.2	Pre-1947	83	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01473	Cast Iron, Assumed	8"	25.0	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01499	Cast Iron, Assumed	8"	25.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01500	Cast Iron, Assumed	8"	7.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01518	Cast Iron, Assumed	8"	55.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01520	Cast Iron, Assumed	8"	90.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01547	Cast Iron, Assumed	8"	23.5	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01617	Cast Iron, Assumed	8"	18.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01619	Cast Iron, Assumed	8"	3.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01661	Cast Iron, Assumed	8"	5.4	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01671	Cast Iron, Assumed	8"	43.5	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01725	Cast Iron, Assumed	8"	284.8	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01729	Cast Iron, Assumed	8"	5.6	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01731	Cast Iron, Assumed	8"	30.9	Pre-1947	83	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00357	Cast Iron, Assumed	8"	332.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01356	Ductile Iron	8"	13.0	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01357	Ductile Iron	8"	636.1	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01739	Ductile Iron	8"	20.8	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01740	Ductile Iron	8"	12.4	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01741	Ductile Iron	8"	805.1	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01744	Ductile Iron	8"	732.5	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01746	Ductile Iron	8"	689.9	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
WMAIN-01747	Ductile Iron	8"	629.4	2008	9	0.8	0	0.7	90	5.9	1.0	5.9	0.1	81
<Null>	Ductile Iron	8"	8.8	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	29.9	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	289.6	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	116.5	2015	2	1	0	0.7	90	6.5	0.2	1.4	0.0	88
<Null>	Ductile Iron	8"	75.5	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	399.5	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
<Null>	Ductile Iron	8"	487.0	2015	2	1	0	0.7	90	6.5	0.2	1.4	0.0	88
WMAIN-00167	Ductile Iron, Assumed	8"	212.0	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-00212	Ductile Iron, Assumed	8"	15.5	2006	11	1	0	0.7	90	6.5	1.2	7.9	0.1	79

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00651	Ductile Iron, Assumed	8"	196.3	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-00785	Ductile Iron, Assumed	8"	16.0	1993	24	1	0	0.7	90	6.5	2.7	17.3	0.3	66
WMAIN-00787	Ductile Iron, Assumed	8"	24.0	1993	24	1	0	0.7	90	6.5	2.7	17.3	0.3	66
WMAIN-00813	Ductile Iron, Assumed	8"	265.7	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00814	Ductile Iron, Assumed	8"	427.6	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00815	Ductile Iron, Assumed	8"	216.8	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00816	Ductile Iron, Assumed	8"	12.5	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-00817	Ductile Iron, Assumed	8"	94.3	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-00833	Ductile Iron, Assumed	8"	1176.9	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-00860	Ductile Iron, Assumed	8"	5.0	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-00887	Ductile Iron, Assumed	8"	6.5	2002	15	0.3	0	0.7	90	4.4	1.7	7.3	0.2	75
WMAIN-00891	Ductile Iron, Assumed	8"	70.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01091	Ductile Iron, Assumed	8"	481.1	1974	43	1	0	0.7	90	6.5	4.8	31.1	0.5	47
WMAIN-01107	Ductile Iron, Assumed	8"	17.7	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01215	Ductile Iron, Assumed	8"	324.8	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01216	Ductile Iron, Assumed	8"	38.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01217	Ductile Iron, Assumed	8"	18.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01218	Ductile Iron, Assumed	8"	19.0	2007	10	1	0.5	0.7	90	7.5	1.1	8.3	0.1	80
WMAIN-01219	Ductile Iron, Assumed	8"	3.4	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01220	Ductile Iron, Assumed	8"	32.2	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01221	Ductile Iron, Assumed	8"	32.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01222	Ductile Iron, Assumed	8"	338.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01223	Ductile Iron, Assumed	8"	141.5	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01224	Ductile Iron, Assumed	8"	284.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01225	Ductile Iron, Assumed	8"	231.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01226	Ductile Iron, Assumed	8"	76.8	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01227	Ductile Iron, Assumed	8"	34.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01228	Ductile Iron, Assumed	8"	17.9	2007	10	1	0.5	0.7	90	7.5	1.1	8.3	0.1	80
WMAIN-01229	Ductile Iron, Assumed	8"	7.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01230	Ductile Iron, Assumed	8"	9.6	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01231	Ductile Iron, Assumed	8"	119.2	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01232	Ductile Iron, Assumed	8"	89.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01233	Ductile Iron, Assumed	8"	89.0	2007	10	1	0.5	0.7	90	7.5	1.1	8.3	0.1	80
WMAIN-01234	Ductile Iron, Assumed	8"	15.7	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01235	Ductile Iron, Assumed	8"	59.7	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01236	Ductile Iron, Assumed	8"	93.1	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01237	Ductile Iron, Assumed	8"	131.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01238	Ductile Iron, Assumed	8"	10.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01239	Ductile Iron, Assumed	8"	30.0	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01240	Ductile Iron, Assumed	8"	16.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01241	Ductile Iron, Assumed	8"	15.0	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01242	Ductile Iron, Assumed	8"	22.4	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01243	Ductile Iron, Assumed	8"	249.9	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01244	Ductile Iron, Assumed	8"	52.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01245	Ductile Iron, Assumed	8"	11.6	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01246	Ductile Iron, Assumed	8"	50.5	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01270	Ductile Iron, Assumed	8"	107.3	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01274	Ductile Iron, Assumed	8"	9.7	2007	10	0.8	0	0.7	90	5.9	1.1	6.6	0.1	80
WMAIN-01275	Ductile Iron, Assumed	8"	75.1	2009	8	0.2	0.8	0.7	90	5.7	0.9	5.1	0.1	82
WMAIN-01276	Ductile Iron, Assumed	8"	244.5	2009	8	0.8	0.5	0.7	90	6.9	0.9	6.1	0.1	82
WMAIN-01277	Ductile Iron, Assumed	8"	60.5	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01278	Ductile Iron, Assumed	8"	191.3	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01279	Ductile Iron, Assumed	8"	257.6	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01280	Ductile Iron, Assumed	8"	54.2	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01281	Ductile Iron, Assumed	8"	100.7	2009	8	0.2	0.5	0.7	90	5.1	0.9	4.5	0.1	82
WMAIN-01282	Ductile Iron, Assumed	8"	28.8	2009	8	0.2	0.8	0.7	90	5.7	0.9	5.1	0.1	82
WMAIN-01283	Ductile Iron, Assumed	8"	23.8	2009	8	0.2	0.8	0.7	90	5.7	0.9	5.1	0.1	82
WMAIN-01284	Ductile Iron, Assumed	8"	90.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01285	Ductile Iron, Assumed	8"	75.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01286	Ductile Iron, Assumed	8"	56.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01287	Ductile Iron, Assumed	8"	36.5	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01288	Ductile Iron, Assumed	8"	539.5	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01289	Ductile Iron, Assumed	8"	21.6	2009	8	0.8	0	0.7	90	5.9	0.9	5.2	0.1	82
WMAIN-01290	Ductile Iron, Assumed	8"	29.9	2009	8	0.2	0.5	0.7	90	5.1	0.9	4.5	0.1	82
WMAIN-01291	Ductile Iron, Assumed	8"	32.7	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01292	Ductile Iron, Assumed	8"	14.6	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01293	Ductile Iron, Assumed	8"	18.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01294	Ductile Iron, Assumed	8"	8.0	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01295	Ductile Iron, Assumed	8"	8.4	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01296	Ductile Iron, Assumed	8"	22.5	2009	8	0.2	0.5	0.7	90	5.1	0.9	4.5	0.1	82
WMAIN-01297	Ductile Iron, Assumed	8"	16.5	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01298	Ductile Iron, Assumed	8"	0.4	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01299	Ductile Iron, Assumed	8"	104.4	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01308	Ductile Iron, Assumed	8"	1273.1	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01312	Ductile Iron, Assumed	8"	19.4	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01331	Ductile Iron, Assumed	8"	697.2	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01332	Ductile Iron, Assumed	8"	650.1	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01333	Ductile Iron, Assumed	8"	195.8	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01334	Ductile Iron, Assumed	8"	236.9	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01335	Ductile Iron, Assumed	8"	30.3	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01336	Ductile Iron, Assumed	8"	28.9	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01337	Ductile Iron, Assumed	8"	14.0	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01338	Ductile Iron, Assumed	8"	228.8	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01341	Ductile Iron, Assumed	8"	362.5	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01342	Ductile Iron, Assumed	8"	134.9	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01343	Ductile Iron, Assumed	8"	14.9	2006	11	1	0	0.7	90	6.5	1.2	7.9	0.1	79
WMAIN-01344	Ductile Iron, Assumed	8"	12.0	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01345	Ductile Iron, Assumed	8"	5.6	2006	11	0.8	0	0.7	90	5.9	1.2	7.2	0.1	79
WMAIN-01346	Ductile Iron, Assumed	8"	9.3	2006	11	1	0	0.7	90	6.5	1.2	7.9	0.1	79
WMAIN-01347	Ductile Iron, Assumed	8"	32.8	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
WMAIN-01359	Ductile Iron, Assumed	8"	96.1	1974	43	0.2	0	0.7	90	4.1	4.8	19.6	0.5	47
WMAIN-01375	Ductile Iron, Assumed	8"	78.6	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01376	Ductile Iron, Assumed	8"	0.1	2007	10	0.2	0	0.7	90	4.1	1.1	4.6	0.1	80
WMAIN-01522	Ductile Iron, Assumed	8"	55.5	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01523	Ductile Iron, Assumed	8"	78.1	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01524	Ductile Iron, Assumed	8"	9.9	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01528	Ductile Iron, Assumed	8"	98.4	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01529	Ductile Iron, Assumed	8"	27.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01530	Ductile Iron, Assumed	8"	11.0	2007	10	0.3	0	0.7	90	4.4	1.1	4.9	0.1	80
WMAIN-01626	Ductile Iron, Assumed	8"	4.3	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01707	Ductile Iron, Assumed	8"	3.3	2007	10	1	0	0.7	90	6.5	1.1	7.2	0.1	80
WMAIN-01708	Ductile Iron, Assumed	8"	31.6	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01709	Ductile Iron, Assumed	8"	6.3	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01710	Ductile Iron, Assumed	8"	0.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01711	Ductile Iron, Assumed	8"	0.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
WMAIN-01712	Ductile Iron, Assumed	8"	9.8	2009	8	0.2	0	0.7	90	4.1	0.9	3.6	0.1	82
<Null>	Ductile Iron, Assumed	8"	13.6	2015	2	0.8	0	0.7	90	5.9	0.2	1.3	0.0	88
WMAIN-00084	Cast Iron, Assumed	10"	574.8	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-00096	Cast Iron, Assumed	10"	291.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00097	Cast Iron, Assumed	10"	308.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00098	Cast Iron, Assumed	10"	325.3	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00099	Cast Iron, Assumed	10"	369.8	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00100	Cast Iron, Assumed	10"	291.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00606	Cast Iron, Assumed	10"	598.1	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00615	Cast Iron, Assumed	10"	90.7	1969	48	1	0	0.7	75	6.5	6.4	41.6	0.6	27
WMAIN-00758	Cast Iron, Assumed	10"	71.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00795	Cast Iron, Assumed	10"	144.6	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00796	Cast Iron, Assumed	10"	129.5	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00797	Cast Iron, Assumed	10"	116.7	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00798	Cast Iron, Assumed	10"	121.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-00811	Cast Iron, Assumed	10"	10.5	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-00830	Cast Iron, Assumed	10"	381.5	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17

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WMAIN-00831	Cast Iron, Assumed	10"	313.9	1959	58	0.2	0.5	0.7	75	5.1	7.7	39.4	0.8	17
WMAIN-00923	Cast Iron, Assumed	10"	434.4	1959	58	0.2	1	0.7	75	6.1	7.7	47.2	0.8	17
WMAIN-00954	Cast Iron, Assumed	10"	260.1	1959	58	0.8	0	0.7	75	5.9	7.7	45.6	0.8	17
WMAIN-00955	Cast Iron, Assumed	10"	419.4	1959	58	0.8	0	0.7	75	5.9	7.7	45.6	0.8	17
WMAIN-01082	Cast Iron, Assumed	10"	52.2	1959	58	0.2	0	0.7	75	4.1	7.7	31.7	0.8	17
WMAIN-01129	Cast Iron, Assumed	10"	96.1	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01166	Cast Iron, Assumed	10"	17.0	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01256	Cast Iron, Assumed	10"	429.9	1950	67	1	0	0.7	75	6.5	8.9	58.1	0.9	8
WMAIN-01314	Cast Iron, Assumed	10"	638.6	1909	108	0.8	0	0.7	75	5.9	10.0	59.0	1.0	0
WMAIN-01451	Cast Iron, Assumed	10"	38.4	1959	58	1	0	0.7	75	6.5	7.7	50.3	0.8	17
WMAIN-01699	Cast Iron, Assumed	10"	20.2	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01700	Cast Iron, Assumed	10"	74.9	1909	108	1	0	0.7	75	6.5	10.0	65.0	1.0	0
WMAIN-01713	Cast Iron, Assumed	10"	3.3	1959	58	0.8	0	0.7	75	5.9	7.7	45.6	0.8	17
WMAIN-00825	Ductile Iron, Assumed	10"	11.1	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01104	Ductile Iron, Assumed	10"	8.0	1974	43	0.2	0	0.7	90	4.1	4.8	19.6	0.5	47
WMAIN-01133	Ductile Iron, Assumed	10"	64.6	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01428	Ductile Iron, Assumed	10"	1.5	2008	8	1	0	0.7	90	6.5	0.9	5.8	0.1	82
WMAIN-01503	Ductile Iron, Assumed	10"	257.0	1974	43	0.2	0	0.7	90	4.1	4.8	19.6	0.5	47
WMAIN-00014	Cast Iron, Assumed	12"	8.0	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00015	Cast Iron, Assumed	12"	15.0	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00043	Cast Iron, Assumed	12"	172.7	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00044	Cast Iron, Assumed	12"	185.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00062	Cast Iron, Assumed	12"	8.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00063	Cast Iron, Assumed	12"	317.9	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00064	Cast Iron, Assumed	12"	7.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00065	Cast Iron, Assumed	12"	300.3	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00066	Cast Iron, Assumed	12"	9.4	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00077	Cast Iron, Assumed	12"	636.8	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00080	Cast Iron, Assumed	12"	9.4	1940	77	0	0	1	75	5	10.0	50.0	1.0	0
WMAIN-00088	Cast Iron, Assumed	12"	295.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00089	Cast Iron, Assumed	12"	286.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00091	Cast Iron, Assumed	12"	9.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00095	Cast Iron, Assumed	12"	44.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00116	Cast Iron, Assumed	12"	22.6	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00117	Cast Iron, Assumed	12"	16.1	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00125	Cast Iron, Assumed	12"	397.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00126	Cast Iron, Assumed	12"	363.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00127	Cast Iron, Assumed	12"	316.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00128	Cast Iron, Assumed	12"	272.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00130	Cast Iron, Assumed	12"	9.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00132	Cast Iron, Assumed	12"	275.9	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00133	Cast Iron, Assumed	12"	231.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00134	Cast Iron, Assumed	12"	315.1	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00173	Cast Iron, Assumed	12"	502.1	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00174	Cast Iron, Assumed	12"	324.9	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00177	Cast Iron, Assumed	12"	22.8	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00178	Cast Iron, Assumed	12"	73.5	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00181	Cast Iron, Assumed	12"	12.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00195	Cast Iron, Assumed	12"	312.4	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00196	Cast Iron, Assumed	12"	325.6	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00201	Cast Iron, Assumed	12"	342.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00214	Cast Iron, Assumed	12"	58.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00215	Cast Iron, Assumed	12"	225.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00216	Cast Iron, Assumed	12"	6.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00217	Cast Iron, Assumed	12"	5.8	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00220	Cast Iron, Assumed	12"	300.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00226	Cast Iron, Assumed	12"	360.8	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00227	Cast Iron, Assumed	12"	25.3	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00260	Cast Iron, Assumed	12"	74.5	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00261	Cast Iron, Assumed	12"	792.6	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00262	Cast Iron, Assumed	12"	1028.2	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00325	Cast Iron, Assumed	12"	8.9	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00327	Cast Iron, Assumed	12"	630.5	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00328	Cast Iron, Assumed	12"	290.2	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00329	Cast Iron, Assumed	12"	631.4	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00330	Cast Iron, Assumed	12"	29.7	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00331	Cast Iron, Assumed	12"	14.7	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00360	Cast Iron, Assumed	12"	670.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00385	Cast Iron, Assumed	12"	1223.5	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00386	Cast Iron, Assumed	12"	9.5	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00388	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00391	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00415	Cast Iron, Assumed	12"	277.1	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00416	Cast Iron, Assumed	12"	116.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00418	Cast Iron, Assumed	12"	348.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00420	Cast Iron, Assumed	12"	22.1	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00421	Cast Iron, Assumed	12"	25.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00423	Cast Iron, Assumed	12"	9.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00426	Cast Iron, Assumed	12"	9.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00428	Cast Iron, Assumed	12"	291.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00429	Cast Iron, Assumed	12"	296.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00431	Cast Iron, Assumed	12"	333.8	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00432	Cast Iron, Assumed	12"	725.6	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00438	Cast Iron, Assumed	12"	17.3	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00449	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00451	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00458	Cast Iron, Assumed	12"	15.6	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00459	Cast Iron, Assumed	12"	36.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00460	Cast Iron, Assumed	12"	15.1	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00461	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00465	Cast Iron, Assumed	12"	10.3	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00466	Cast Iron, Assumed	12"	0.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00467	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00468	Cast Iron, Assumed	12"	3.9	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00469	Cast Iron, Assumed	12"	676.3	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00470	Cast Iron, Assumed	12"	61.9	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00471	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00472	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00473	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00476	Cast Iron, Assumed	12"	9.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00481	Cast Iron, Assumed	12"	657.9	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00483	Cast Iron, Assumed	12"	222.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00491	Cast Iron, Assumed	12"	674.3	1967	50	0.2	0	1	75	5.6	6.7	37.3	0.7	25
WMAIN-00528	Cast Iron, Assumed	12"	40.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00529	Cast Iron, Assumed	12"	18.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00612	Cast Iron, Assumed	12"	80.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00613	Cast Iron, Assumed	12"	181.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00614	Cast Iron, Assumed	12"	126.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00625	Cast Iron, Assumed	12"	22.1	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00628	Cast Iron, Assumed	12"	13.7	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00639	Cast Iron, Assumed	12"	243.1	1937	80	0.2	1	1	75	7.6	10.0	76.0	1.0	0
WMAIN-00640	Cast Iron, Assumed	12"	300.8	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00646	Cast Iron, Assumed	12"	58.4	1937	80	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00649	Cast Iron, Assumed	12"	505.8	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00679	Cast Iron, Assumed	12"	5.5	1967	50	0.8	0	1	75	7.4	6.7	49.3	0.7	25
WMAIN-00700	Cast Iron, Assumed	12"	473.9	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-00701	Cast Iron, Assumed	12"	180.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00726	Cast Iron, Assumed	12"	270.1	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00750	Cast Iron, Assumed	12"	31.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00751	Cast Iron, Assumed	12"	47.2	1909	108	0	0	1	75	5	10.0	50.0	1.0	0
WMAIN-00809	Cast Iron, Assumed	12"	60.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00819	Cast Iron, Assumed	12"	177.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00820	Cast Iron, Assumed	12"	35.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00821	Cast Iron, Assumed	12"	64.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00822	Cast Iron, Assumed	12"	41.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00823	Cast Iron, Assumed	12"	292.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00824	Cast Iron, Assumed	12"	91.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00826	Cast Iron, Assumed	12"	16.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00827	Cast Iron, Assumed	12"	90.9	1998	19	1	0	1	75	8	2.5	20.3	0.3	56
WMAIN-00837	Cast Iron, Assumed	12"	24.0	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00841	Cast Iron, Assumed	12"	305.2	2005	11	0.8	0	1	75	7.4	1.5	10.9	0.1	64
WMAIN-00843	Cast Iron, Assumed	12"	112.8	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00847	Cast Iron, Assumed	12"	347.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00848	Cast Iron, Assumed	12"	63.4	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00886	Cast Iron, Assumed	12"	71.4	2002	15	1	0	1	75	8	2.0	16.0	0.2	60
WMAIN-00896	Cast Iron, Assumed	12"	200.3	2002	15	1	0	1	75	8	2.0	16.0	0.2	60
WMAIN-00897	Cast Iron, Assumed	12"	111.6	2002	15	1	0	1	75	8	2.0	16.0	0.2	60
WMAIN-00901	Cast Iron, Assumed	12"	697.7	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-00902	Cast Iron, Assumed	12"	150.6	1969	48	0.2	0	1	75	5.6	6.4	35.8	0.6	27
WMAIN-00903	Cast Iron, Assumed	12"	79.6	1969	48	0.2	0	1	75	5.6	6.4	35.8	0.6	27
WMAIN-00907	Cast Iron, Assumed	12"	838.5	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00908	Cast Iron, Assumed	12"	23.3	1909	108	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-00909	Cast Iron, Assumed	12"	47.8	1909	108	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-00910	Cast Iron, Assumed	12"	33.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00919	Cast Iron, Assumed	12"	645.4	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00920	Cast Iron, Assumed	12"	642.4	1940	77	0	0	1	75	5	10.0	50.0	1.0	0
WMAIN-00922	Cast Iron, Assumed	12"	358.9	1940	77	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00945	Cast Iron, Assumed	12"	204.3	1909	108	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-00946	Cast Iron, Assumed	12"	203.9	1979	38	1	0	1	75	8	5.1	40.5	0.5	37
WMAIN-00951	Cast Iron, Assumed	12"	488.0	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00952	Cast Iron, Assumed	12"	23.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00975	Cast Iron, Assumed	12"	1099.0	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00985	Cast Iron, Assumed	12"	13.2	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00986	Cast Iron, Assumed	12"	93.6	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00993	Cast Iron, Assumed	12"	248.7	1947	70	0.8	1	1	75	9.4	9.3	87.7	0.9	5
WMAIN-00999	Cast Iron, Assumed	12"	269.6	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01000	Cast Iron, Assumed	12"	132.1	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01005	Cast Iron, Assumed	12"	132.2	1998	19	1	0	1	75	8	2.5	20.3	0.3	56
WMAIN-01009	Cast Iron, Assumed	12"	487.7	1909	108	0.2	0	1	75	5.6	10.0	56.0	1.0	0
WMAIN-01030	Cast Iron, Assumed	12"	24.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01031	Cast Iron, Assumed	12"	1009.0	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01045	Cast Iron, Assumed	12"	156.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01046	Cast Iron, Assumed	12"	20.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01062	Cast Iron, Assumed	12"	105.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01063	Cast Iron, Assumed	12"	11.7	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01064	Cast Iron, Assumed	12"	70.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01065	Cast Iron, Assumed	12"	14.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01066	Cast Iron, Assumed	12"	57.8	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01067	Cast Iron, Assumed	12"	162.0	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01085	Cast Iron, Assumed	12"	525.5	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01097	Cast Iron, Assumed	12"	649.0	1967	50	0.2	0	1	75	5.6	6.7	37.3	0.7	25
WMAIN-01101	Cast Iron, Assumed	12"	246.6	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01102	Cast Iron, Assumed	12"	1326.6	1967	50	0.2	0	1	75	5.6	6.7	37.3	0.7	25
WMAIN-01105	Cast Iron, Assumed	12"	13.0	1998	19	0.3	0	1	75	5.9	2.5	14.9	0.3	56
WMAIN-01106	Cast Iron, Assumed	12"	697.0	1998	19	1	0	1	75	8	2.5	20.3	0.3	56
WMAIN-01130	Cast Iron, Assumed	12"	5.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01143	Cast Iron, Assumed	12"	54.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01144	Cast Iron, Assumed	12"	69.8	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01161	Cast Iron, Assumed	12"	24.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01163	Cast Iron, Assumed	12"	52.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01165	Cast Iron, Assumed	12"	10.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01167	Cast Iron, Assumed	12"	22.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01172	Cast Iron, Assumed	12"	59.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01175	Cast Iron, Assumed	12"	11.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01176	Cast Iron, Assumed	12"	20.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01177	Cast Iron, Assumed	12"	88.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01178	Cast Iron, Assumed	12"	11.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01179	Cast Iron, Assumed	12"	9.9	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01180	Cast Iron, Assumed	12"	21.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01181	Cast Iron, Assumed	12"	144.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01182	Cast Iron, Assumed	12"	159.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01183	Cast Iron, Assumed	12"	404.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01184	Cast Iron, Assumed	12"	531.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01185	Cast Iron, Assumed	12"	25.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01187	Cast Iron, Assumed	12"	171.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01188	Cast Iron, Assumed	12"	19.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01189	Cast Iron, Assumed	12"	31.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01190	Cast Iron, Assumed	12"	221.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01191	Cast Iron, Assumed	12"	3.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01192	Cast Iron, Assumed	12"	88.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01193	Cast Iron, Assumed	12"	375.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01194	Cast Iron, Assumed	12"	204.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01195	Cast Iron, Assumed	12"	74.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01196	Cast Iron, Assumed	12"	55.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01197	Cast Iron, Assumed	12"	31.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01198	Cast Iron, Assumed	12"	36.3	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01199	Cast Iron, Assumed	12"	194.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01205	Cast Iron, Assumed	12"	292.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01206	Cast Iron, Assumed	12"	366.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01207	Cast Iron, Assumed	12"	544.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01208	Cast Iron, Assumed	12"	73.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01209	Cast Iron, Assumed	12"	73.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01210	Cast Iron, Assumed	12"	61.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01211	Cast Iron, Assumed	12"	2.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01250	Cast Iron, Assumed	12"	20.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01251	Cast Iron, Assumed	12"	106.2	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01260	Cast Iron, Assumed	12"	3.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01261	Cast Iron, Assumed	12"	18.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01307	Cast Iron, Assumed	12"	235.8	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01324	Cast Iron, Assumed	12"	100.2	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01348	Cast Iron, Assumed	12"	532.3	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01364	Cast Iron, Assumed	12"	33.2	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01365	Cast Iron, Assumed	12"	7.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01366	Cast Iron, Assumed	12"	6.3	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01368	Cast Iron, Assumed	12"	0.0	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01369	Cast Iron, Assumed	12"	0.0	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01370	Cast Iron, Assumed	12"	90.7	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01371	Cast Iron, Assumed	12"	25.7	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01372	Cast Iron, Assumed	12"	105.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01373	Cast Iron, Assumed	12"	31.2	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01374	Cast Iron, Assumed	12"	135.1	1969	48	0.8	0	1	75	7.4	6.4	47.4	0.6	27
WMAIN-01379	Cast Iron, Assumed	12"	57.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01380	Cast Iron, Assumed	12"	297.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01381	Cast Iron, Assumed	12"	24.3	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01382	Cast Iron, Assumed	12"	145.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01383	Cast Iron, Assumed	12"	45.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01384	Cast Iron, Assumed	12"	59.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01385	Cast Iron, Assumed	12"	52.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01386	Cast Iron, Assumed	12"	63.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01387	Cast Iron, Assumed	12"	55.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01388	Cast Iron, Assumed	12"	35.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01390	Cast Iron, Assumed	12"	5.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01392	Cast Iron, Assumed	12"	5.9	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01394	Cast Iron, Assumed	12"	62.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01395	Cast Iron, Assumed	12"	28.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01396	Cast Iron, Assumed	12"	40.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01397	Cast Iron, Assumed	12"	2.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01398	Cast Iron, Assumed	12"	63.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01399	Cast Iron, Assumed	12"	36.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01400	Cast Iron, Assumed	12"	21.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01401	Cast Iron, Assumed	12"	29.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01402	Cast Iron, Assumed	12"	15.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01403	Cast Iron, Assumed	12"	0.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01404	Cast Iron, Assumed	12"	146.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01405	Cast Iron, Assumed	12"	31.9	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01406	Cast Iron, Assumed	12"	11.0	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01407	Cast Iron, Assumed	12"	29.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01408	Cast Iron, Assumed	12"	13.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01409	Cast Iron, Assumed	12"	14.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01410	Cast Iron, Assumed	12"	9.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01411	Cast Iron, Assumed	12"	9.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01412	Cast Iron, Assumed	12"	2.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01413	Cast Iron, Assumed	12"	7.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01414	Cast Iron, Assumed	12"	2.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01415	Cast Iron, Assumed	12"	6.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01417	Cast Iron, Assumed	12"	21.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01418	Cast Iron, Assumed	12"	0.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01429	Cast Iron, Assumed	12"	10.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01430	Cast Iron, Assumed	12"	5.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01435	Cast Iron, Assumed	12"	53.2	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01436	Cast Iron, Assumed	12"	1.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01437	Cast Iron, Assumed	12"	6.6	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01438	Cast Iron, Assumed	12"	319.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01439	Cast Iron, Assumed	12"	154.1	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01456	Cast Iron, Assumed	12"	8.1	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01457	Cast Iron, Assumed	12"	37.7	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01459	Cast Iron, Assumed	12"	93.1	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01460	Cast Iron, Assumed	12"	82.6	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01461	Cast Iron, Assumed	12"	21.0	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01462	Cast Iron, Assumed	12"	186.7	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01463	Cast Iron, Assumed	12"	641.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01464	Cast Iron, Assumed	12"	450.7	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01465	Cast Iron, Assumed	12"	360.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01466	Cast Iron, Assumed	12"	261.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01467	Cast Iron, Assumed	12"	16.7	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-01513	Cast Iron, Assumed	12"	3.6	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01514	Cast Iron, Assumed	12"	185.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01515	Cast Iron, Assumed	12"	122.9	1950	67	0.3	0	1	75	5.9	8.9	52.7	0.9	8
WMAIN-01516	Cast Iron, Assumed	12"	29.5	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01517	Cast Iron, Assumed	12"	25.8	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01521	Cast Iron, Assumed	12"	101.8	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01532	Cast Iron, Assumed	12"	61.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01533	Cast Iron, Assumed	12"	6.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01534	Cast Iron, Assumed	12"	20.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01535	Cast Iron, Assumed	12"	6.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01536	Cast Iron, Assumed	12"	102.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01537	Cast Iron, Assumed	12"	10.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01544	Cast Iron, Assumed	12"	29.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01549	Cast Iron, Assumed	12"	382.5	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01550	Cast Iron, Assumed	12"	8.3	1909	108	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01551	Cast Iron, Assumed	12"	10.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01552	Cast Iron, Assumed	12"	30.7	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01553	Cast Iron, Assumed	12"	10.4	2008	8	1	0	1	75	8	1.1	8.5	0.1	67
WMAIN-01563	Cast Iron, Assumed	12"	55.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01564	Cast Iron, Assumed	12"	23.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66

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WMAIN-01565	Cast Iron, Assumed	12"	63.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01566	Cast Iron, Assumed	12"	18.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01567	Cast Iron, Assumed	12"	35.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01568	Cast Iron, Assumed	12"	3.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01569	Cast Iron, Assumed	12"	51.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01570	Cast Iron, Assumed	12"	17.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01571	Cast Iron, Assumed	12"	22.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01572	Cast Iron, Assumed	12"	0.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01573	Cast Iron, Assumed	12"	10.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01574	Cast Iron, Assumed	12"	35.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01575	Cast Iron, Assumed	12"	27.0	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01576	Cast Iron, Assumed	12"	44.0	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01577	Cast Iron, Assumed	12"	52.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01578	Cast Iron, Assumed	12"	22.0	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01579	Cast Iron, Assumed	12"	56.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01580	Cast Iron, Assumed	12"	11.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01581	Cast Iron, Assumed	12"	10.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01582	Cast Iron, Assumed	12"	109.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01583	Cast Iron, Assumed	12"	60.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01584	Cast Iron, Assumed	12"	9.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01585	Cast Iron, Assumed	12"	54.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01586	Cast Iron, Assumed	12"	4.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01587	Cast Iron, Assumed	12"	22.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01588	Cast Iron, Assumed	12"	19.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01589	Cast Iron, Assumed	12"	0.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01590	Cast Iron, Assumed	12"	86.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01591	Cast Iron, Assumed	12"	7.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01592	Cast Iron, Assumed	12"	28.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01593	Cast Iron, Assumed	12"	26.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01594	Cast Iron, Assumed	12"	8.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01595	Cast Iron, Assumed	12"	4.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01596	Cast Iron, Assumed	12"	72.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01597	Cast Iron, Assumed	12"	39.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01598	Cast Iron, Assumed	12"	48.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01599	Cast Iron, Assumed	12"	2.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01600	Cast Iron, Assumed	12"	51.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01601	Cast Iron, Assumed	12"	33.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01602	Cast Iron, Assumed	12"	41.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01603	Cast Iron, Assumed	12"	1.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01604	Cast Iron, Assumed	12"	17.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01605	Cast Iron, Assumed	12"	53.1	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01606	Cast Iron, Assumed	12"	56.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01607	Cast Iron, Assumed	12"	2.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01608	Cast Iron, Assumed	12"	16.4	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01609	Cast Iron, Assumed	12"	46.9	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01610	Cast Iron, Assumed	12"	63.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01611	Cast Iron, Assumed	12"	57.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01612	Cast Iron, Assumed	12"	24.7	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01613	Cast Iron, Assumed	12"	32.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01614	Cast Iron, Assumed	12"	12.6	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01615	Cast Iron, Assumed	12"	43.8	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01616	Cast Iron, Assumed	12"	7.3	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01622	Cast Iron, Assumed	12"	8.2	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01623	Cast Iron, Assumed	12"	20.5	2008	9	1	0	1	75	8	1.2	9.6	0.1	66
WMAIN-01646	Cast Iron, Assumed	12"	52.6	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01691	Cast Iron, Assumed	12"	78.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01702	Cast Iron, Assumed	12"	2.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01703	Cast Iron, Assumed	12"	166.1	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01734	Cast Iron, Assumed	12"	604.1	1934	83	0.8	0	1	75	7.4	10.0	74.0	1.0	0
WMAIN-01735	Cast Iron, Assumed	12"	5.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00001	Ductile Iron	12"	55.6	1959	58	1	0	1	90	8	6.4	51.6	0.6	32

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00002	Ductile Iron	12"	13.5	1959	58	1	0	1	90	8	6.4	51.6	0.6	32
<Null>	Ductile Iron	12"	559.0	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
<Null>	Ductile Iron	12"	601.2	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-00228	Ductile Iron, Assumed	12"	1037.4	1971	46	0.8	0	1	90	7.4	5.1	37.8	0.5	44
WMAIN-00856	Ductile Iron, Assumed	12"	441.1	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00857	Ductile Iron, Assumed	12"	478.2	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00858	Ductile Iron, Assumed	12"	383.6	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00861	Ductile Iron, Assumed	12"	179.9	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00862	Ductile Iron, Assumed	12"	86.2	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00863	Ductile Iron, Assumed	12"	26.2	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00864	Ductile Iron, Assumed	12"	51.8	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00865	Ductile Iron, Assumed	12"	17.8	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00866	Ductile Iron, Assumed	12"	62.5	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00867	Ductile Iron, Assumed	12"	44.4	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00869	Ductile Iron, Assumed	12"	188.4	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00870	Ductile Iron, Assumed	12"	3.1	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00871	Ductile Iron, Assumed	12"	1.8	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00872	Ductile Iron, Assumed	12"	3.0	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00873	Ductile Iron, Assumed	12"	1.6	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00874	Ductile Iron, Assumed	12"	2.0	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00875	Ductile Iron, Assumed	12"	4.0	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00876	Ductile Iron, Assumed	12"	404.4	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00877	Ductile Iron, Assumed	12"	72.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00878	Ductile Iron, Assumed	12"	72.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00879	Ductile Iron, Assumed	12"	2.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00880	Ductile Iron, Assumed	12"	2.0	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00881	Ductile Iron, Assumed	12"	16.4	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00882	Ductile Iron, Assumed	12"	18.6	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00883	Ductile Iron, Assumed	12"	160.3	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00884	Ductile Iron, Assumed	12"	5.9	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00885	Ductile Iron, Assumed	12"	4.2	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-00889	Ductile Iron, Assumed	12"	237.9	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00890	Ductile Iron, Assumed	12"	108.6	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00892	Ductile Iron, Assumed	12"	30.6	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-00893	Ductile Iron, Assumed	12"	23.0	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00894	Ductile Iron, Assumed	12"	265.6	2002	15	1	0	1	90	8	1.7	13.3	0.2	75
WMAIN-00895	Ductile Iron, Assumed	12"	3.4	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-01134	Ductile Iron, Assumed	12"	24.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01135	Ductile Iron, Assumed	12"	6.5	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01142	Ductile Iron, Assumed	12"	38.0	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-01169	Ductile Iron, Assumed	12"	15.0	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01200	Ductile Iron, Assumed	12"	116.3	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01201	Ductile Iron, Assumed	12"	32.5	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01202	Ductile Iron, Assumed	12"	17.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01203	Ductile Iron, Assumed	12"	238.8	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01204	Ductile Iron, Assumed	12"	432.1	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01263	Ductile Iron, Assumed	12"	3.3	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01264	Ductile Iron, Assumed	12"	3.4	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01300	Ductile Iron, Assumed	12"	67.0	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01301	Ductile Iron, Assumed	12"	649.9	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01302	Ductile Iron, Assumed	12"	75.9	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01303	Ductile Iron, Assumed	12"	47.5	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01304	Ductile Iron, Assumed	12"	86.5	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01305	Ductile Iron, Assumed	12"	54.5	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01306	Ductile Iron, Assumed	12"	329.9	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01313	Ductile Iron, Assumed	12"	11.8	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01349	Ductile Iron, Assumed	12"	3.6	2006	11	1	0	1	90	8	1.2	9.8	0.1	79
WMAIN-01416	Ductile Iron, Assumed	12"	52.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01419	Ductile Iron, Assumed	12"	60.0	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01420	Ductile Iron, Assumed	12"	48.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01423	Ductile Iron, Assumed	12"	60.9	2008	8	1	0	1	90	8	0.9	7.1	0.1	82

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01424	Ductile Iron, Assumed	12"	35.1	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01425	Ductile Iron, Assumed	12"	72.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01426	Ductile Iron, Assumed	12"	50.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01431	Ductile Iron, Assumed	12"	13.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01432	Ductile Iron, Assumed	12"	8.8	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01433	Ductile Iron, Assumed	12"	6.4	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01434	Ductile Iron, Assumed	12"	19.3	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01526	Ductile Iron, Assumed	12"	24.1	2007	10	0.3	0	1	90	5.9	1.1	6.6	0.1	80
WMAIN-01531	Ductile Iron, Assumed	12"	31.3	2007	10	1	0	1	90	8	1.1	8.9	0.1	80
WMAIN-01554	Ductile Iron, Assumed	12"	9.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01555	Ductile Iron, Assumed	12"	10.2	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01556	Ductile Iron, Assumed	12"	16.7	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01557	Ductile Iron, Assumed	12"	35.4	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01558	Ductile Iron, Assumed	12"	14.9	2008	8	1	0	1	90	8	0.9	7.1	0.1	82
WMAIN-01560	Ductile Iron, Assumed	12"	3.2	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-01561	Ductile Iron, Assumed	12"	1.1	2012	5	1	0	1	90	8	0.6	4.4	0.1	85
WMAIN-00101	Cast Iron, Assumed	16"	31.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00102	Cast Iron, Assumed	16"	334.1	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00103	Cast Iron, Assumed	16"	363.8	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00104	Cast Iron, Assumed	16"	319.2	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00105	Cast Iron, Assumed	16"	7.0	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00106	Cast Iron, Assumed	16"	9.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00107	Cast Iron, Assumed	16"	311.3	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00115	Cast Iron, Assumed	16"	9.4	1937	80	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00417	Cast Iron, Assumed	16"	9.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00501	Cast Iron, Assumed	16"	69.3	1934	83	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00502	Cast Iron, Assumed	16"	30.7	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00505	Cast Iron, Assumed	16"	9.4	1934	83	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00719	Cast Iron, Assumed	16"	15.5	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00720	Cast Iron, Assumed	16"	62.4	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00763	Cast Iron, Assumed	16"	250.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-00810	Cast Iron, Assumed	16"	151.1	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00840	Cast Iron, Assumed	16"	304.0	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00917	Cast Iron, Assumed	16"	266.5	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00918	Cast Iron, Assumed	16"	569.8	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-00921	Cast Iron, Assumed	16"	956.2	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00924	Cast Iron, Assumed	16"	731.2	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00940	Cast Iron, Assumed	16"	61.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00990	Cast Iron, Assumed	16"	84.3	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-01012	Cast Iron, Assumed	16"	477.6	1950	67	0	0	1	75	5	8.9	44.7	0.9	8
WMAIN-01013	Cast Iron, Assumed	16"	149.8	1934	83	0.2	0	1	75	5.6	10.0	56.0	1.0	0
WMAIN-01014	Cast Iron, Assumed	16"	98.5	1934	83	0.2	0	1	75	5.6	10.0	56.0	1.0	0
WMAIN-01015	Cast Iron, Assumed	16"	281.6	1934	83	0.2	1	1	75	7.6	10.0	76.0	1.0	0
WMAIN-01052	Cast Iron, Assumed	16"	110.6	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01053	Cast Iron, Assumed	16"	164.5	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01058	Cast Iron, Assumed	16"	84.2	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01059	Cast Iron, Assumed	16"	53.1	1959	58	0.2	0	1	75	5.6	7.7	43.3	0.8	17
WMAIN-01060	Cast Iron, Assumed	16"	130.4	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-01084	Cast Iron, Assumed	16"	64.4	1937	80	0.3	0	1	75	5.9	10.0	59.0	1.0	0
WMAIN-01098	Cast Iron, Assumed	16"	623.2	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01131	Cast Iron, Assumed	16"	5.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01159	Cast Iron, Assumed	16"	23.5	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01255	Cast Iron, Assumed	16"	404.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-01449	Cast Iron, Assumed	16"	40.3	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01455	Cast Iron, Assumed	16"	0.3	1959	58	0.3	0	1	75	5.9	7.7	45.6	0.8	17
WMAIN-01491	Cast Iron, Assumed	16"	59.8	1967	50	1	0	1	75	8	6.7	53.3	0.7	25
WMAIN-01559	Cast Iron, Assumed	16"	49.9	1959	58	1	0	1	75	8	7.7	61.9	0.8	17
WMAIN-00941	Ductile Iron, Assumed	16"	110.2	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-00942	Ductile Iron, Assumed	16"	421.1	1950	67	0.2	0.5	1	90	6.6	7.4	49.1	0.7	23
WMAIN-01054	Ductile Iron, Assumed	16"	155.2	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01055	Ductile Iron, Assumed	16"	92.5	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85

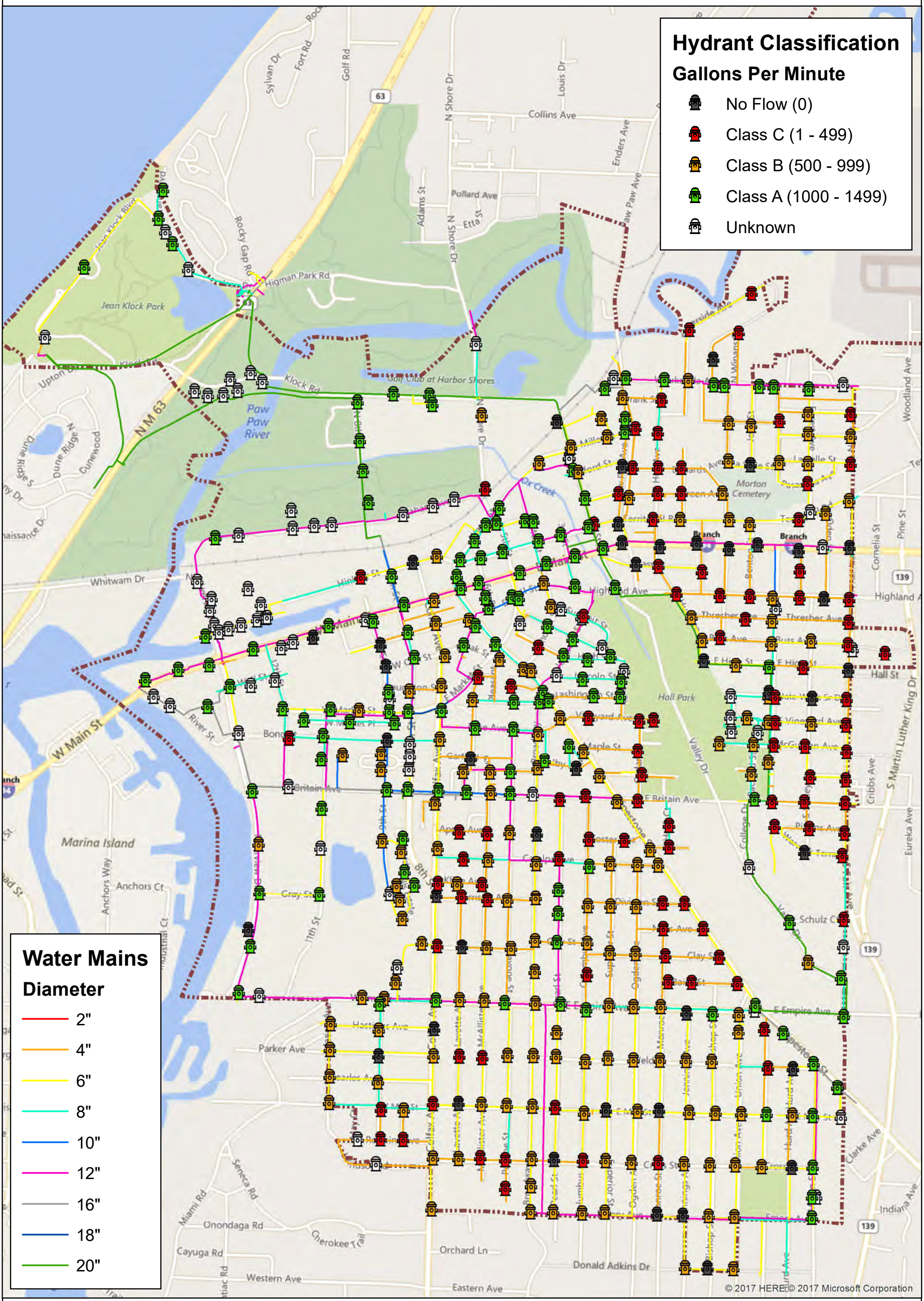
GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-01056	Ductile Iron, Assumed	16"	93.3	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01057	Ductile Iron, Assumed	16"	397.8	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01061	Ductile Iron, Assumed	16"	420.8	2012	5	0.2	0	1	90	5.6	0.6	3.1	0.1	85
WMAIN-01318	Ductile Iron, Assumed	16"	665.8	Pre-1999	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00085	Cast Iron, Assumed	18"	181.8	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00427	Cast Iron, Assumed	18"	6.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00828	Cast Iron, Assumed	18"	111.3	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00904	Cast Iron, Assumed	18"	98.2	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00905	Cast Iron, Assumed	18"	196.9	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00906	Cast Iron, Assumed	18"	303.4	1969	48	1	0	1	75	8	6.4	51.2	0.6	27
WMAIN-00943	Cast Iron, Assumed	18"	123.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01447	Cast Iron, Assumed	18"	89.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01448	Cast Iron, Assumed	18"	70.7	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00112	Cast Iron, Assumed	20"	65.5	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00150	Cast Iron, Assumed	20"	174.5	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00151	Cast Iron, Assumed	20"	44.1	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00153	Cast Iron, Assumed	20"	15.2	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00154	Cast Iron, Assumed	20"	52.8	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00157	Cast Iron, Assumed	20"	703.3	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00508	Cast Iron, Assumed	20"	32.1	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00509	Cast Iron, Assumed	20"	97.8	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00591	Cast Iron, Assumed	20"	909.8	1968	49	0.2	0	1	75	5.6	6.5	36.6	0.7	26
WMAIN-00594	Cast Iron, Assumed	20"	354.1	1968	49	0.2	0	1	75	5.6	6.5	36.6	0.7	26
WMAIN-00595	Cast Iron, Assumed	20"	645.2	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00598	Cast Iron, Assumed	20"	93.9	1968	49	0.2	0	1	75	5.6	6.5	36.6	0.7	26
WMAIN-00694	Cast Iron, Assumed	20"	9.4	1934	83	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00712	Cast Iron, Assumed	20"	87.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00713	Cast Iron, Assumed	20"	647.0	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00716	Cast Iron, Assumed	20"	9.4	1950	67	1	0	1	75	8	8.9	71.5	0.9	8
WMAIN-00734	Cast Iron, Assumed	20"	589.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00735	Cast Iron, Assumed	20"	318.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00738	Cast Iron, Assumed	20"	9.4	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00752	Cast Iron, Assumed	20"	1548.1	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00753	Cast Iron, Assumed	20"	56.6	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00786	Cast Iron, Assumed	20"	22.9	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00790	Cast Iron, Assumed	20"	352.6	1909	108	0	0.8	1	75	6.6	10.0	66.0	1.0	0
WMAIN-00832	Cast Iron, Assumed	20"	1003.0	1968	49	1	0	1	75	8	6.5	52.3	0.7	26
WMAIN-00926	Cast Iron, Assumed	20"	990.2	2000	17	0	0	1	75	5	2.3	11.3	0.2	58
WMAIN-00931	Cast Iron, Assumed	20"	88.7	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00932	Cast Iron, Assumed	20"	195.5	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-00933	Cast Iron, Assumed	20"	173.2	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00936	Cast Iron, Assumed	20"	921.5	1950	67	0.2	0	1	75	5.6	8.9	50.0	0.9	8
WMAIN-00937	Cast Iron, Assumed	20"	30.6	1950	67	0.2	0	1	75	5.6	8.9	50.0	0.9	8
WMAIN-00991	Cast Iron, Assumed	20"	67.7	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-01117	Cast Iron, Assumed	20"	1616.9	2000	17	1	0	1	75	8	2.3	18.1	0.2	58
WMAIN-01119	Cast Iron, Assumed	20"	2237.2	2000	17	1	0.5	1	75	9	2.3	20.4	0.2	58
WMAIN-01120	Cast Iron, Assumed	20"	881.0	1947	70	1	0	1	75	8	9.3	74.7	0.9	5
WMAIN-01361	Cast Iron, Assumed	20"	51.6	1947	70	0.8	0	1	75	7.4	9.3	69.1	0.9	5
WMAIN-01538	Cast Iron, Assumed	20"	25.1	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-01539	Cast Iron, Assumed	20"	111.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
<Null>	Cast Iron, Assumed	20"	225.4	1947	70	0.2	0	1	75	5.6	9.3	52.3	0.9	5
WMAIN-00752	Cast Iron, Assumed	20"	790.0	1909	108	1	0	1	75	8	10.0	80.0	1.0	0
WMAIN-00654	Ductile Iron, Assumed	20"	108.4	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00780	Ductile Iron, Assumed	20"	396.9	1993	24	1	0	1	90	8	2.7	21.3	0.3	66
WMAIN-00781	Ductile Iron, Assumed	20"	52.0	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00782	Ductile Iron, Assumed	20"	4.5	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00783	Ductile Iron, Assumed	20"	10.3	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00784	Ductile Iron, Assumed	20"	29.8	1993	24	0.3	0	1	90	5.9	2.7	15.7	0.3	66
WMAIN-00791	Ductile Iron, Assumed	20"	1575.5	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-00925	Ductile Iron, Assumed	20"	157.0	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00927	Ductile Iron, Assumed	20"	1624.5	1974	43	1	0	1	90	8	4.8	38.2	0.5	47

GIS Object ID	Material	Diameter (Inch)	Length of Pipe (Feet)	Assumed Install Date	Age in 2017	Proximity to Road Value (0 - 1)	Proximity to Buildings Value (0 - 1)	Size Value (0 - 1)	Effective Excepted Life (EEL)	Consequence of Failure (COF) (0 = Low, 10 = High)	Probability of Failure (POF) (0 = Low, 10 = High)	Criticality (COF x POF) (0 = Low, 100 = Critical)	Consumed Pipe (0 = New, 1 = Consumed)	Remaining Useful Life (Years)
WMAIN-00928	Ductile Iron, Assumed	20"	690.1	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00929	Ductile Iron, Assumed	20"	506.3	Pre-2012	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-00930	Ductile Iron, Assumed	20"	112.2	1974	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-00934	Ductile Iron, Assumed	20"	259.2	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00935	Ductile Iron, Assumed	20"	300.2	1974	43	1	0	1	90	8	4.8	38.2	0.5	47
WMAIN-00953	Ductile Iron, Assumed	20"	761.6	1993	24	0.8	0	1	90	7.4	2.7	19.7	0.3	66
WMAIN-01033	Ductile Iron, Assumed	20"	211.7	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-01034	Ductile Iron, Assumed	20"	176.0	1950	67	0	0	1	90	5	7.4	37.2	0.7	23
WMAIN-01109	Ductile Iron, Assumed	20"	2055.7	1993	24	0.8	0	1	90	7.4	2.7	19.7	0.3	66
WMAIN-01118	Ductile Iron, Assumed	20"	87.4	2000	17	1	0	1	90	8	1.9	15.1	0.2	73
WMAIN-01121	Ductile Iron, Assumed	20"	303.0	1974	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-01122	Ductile Iron, Assumed	20"	17.8	2000	17	0.3	0	1	90	5.9	1.9	11.1	0.2	73
WMAIN-01123	Ductile Iron, Assumed	20"	19.9	2000	17	0.3	0	1	90	5.9	1.9	11.1	0.2	73
WMAIN-01124	Ductile Iron, Assumed	20"	228.6	1974	43	0.2	0	1	90	5.6	4.8	26.8	0.5	47
WMAIN-01125	Ductile Iron, Assumed	20"	572.0	2000	17	0.3	0	1	90	5.9	1.9	11.1	0.2	73
WMAIN-01126	Ductile Iron, Assumed	20"	544.6	2000	17	0	0	1	90	5	1.9	9.4	0.2	73
WMAIN-01127	Ductile Iron, Assumed	20"	826.7	1974	43	0	0	1	90	5	4.8	23.9	0.5	47
WMAIN-01363	Ductile Iron, Assumed	20"	60.5	1950	67	1	0	1	90	8	7.4	59.6	0.7	23
WMAIN-01696	Ductile Iron, Assumed	20"	53.6	1993	24	1	0	1	90	8	2.7	21.3	0.3	66

APPENDIX B

2017 HYDRANT CLASSIFICATION MAP

Hydrants by Classification



City of Benton Harbor, Michigan

0 0.125 0.25 0.5 Mi

ABONMARCHE
Confidence By Design

Prepared: September 2017

HYDRANT FLOW
Legend: Fire Flow (Available) (gpm)

red	<= 500
cyan	<= 750
blue	<= 1,000
green	<= 1,500

Color Coding Legend
Pipe: Diameter (in)

red	<= 2.0
orange	<= 4.0
yellow	<= 6.0
cyan	<= 8.0
blue	<= 10.0
magenta	<= 12.0
gray	<= 16.0
purple	<= 18.0
dark green	<= 20.0

ABONMARCHE

Battle Creek, Benton Harbor, Manistee, South Haven, Goshen, Hobart, Lafayette, South Bend, Valparaiso

Engineering · Architecture · Land Surveying

PROJECT: BENTON HARBOR WATER RELIABILITY STUDY

SHEET TITLE: TOTAL AVAILABLE FIRE FLOW CURRENT CONDITIONS

DRAWN BY: SRF

DESIGNED BY:

PM REVIEW:

QA/QC REVIEW:

DATE:

SEAL:

SIGNATURE:

DATE:

HARD COPY IS INTENDED TO BE 24" X 36" WHEN PLOTTED. SCALE(S) INDICATED AND GRAPHIC QUALITY MAY NOT BE ACCURATE FOR ANY OTHER SIZES

SCALE:
HORZ: 1"=750'
VERT:

ACI JOB # 16-1099

SHEET NO. 1 of 1

NO.	REVISION DESCRIPTION:	BY:	DATE:

APPENDIX C

WATER TOWER

INSPECTION REPORT

Dixon Engineering, Inc.

Maintenance Inspection

650,000 Gallon Double Ellipse

Britain Tank
Benton Harbor, Michigan

Inspection Performed: May 7, 2008
Report Prepared: May 21, 2008
Reviewed by Ira M. Gabin, P.E.: June 4, 2008

Phone (616) 374-3221
Fax (616) 374-7116
http://www.dixonengineering.net
dixon@dixonengineering.net

Dixon Engineering Inc.
1104 Third Ave. Lake Odessa, MI 48849

CONCLUSIONS:

1. The exterior coating is a urethane system that is in fair condition, has poor adhesion, and is slightly faded. Primary modes of failure are delamination, primer bleed-through, and spot coating breaks to the substrate. There are numerous areas of spot coating failure on the sidewalls and roof. Coating deterioration is moderate. The logo and lettering are extensively faded.

2. The wet interior coating is a three coat epoxy system that is in good condition. There are areas of minor spot failure on the floor and sidewalls. Above the high water line the coating is in good condition. The roof coating is deteriorating at open lap seams and on the roof beam edges. The roof beams and lap joints have minor edge corrosion.

3. Lower sections of some of the radial roof stiffeners have fallen into the tank's bowl.

RECOMMENDATIONS:

1. Schedule regular cleanings and inspections of the tank by an independent, third party as recommended by AWWA, or once every five years.

2. In three years budget to high pressure water jet (10,000 – 20,000 psi) spot power tool clean, and recoat the exterior with an acrylic system. The estimated cost is $195,000.

3. Or, abrasive blast clean the tank's exterior to a commercial grade (SSPC-SP6) condition inside a dust-tight, flexible-frame containment system, and recoat with a four coat polyurethane system. The estimated cost is $300,000, plus $75,000 for containment.

4. Repair and continue cathodic protection for wet interior surfaces. Use a qualified cathodic protection contractor for maintenance.

5. Repair foundation cracks and seal the surface with an epoxy coating. Cost would be incidental if completed with a major recoating project.

6. Recaulk areas of missing caulk between the tank's column baseplates and foundations. This could be done by in-house personnel.

7. Adjust the sway rods. The estimated cost is $3,000.

8. Install a 30 in. manway in the bottom of the riser. The estimated cost is $7,000.

9. Enlarge the roof hatch to 30 in. diameter. The estimated cost is $3,000.

10. Install a 25 ft. diameter, 42 in. high railing and a painter's rail on the roof. The estimated cost is $12,000.

11. Abrasive blast clean to a near white grade (SSPC-SP10), and paint the rusted pit piping. The estimated cost is $5,000.

12. Install a new wet interior ladder from the roof hatch to the bowl. Equip with a fall prevention device. Remove the damaged 4 ft. of ladder at the sidewall manway and replace with new. The estimated cost is $8,000.

13. Remove the roof ladder, and replace with hand rails from the step-off platform to the roof hand rail. The estimated cost is $10,000.

14. Weld plates over the cathodic protection lift holes in the roof and the hole in the roof vent. The estimated cost is $3,000.

15. Reinstall the fallen sections of the roof beams and inspect the remaining beams for repair. Budget $20,000.

A DISCUSSION on RESCUE/RETRIEVAL OPERATIONS from ELEVATED LEGGED STORAGE TANKS

A series of accidents involving falls from or in water tanks has highlighted inadequacies in tank design and a potentially greater problem. The rescue may be more dangerous than the original accident, with the potential for more loss of life or injury. Contractors and engineers are responsible for their own employees. Even with safety training and proper equipment, accidents will occur. Most rescue squads are local or neighboring fire departments, some with more practice than other departments. Elevated tanks were designed to store water, not for rescue or retrieval convenience. The following items would make working on and retrieval from water tanks safer. This discussion is offered as a starting point. We recommend that you meet with your rescue personnel and draft a rescue plan. A copy of the plan should be kept at the tank and with the rescue crew.

OSHA now requires 30 in. manways and hatches, and roof ladders are to be replaced with platforms, steps, and railings. We have always objected to replacement of ladders every other year as regulations change, especially on retrofit of existing tanks. We recommend the changes be made during the next major tank painting project.

Retrieval from Interior:

Current Access:

Access to the roof is from the leg, sidewall, and roof ladders. The ladders do not meet MiOSHA size standards. All exterior ladders contain a rail-type fall prevention device. There is a ladder in the wet interior from the sidewall manway to the bowl area. The wet interior ladder is in poor condition and does not have a fall prevention device. There is a 12 in. x 18 in. manway in the bottom of the riser, and a 24 in. diameter roof hatch to the wet interior. The top of the bowl riser does have a grate, but has a safety railing.

Modified Access:

Providing safe access to rescue personnel is essential. Replace the sidewall ladder so it extends straight up to a work platform with railings that surrounds the roof edge hatch. Replace the existing roof hatch with a 30 in. hatch with a lockable, rainproof lid. The existing hatch is too small for a rescue basket and rescue personnel with equipment. Replace the roof ladder with a series of steps and railings to permit access to the center of the roof standing upright. Install a movable fall prevention device on the railing. Install a 42 in. high railing on the roof. The railing would allow tie-off locations and increased safety during routine maintenance. The ladder and railing could be used your personnel when checking lights, vents, and security annually; or by antenna personnel. The railing could also be used for antenna mounting. Install a new wet interior ladder from the roof hatch to the floor, and repair the damaged section of the sidewall/bowl ladder. Once in the tank there is a 6 ft. diameter riser. A 42 in. high railing has been installed around the top of the riser. This provides a safe, although slippery, work environment for the rescue crew for retrieval down the riser.

Retrieval down Riser:

1. *Retrieval down through the riser is usually the safest method. Remove the new vent from the top center of the tank, and attach a winch or pulley system to a tripod set-up over the vent.*

2. *Raise and lower the basket through the riser and out the new 30 in. diameter manway at the bottom of the riser. Rescue personnel would also raise and lower all their equipment through the riser, and then leave the wet interior using the wet interior ladder with fall prevention. On the roof, personnel would be working from inside the security of a roof railing around the center attachment area and roof hatch.*

Modifications Necessary:

1. *Install a 30 in. manway in the bottom of the riser ($7,000).*

2. *Install a new sidewall ladder with a step-off platform and roof hand rails ($10,000).*

3. *Install a new 30 in. roof hatch ($3,000).*

4. *Install a roof railing ($12,000).*

5. *Install a new wet interior ladder ($8,000).*

Equipment:

Winch or pulley system and tripod.
Basket.
Fall prevention sliders.

COST SUMMARY:

Exterior high pressure water jet and recoat with acrylic system:	$195,000
Adjust sway rods:	3,000
Install 30 in. diameter manway in riser:	7,000
Install 30 in. roof hatch:	3,000
Install roof railing with painter's rail:	12,000
Paint pit piping:	5,000
Install new wet interior ladder with fall prevention:	8,000
Replace sidewall ladder with vertical ladder and step-off platform:	10,000
Weld cathodic caps and hole in roof vent:	3,000
Repair and replace roof beams and seal weld remaining beams and plug holes:	20,000
	$266,000
Engineering and contingencies:	53,000
Total:	**$319,000**

Because of the delaminating topcoat, a long-term strategy includes removal of the total coating system and abrasive blast cleaning and repainting with a dust-tight, flexible-frame containment system – add $180,000 to exterior repainting costs.

Note: The age and design of this tank with its lattice legs, struts, sway rods, and riveted construction make it very expensive to maintain compared to modern tanks. By comparison, the cost to overcoat the exterior of a modern 650,000 gallon pedestal-style tank is estimated at $85,000. The City is encouraged to discuss with its consulting engineers long-term planning for a new tank that would be much cheaper to maintain.

INSPECTION:

On May 7, 2008, Dixon Engineering, Inc. (DIXON) performed a maintenance inspection on the 650,000 gallon double ellipse water storage tank owned by the City of Benton Harbor, MI. Purposes of the inspection were to evaluate the interior and exterior coatings' performance and life expectancy; assess the condition of metal surfaces and appurtenances; review safety and health aspects; and make budgetary recommendations for continued maintenance of the tank. All recommendations are incorporated into this report, with budgeting estimates for repairs. Inspectors for DIXON were Roy Wise, Larry Houck, and Eric Binkowski. Scheduling and arrangements for the inspection were completed through Greg Alimenti.

CONDITIONS and RECOMMENDATIONS:

Exterior Coating Conditions:

The exterior coating is a multiple coat urethane system applied in 1990. It is beginning to chalk and fade, and there is a loss of gloss. Surfaces have faded due to exposure to ultraviolet rays, which is a normal occurrence for an exposed coating system. The coating is adequately protecting the metal and aesthetics are fair. While the coating may appear to have an acceptable aesthetic quality, the actual condition is poor. Adhesion is poor and many, minor coating breaks and exposed prime coat will soon appear, allowing rust to form on the surface.

The riser coating is in fair condition, with minor breaks, with small amounts of surface rust and rust staining. Primary methods of deterioration are spot coating breaks and topcoat delamination.

The bowl coating is in fair condition, with minor coating breaks, with small amounts of surface rust and rust staining. Primary method of deterioration is spot coating breaks to the primer.

The balcony coating is in fair condition.

The exterior sidewall coating is in fair condition. Primary methods of deterioration are delamination and spot coating breaks to the primer, with small amounts of surface rust and rust staining. The sidewalls and lower bowl areas are covered with light algae growth.

The exterior roof coating is in fair condition. Primary methods of deterioration are spot coating breaks and undercoat bleed-through. There are minor areas of primer bleed-through on the roof.

Lettering on the tank consists of "BENTON HARBOR" in two locations. Lettering is block-style. There is a sidewall logo (City logo with gulls).

Exterior Coating Recommendations:

Budget for exterior overcoating by 2011, or when aesthetics dictate. The estimated cost to recoat is $195,000.

High pressure water jet (10,000 – 20,000 psi) the existing coating to remove loose and poorly adhering topcoats. The coating system would consist of a spot prime coat on the bare metal, followed by two full coats of acrylic. The acrylic system had good gloss and sheen retention. The additional recoat would supply an added barrier thickness for continued service. This alternative was selected because the existing primer has good adhesion. The purpose of this procedure is to remove all the poorly adhering topcoat, leaving the primer in-place. This procedure greatly reduces the cost of the project and prolongs the life of the coating system. The system can be repainted every eight-to-ten years without disturbing the primer. With regular recoating, the life of the existing system could be extended twenty years or more before the coating would have to be completely removed. The tank would be removed from service during the project to reduce moisture condensation on the surface.

Wet Interior Coating Conditions:

The wet interior coating is an epoxy system applied by G & M Painting in 1990. The roof coating is in good condition, 99% intact, with the primary areas of deterioration along the lap seams, beam edges, and in crevices. The tank's roof contains open lap seams that have started to rust and stain, typical for a tank of this construction where the lap seams are open and not seal welded or caulked. Staining in the lap seams is not a concern, but should be monitored during future inspections for corrosion growth. Roof beam edge corrosion is typical, but should be corrected before structural loss of steel occurs. Coating deterioration is occurring along edges of some of the roof support beams. Rust is also occurring at the roof-to-beam junction.

The sidewall coating is in good condition, 99% intact. There is no significant damage at the high water line, which would be the area most affected by ice pressures and ice movement. Causes of deterioration are spot coating breaks, delamination from age, and abrasion. The coating is still protecting the metal, with the exception of several spot coating breaks. The sidewalls are covered with light mineral staining, which does not affect the integrity of the coating system.

Coating on the bottom of the tank is in good condition, 99% intact. Causes of deterioration are blisters, spot coating breaks from age, and abrasion. The coating is still protecting the metal, with the exception of some spot coating breaks. The bottom is covered with light mineral staining, which does not affect the integrity of the coating system. The bottom of the tank was covered with approximately ¼ in. of mud sediment that was flushed from the interior.

The riser coating is in fair condition, 95% intact. Causes of deterioration are pinholes, and spot coating breaks at lap seams and stitch welds. The coating is still protecting the metal, with the exception of several spot coating breaks. The riser coating is covered with light mineral staining, which does not affect the integrity of the coating system.

Wet Interior Coating Recommendations:

The existing coating system has not deteriorated to the point where replacement is warranted. The cathodic protection system did not appear to be functioning based on the severed lines at the top of the riser. Long-term budget for repainting in ten years. The estimated cost is $95,000.

Cathodic Protection Conditions:

The floating ring cathodic protection system appeared to be non-functional. The wiring has been sheared in the bowl. Coating breaks are present on the floor, sidewalls, and riser. Pitting has started at the coating breaks, as the cathodic system is not working.

Cathodic Protection Recommendations:

Repair and continue operation of the submerged cathodic protection system. Have a qualified cathodic protection contractor maintain the system. Repairs to the system should be completed as soon as possible to minimize corrosion growth at areas of coating breaks.

Site Conditions:

The tank site is small in size and is fenced with a single locking gate. There is an average size staging area for contractors' equipment. The site is maintained. There is residential development to the east and north, and commercial development to the west. Neighbors are close to the tank and extra precaution will need to be taken to keep paint and/or debris from neighbors' properties. The site is accessible from a municipal street, and the tank is located approximately 20 ft. from the main access road. Drainage for the site is towards the foundation.

Foundation Conditions:

The exposed column and riser foundations are in good condition and showed minor amounts of deterioration. Deterioration includes chipping and spalling. The concrete is spalled without rebar exposure. Differential settlement of the foundations has not occurred from freeze/thaw cycles. The top 6 in. of the foundations are exposed. Corrosion is occurring on some of the anchor bolt chairs.

Grout Conditions:

The grout is in poor condition around the column baseplates. 20 ft. of grout is missing between the bottom plates and column foundations.

Grout Recommendations:

Remove all loose and deteriorated column caulk and repair. This could be done by in-house personnel.

Leg Conditions:

The tank is supported by ten single lattice columns that attach to the sidewalls and bowl at balcony level. The columns are in good condition and appeared in alignment.

Balcony Conditions:

Disclaimer: Unless we feel that ladders and balconies are unsafe, it is our opinion that if they were built to code at the time of construction, they do not require replacement. The code changed three times in the late 1980's and early 1990's and it seems ridiculous to replace each time. However, it is our responsibility to inform you of this possible deficiency.

The exterior balcony is in fair condition. It is located on the exterior sidewalls, is 30 in. wide, with a 42 in. high hand rail. The hand rail has a kick plate at the balcony floor. The diagonal balcony posts and top rail are angle iron. The balcony acts as a sidewall stiffener. There was no evidence of bird droppings or ponding water. There is minor corrosion at the balcony-to-tank connection.

Rod Conditions:

The tank's sway rods are in good condition. Coating on the sway rods is in fair condition, with minor spots of coating failure and surface rust on the rods and turnbuckles, and on the struts between the leg columns. Because of the inaccessibility of the sway rods, exact tension could not be determined. However, based on the amount of coating loss on the rods where the rub against each other, it was evident the rods are loose.

The riser tie rods are in good condition. The tank has ten riser tie rods that extend from the leg columns to the riser with bolted ring connections. Crevice corrosion is active behind the ring.

Rod Recommendations:

Adjust the sway rods. Loose sway rods will allow the tank to move excessively, placing undue stress on the connections. The estimated cost is $3,000.

Overflow Pipe Conditions:

The tank has an 8 in. diameter overflow pipe that exits the roof knuckle, extends down along the sidewall, through the balcony, and down along a leg column to ground level. The pipe discharges to a storm drain below grade.

Hatch/Manway Conditions:

The tank has a 24 in. diameter, flip-top, round roof access hatch to the wet interior that is in good condition. The hatch has a rainproof cover consisting of a 4 in. curb, and a 2 in. lip on the cover. It was locked. The hatch was not operable, as the roof ladder prevents opening the hatch.

The tank has a 24 in. diameter access manway in the sidewall shell, and a 24 in. diameter access manway in the riser that are in good condition. The sidewall manway is not hinged, and the gasket showed no signs of leaking. The bolts have no coating.

Hatch/Manway Recommendations:

Install a 30 in. manway in the riser. Average size rescue baskets will not pass through the existing manway. The estimated cost is $7,000.

Replace the roof access hatch with a new 30 in. curbed hatch that has a 2 in. lip, 4 in. curb, and a lockable hasp. Average size rescue baskets and rescue personnel wearing equipment will not pass through the existing 24 in. hatch. The estimated cost is $3,000.

Vent Conditions:

The roof vent is a 16 in. flow-through design. The vent has a 3 in. diameter hole cut through the top plate for antenna cable. The hole is open and would allow birds to enter the wet interior. The vent is properly screened. No evidence of entry was found.

Vent Recommendations:

Weld shut the hole that was cut in the top plate of the vent. This could be done in conjunction with roof repairs.

Roof Hand Rail/Painter's Rail Conditions:

The roof has neither a roof hand rail nor a painter's rail.

Roof Hand Rail/Painter's Rail Recommendations:

Install a 25 ft. diameter, 42 in. high railing on the roof. The railing would allow tie-off locations and safety during routine vent screen and obstruction light inspections, and would also provide a work area for retrieval personnel using roof extraction. The railing should provide sufficient area to rest a basket for helicopter lift, or for stabilizing before lowering down through the riser. Install a painter's rail outside the railing so contractor rigging does not interfere with the railing's interior clear area. The estimated cost is $12,000.

Install safety grabs and rigging couplings on the exterior roof near the painter's rail for fall prevention of workers in the wet interior. The grabs would allow workers in the wet interior to be completely tied off to fall prevention at all times. Cost would be incidental to coating costs.

Antenna Conditions:

The roof area contains one antenna that is attached to the roof vent.

The balcony has three antennas attached to mounting brackets on the hand rail. The antenna cables attached to the roof vent present a potential safety and health problem.

Antenna Recommendations:

Lock the access hatch to the wet interior. Because of the antennas there will be people working on the tank on a routine basis who may not be familiar with the sanitary requirements of a potable water supply. In addition, with more people accessing the tank, the door may be inadvertently left open.

Require the antenna contractor to return and correct the cable and hygiene problems. The simple solution is to have a mounting pole welded to the roof and a plate welded over the open hole.

Pit/Pit Piping Conditions:

The tank is operated by valves located in the pit below the tank. The pit does not have an altitude valve. The owner noted there have been no problems with the valve. The rusted piping is in poor condition. Coating on the piping is also in poor condition. The pipes and valves have extensive coating failure. Some of the valves are new and do not require painting. Said valves should be protected from damage during any maintenance painting. No coating remains on the piping. Steel loss is occurring on the flanges and bolts in the pit. The pit was dry during the inspection.

Pit/Pit Piping Recommendations:

Abrasive blast clean the piping to a near white condition (SSPC-SP10), and apply two coats of epoxy. The corroded bolts should be replaced after abrasive blast cleaning. The estimated cost is $5,000.

Fill Pipe Conditions:

The 10 in. diameter fill pipe extends 1 ft. into the bottom of the riser. The top of the pipe does not have a deflector plate.

Mud Valve Conditions:

A single mud valve is located in the bottom of the riser. The valve operated properly during the inspection.

Ladder Conditions:

The tank has an exterior leg ladder that starts approximately 12 ft. above ground level, and extends up to the balcony. The ladder is in good condition, and contains a rail-type fall prevention device.

The tank has a fixed sidewall shell and revolving roof ladder. The ladder has a rail-type fall prevention device, preventing movement. The roof ladder cannot move past the roof manway and overflow weir box. The revolving roof ladder attaches around the vent pipe at the center of the roof.

The wet interior has a ladder from the sidewall manway to the bottom of the bowl. The ladder is in poor condition, and does not meet current MiOSHA size requirements. The top section has been damaged by ice. The ladder does not have a rail-type fall prevention device. There is no ladder from the roof manway to the bowl.

Ladder Recommendations:

The revolving roof sidewall shell ladder should be replaced with a vertical sidewall ladder that runs up to a step-off platform that is surrounded with hand rails at the roof hatch. The step-off platform would provide a safe working area around the roof hatch. The estimated cost is $10,000. A hand rail from the step-off platform to the roof hand rail would replace the roof ladder. Steps or cleats would be installed to increase traction. This would remove all loading from the roof vent pipe.

Install a ladder in the wet interior from the roof to the bowl. Equip with a fall prevention device. Repair the damaged section of the sidewall/bowl ladder. The estimated cost is $8,000.

Wet Interior Metal Conditions:

The steel structure is in poor condition above the high water line, and in good condition below the high water line.

The interior roof is supported by twelve radial beams that are in poor condition, with minor corrosion at the edges. Several of the roof beams are bent and broken. There are gaps in the riveted seam where the roof meets the sidewalls. There are several old bolt holes in the roof.

There is a hand rail around the riser opening.

Metal in the riser is severely pitted. The pitting occurred prior to the current coating application. The metal is being protected by the current coating. There is minor, active corrosion in the riser.

Wet Interior Metal Recommendations:

Monitor corrosion on edges of the roof beams. Recoat the roof before metal loss becomes significant.

Reweld or replace the five bent and broken roof beams. The estimated cost is $20,000. This is budgeted separately and does not include any other paint touch-ups. Plug the old bolts holes in the roof and seal the gaps in the riveted seam where the roof meets the sidewall, and where the cathodic caps on the roof have shifted. Seal weld the remaining or undamaged roof beams.

STEEL TANK FIELD INSPECTION REPORT
LEG TANK

DATE: **May 7, 2008**

I. TANK DATA

OWNER: **City of Benton Harbor**
CLIENT CODE: **22-11-05-01**
TANK NAME: **650,000 Gallon Double Ellipse (Britain Tank)**
LOCATION: City: **Benton Harbor**
State: **MI**
TANK SIZE: Capacity: **650,000 gallons**
Height to bottom (LWL): **126 feet**
CONSTRUCTION: **Welded - Riveted**
Type of Structure: **Double Ellipse**
Type of Roof: **Ellipsoid**
Type of Bowl: **Ellipsoid**
DATE CONSTRUCTED: **1962**
MANUFACTURER: **PDM**

COATING HISTORY:	EXTERIOR	WET INTERIOR	DRY INTERIOR **N/A**
DATE LAST COATED	**1990**	**1990**	
CONTRACTOR	**G&M**	**G&M**	
PAINT SYSTEM	**Polyurethane**	**3 coat epoxy polyamide**	
SURFACE PREPARATION	**SP6**	**SP10**	
PAINT MANUFACTURER	**Tnemec**	**Tnemec**	
PAINT SAMPLES	**No**	**No**	
LEAD COATING	**No**	**No**	

INSPECTED BY: **Dixon Engineering, Inc.**
INSPECTORS: **Roy Wise; Larry Houck; Eric Binkowski**
TYPE OF INSPECTION: Maintenance
DATE LAST INSPECTED: **10/16/97**

II. INSPECTION DATA

SITE CONDITIONS:

Fenced: **Yes**
Control building: **No**
Antenna control sites: **Yes**
Number: **1**
Location: **Adjacent to riser; underneath bow; city antenna**
Site condition: **Not maintained**
Neighborhood: **Residential - Retail**
Describe surroundings: **Residential north and east; body shop west**
Power lines within 50 feet: **Yes**
Other concerns: **Building (8 ft. x 8 ft.) located 6 ft. from riser; trees and limbs touching tank southeast side; fencing 6 ft. – 8 ft. from tank legs**

PIPING:

Pit: **Yes**
Location: **Adjacent to tank**
Condition of pit structure: **Fair**
SCADA controls: **No**
Controls heated: **Yes**
Altitude valve: **Yes**
Condition of coating: **Poor**
Describe coating: **Erosion - No coating remaining**
Condition of metal: **Good**
Piping comments: **Some valves are new with intact coating; older valves/pipes have scale rust on bolts and flanges**

FOUNDATION:

Riser:

Foundation exposed: **Yes**
Amount exposed: **6 inches**
Exposed foundation condition: **Good**
Chipped or cracked: **Yes**
Severity: **Minor**
Type of grout: **None**
Indications of foundation settlement: **No**
Riser comments: **Riser moved during inspection**

Legs:

Foundation exposed: **Yes**

FOUNDATION:

Amount exposed: **6 inches**
Exposed foundation condition: **Good**
Concrete chipped or cracked: **Yes**
Severity: **Minor**
Type of grout: **Caulk**
Condition: **Fair**
Grout missing: **Yes**
Amount missing: **20 ft.**
Indications of foundation settlement: **No**
Leg comments: **Delaminated coating to substrate**

Site:

Site drainage: **Towards foundation**
Indications of underground leakage: **No**
Undermining of foundation: **No**
Shrubs, trees, etc. encroachment: **No**

EXTERIOR:

Legs:

Number: **10**
Type: **Lattice**
Exterior connection to tank: **Good**
Explain: **Minimal rusting/rust staining**
Topcoat condition: **Good**
Primer/Previous coating condition: **Good**
Describe coating: **Delamination - Spot coating breaks to substrate**
Dry film thickness (DFT) of coatings: **8 - 14 mils**
Metal condition: **Good**
Leg comments: **Delaminated topcoat to prime**

Riser:

Diameter: **72 inches**
Topcoat condition: **Fair**
Primer/Previous coating condition: **Good**
Describe coating: **Delamination - Rust bleed through**
Mildew growth: **Yes**
Amount: **Light**
Dry film thickness (DFT) of coatings: **6 - 10 mils**
Metal condition: **Good**

EXTERIOR:

Riser comments: **Delaminated topcoat-to-prime; exposed steel rusting**

Tank Bowl:

Topcoat condition: **Good**
Primer/Previous coating condition: **Good**
Mildew growth: **Yes**
Amount: **Light**
Metal condition: **Good**
Riser to bowl connection: **Good**
Bowl comments: **Light algae growth**

Tank Sidewall:

Lettering: **Yes** Number: **2**
Describe the lettering: **BENTON HARBOR**
Logo: **Yes** Number: **1**
Describe the logo: **City logo with gulls**
Topcoat condition: **Fair**
Primer/Previous coating condition: **Good**
Describe coating: **Fading - Delamination - Spot coating breaks to primer**
Dry film thickness (DFT) of coatings: **8 - 13 mils**
Metal condition: **Good**
Sidewall comments: **Topcoat cracks and delamination; areas of pinhole rusting at low film build**

Tank Roof:

Topcoat condition: **Good**
Primer/Previous coating condition: **Fair**
Describe coating: **Fading - Delamination - Spot coating breaks to substrate - Rust bleed-through**
Dry film thickness (DFT) of coatings: **7 - 14 mils**
Metal condition: **Good**
Roof comments: **Rusting at spot coating breaks; coating undercoat bleed-through from coating erosion**

EXTERIOR ACCESSORIES:

Anchor Bolts:

Number bolts per leg: **2**
Diameter: **1½ inches**

EXTERIOR ACCESSORIES:

Number of riser anchor bolts: **None**
Coating condition: **Good**
Metal condition: **Good**
Anchor bolt comments: **Some rust bleed-through and corrosion with minor steel loss**

Exterior Overflow Pipe:

Coating condition: **Good**
Metal condition: **Good**
Inside diameter: **8 inches**
Condition of screen: **None in-place**
Flap gate: **No**
Air gap: **No**
Splash pad: **No**
Overflow comments: **Overflow connects to storm sewer below grade**

Riser Manway:

Coating condition: **Fair**
Metal condition: **Good**
Size: **24 in. diameter**
Gasket leaking: **No**
Hinged: **Yes**

Struts and Rods:

Number of bays: **4**
Sway rods:
- Coating condition: **Fair**
- Metal condition: **Good**

Struts:
- Coating condition: **Fair**
- Metal condition: **Good**

Riser rods:
- Coating condition: **Fair**
- Metal condition: **Good**

Sway rods, struts, rod comments: **Loose sway rods in upper bay; coating delaminated from prime coat**

Leg Ladder:

Coating condition: **Good**

EXTERIOR ACCESSORIES:

Metal condition: **Good**
Toe clearance: **7 inches**
Width of rungs: **15 inches**
Thickness of rungs: **$^{5}/_{8}$ inch**
Shape of rungs: **Round**
Fall prevention device: **Yes**
Type: **Rail**
Condition: **Good**
Cage: **No**
Step-off Platform: **No**
Leg ladder comments: **Delaminated topcoat-to-prime; surface rusting at exposed prime**

Balcony:

Balcony width: **30 inches**
Railing height: **42 inches**
Midrail: **Diagonals**
Toe plate height: **3 inches**
Coating condition: **Fair**
Describe coating: **Delamination - Spot coating breaks to substrate**
Balcony supports and connections: **Good**
Missing bolts or rivets: **No**
Number of penetrations: **11**
Penetrations reinforced: **No**
Penetration uses: **Overflow pipe - columns**
Accumulation of bird droppings: **No**
Water pooling: **No**
Metal condition: **Good**
Balcony comments: **Antenna cables/conduit; rusting along balcony toe kick**

Sidewall Ladder:

Style: **Vertical**
Coating condition: **Good**
Metal condition: **Good**
Toe clearance: **6 inches**
Width of rungs: **15 inches**
Thickness of rungs: **$^{5}/_{8}$ inch**
Shape of rungs: **Round**

EXTERIOR ACCESSORIES:

Style: **Fixed**
Fall prevention device: **Yes**
Type: **Rail**
Cage: **No**

Sidewall Hatch:

Coating condition: **Good**
Metal condition: **Good**
Size: **24 in. diameter**
Bolted: **Yes**
Hinged: **No**
Gasket leaking: **No**

Platform: N/A

Roof Ladder:

Design: **Revolving**
Coating condition: **Good**
Metal condition: **Good**
Width of rungs: **15 inches**
Shape of rungs: **Round**
Fall prevention device: **Yes**
Type: **Rail**
Condition: **Good**
Cage: **No**
Roof ladder comments: **Roof ladder over top of the wet interior roof manway restricting manway operation; ladder offset to sidewall ladder**

Roof Handrail: N/A [Proposed Diameter: 25 feet]

Roof Access Hatches:

Wet interior:
Coating condition: **Good**
Metal condition: **Good**
Opening size: **24 inches**
Shape: **Round**
Hatch security: **Unknown**
Hatch comments: **Unable to open because of roof ladder**

EXTERIOR ACCESSORIES:

Roof Vents:

Number of vents: **1**
Type: **Standard**
Neck diameter: **16 inches**
Coating condition: **Good**
Metal condition: **Good**
Screen condition: **Good**
% of screen open: **100**
Vent Comments: **3 in. diameter hole cut in top of vent for antenna cable**

Aviation Lights: N/A

Cathodic Caps:

Number: **10 - 12**
Coating condition: **Good**
Metal condition: **Good**
Aligned: **No**
Cathodic cap comments: **Caps require adjustment to close open gaps in roof**

Rigging Couplings: N/A

Antennas:

Number: **3 + 1**
Location: **Balcony (3); Roof vent (1)**
Cable runs: **Up 2 legs**
Cables interfere with climbing: **No**
Antenna comments: **Antenna on roof runs through open hole in top of vent restricting closing of hole**

WET INTERIOR:

Tank Roof:

Topcoat condition: **Good**
Primer condition: **Good**
Metal condition: **Good**
Roof to sidewall connection: **Fair**
Condition of laps: **Good**
Laps: **Open**

EXTERIOR ACCESSORIES:

Tank roof comments: **5 approximately 6 in. gaps at roof-to-sidewall connection; several old bolt holes in roof**

Tank Sidewall:

Topcoat condition: **Good**
Primer condition: **Good**
Describe coating: **Rust undercutting - no coating where steel beams removed**
Mineral deposits: **Light**
Metal condition: **Good**
Active pitting: **No**
Previous pitting: **No**
Previous pit filling: **Unknown**
Tank Sidewall comments: **Spot rusting at rivets/lap seams**

Access Tube: N/A

Tank Bottom:

Topcoat condition: **Good**
Primer condition: **Good**
Describe coating: **Spot coating breaks to substrate**
Mineral deposits: **Light**
Metal condition: **Good**
Active pitting: **No**
Previous pitting: **No**
Previous pit filling: **Unknown**
Sediment on floor: **Yes**
Depth of sediment: **¼ inch**
Tank bottom comments: **Some burn marks from cut steel; multiple pinholes and rusting throughout bowl**

Riser:

Topcoat condition: **Good**
Primer condition: **Good**
Describe coating: **Spot coating breaks to substrate**
Metal condition: **Good**
Active pitting: **Yes**
Deepest pit depth: **⅛ inch**
Number of pits: **11-25**

EXTERIOR ACCESSORIES:

Previous pitting: **Yes**

Number of pits: **More than 75**

Previous pit filling: **Unknown**

Riser comments: **Rusting at all rivet seams**

WET INTERIOR ACCESSORIES:

Tank Ladder:

Coating condition: **Good**

Metal condition: **Fair**

Toe clearance: **8 inches**

Width of rungs: **16 inches**

Thickness of rungs: **$^{5}/_{8}$ inch**

Shape of rungs: **Round**

Shape of side rails: **Flat plate**

Fall prevention device: **No**

Tank ladder comments: **Previous steel loss on rungs**

Cathodic Protection:

Clips and pressure fitting present: **Yes**

Type: **Floating ring**

Condition: **Poor**

Explain: **Wires sheared off at top of riser**

Cathodic protection comments: **Cathodic requires repair**

Fill Pipe:

Diameter: **10 inches**

Coating condition: **Good**

Metal condition: **Good**

Height above floor: **18 inches**

Deflector plate/grate/bar: **No**

Recirculation line: **No**

Fill pipe comments: **No deflector plate**

Draw Pipe: N/A - (Same as fill pipe)

Overflow:

Type: **Weir box**

Coating condition: **Fair**

Metal condition: **Good**

WET INTERIOR ACCESSORIES:

Roof Beams: Radial
Number: **12**
Shape: **Angle**
Dimensions: **3 x 4 inches**
Coating condition: **Good**
Metal condition: **Good**
Roof beam comments: **Bottom sections have been removed approximately 5 ft. and fallen into the tank; 5 beams require repair**

Sidewall Beams: N/A

Riser Safety:
Riser grate: **No**
Riser railing: **Yes**
Railing height: **42 inches**
Midrail height: **24 inches**
Toe plate height: **4 inches**
Coating condition: **Good**
Metal condition: **Good**

Siphon: N/A

Interior Balcony: N/A

Spider: N/A

Recommendations:

Coating: **Budget to abrasive blast clean the exterior or high pressure water clean and acrylic overcoat system; abrasive blast clean pit piping and paint**

Health: **Weld cathodic caps and holes in roof; relocate antennas on roof vent; weld plate over open hole**

Safety: **Install exterior sidewall ladder with platform; adjust sway rods; install 30 in. manway in riser and 30 in. roof hatch; install railing and painter's rail on roof; new ladder in wet interior and on sidewall; install antenna post to roof and relocate antenna from roof vent**

Metal: **Fix and replace roof beams; repair cathodic protection; install deflector plate on fill pipe**

Field Inspection Report is prepared from the contractor's viewpoint. It contains most of the information the contractor needs to prepare his bid for any repairs or repainting. The Engineer uses it to prepare the engineering report. Cost estimates are more accurate if contractor problems can be anticipated. While prepared from the contractor's viewpoint, the only intended beneficiary is the owner. These reports are completed with diligence, but the accuracy is not guaranteed. The contractor is still advised to visit the site.

(1) Benton Harbor 650,000 gallon water storage tank.

(2) Delaminated coating on leg foundation, and missing grout beneath baseplate.

(3) Missing grouting on riser baseplate, and delaminated coating on foundation.

(4) Building with antenna control equipment next to riser.

(5) Delaminated topcoat on lattice leg.

(6) Delaminated topcoat on leg.

(7) Delaminated topcoat on leg and leg strut.

(8) Rust at buckles, and delaminated topcoat on strut.

(9) Delaminated topcoat on strut and leg.

(10) Delaminated coating on riser, and rust staining.

(11) Delaminated coating on riser, and rust staining.

(12) Delaminated coating on riser, and algae on bowl.

(13) Bottom of bowl, and areas of topcoat delamination.

(14) Lower bowl algae stain and accumulation.

(15) Coating intact on upper bowl.

(16) Delaminated coating/rust at balcony.

(17) Delaminated topcoat on sidewall.

(18) Sidewall ladder and pinhole rusting.

(19) Faded lettering, and overflow bracket.

(20) Pinhole rusting on sidewall.

(21) Roof coating is intact - areas of bleed-through.

(22) Exterior roof coating is intact.

(23) Roof cathodic cap.

(24) Roof ladder over top of the roof manway.

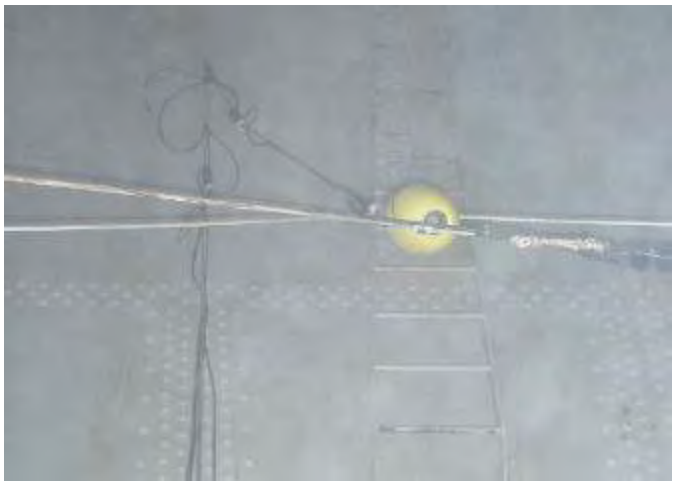
(25) Roof ladder over top of the roof manway.

(26) Overflow weir box and antenna cable showing rusting.

(27) Roof vent with antenna mount and open hole.

(28) Roof vent screen and antenna cable.

(29) Bottom of sidewall/bowl ladder.



(30) Sidewall/bowl ladder, and cathodic protection float.

(31) Damaged 4 ft. of sidewall/bowl ladder, and torn gasket.

(32) Coating breaks on lower sidewall rivets.

(33) Coating break and rusting on upper bowl.

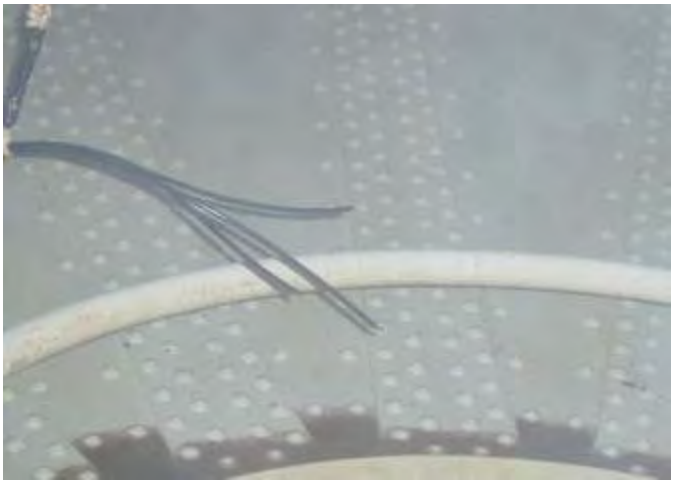
(34) Coating intact on lower sidewall.

(35) Coating intact on sidewall.

(36) Coating intact on previous pitting.

(37) Light coming through roof cathodic lift plates.

(38) Bottom of bowl, and riser railing.



(39) Cut or sheared cathodic wires.

(40) Riser-to-bowl junction - coating protecting steel.

(41) Rust staining at riser can stitch welds.

(42) Rust staining at riser can stitch welds.

(43) Rust staining at riser can stitch welds.

(44) Rusting in area of previous pitting.

(45) Coating intact in areas of previous pitting.

(46) Fill pipe and mud valve.

(47) Riser hatch manway cover hinge.

(48) Rusted pit piping and flanges.

(49) Leg ladder fall prevention rail and vandal guard.

(50) Deformed riser ladder rung.

(51) Pit door opening and stairway.

APPENDIX D

2010, 2011, 2015, 2016 ANNUAL WATER QUALITY REPORTS

City of Benton Harbor Utility Services Department's 2010 Consumers Confidence Report

Contact Us: Michael O'Malley, Benton Harbor Water Plant (269) 927-8471
Darwin Watson, Benton Harbor Public Works/Utility Services Director (269) 927-8445
Utility Billing Payment Center (269) 934-7638
Benton Charter Township Water (269) 925-0616

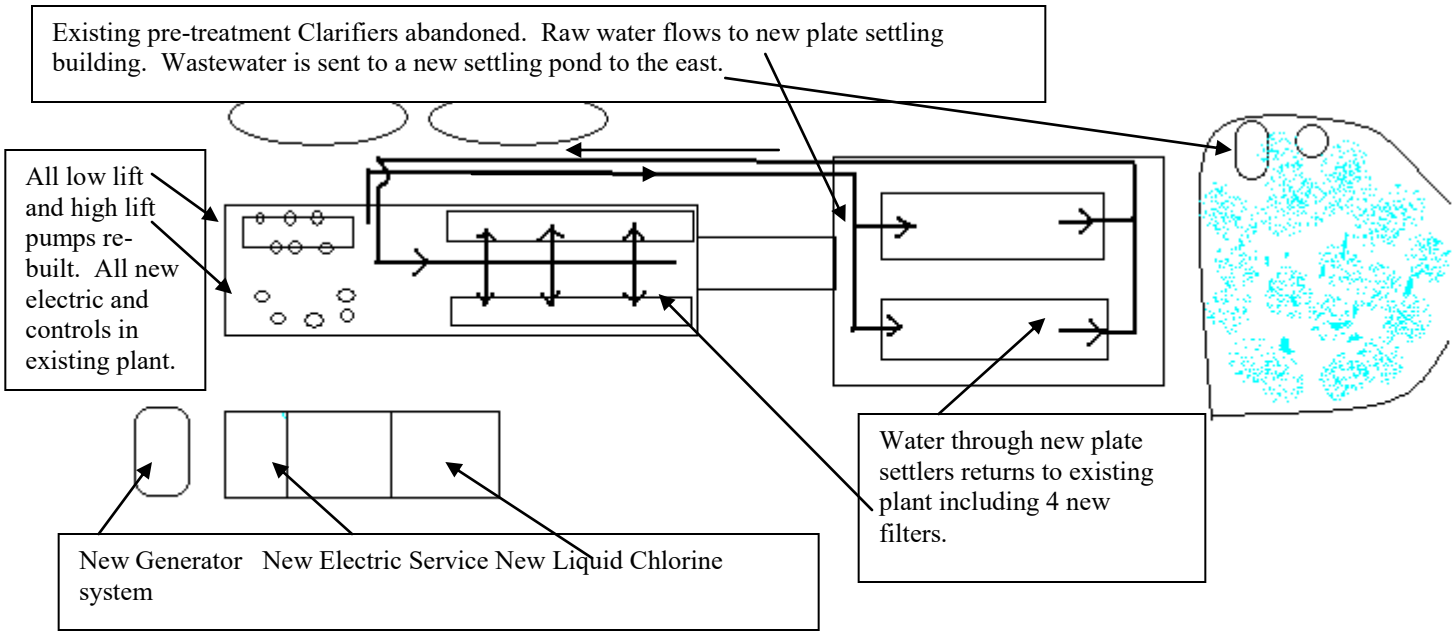
Water Plant Renovations are Nearly Complete

The Benton Harbor Water Plant is located in the southwest corner of Benton Harbor's beautiful Jean Klock Park. The Water Plant was constructed in the 1950's as a complete treatment plant that includes chemical addition for disinfection and particulate removal; mixing and settling chambers; filters; a storage reservoir; and high lift pumps to distribute the water to the City and the Townships of Benton Charter, St. Joe Charter, Hagar and Sodus. The water plant was aging and had experienced some failures. For the past 15 months the Contractor Davis Construction with several sub-contractors have been busy remodeling the existing plant and equipment and building the new treatment addition shown in the photograph. The project is nearly complete and will probably finish slightly over the $12 million budget. Funding for the project is through the State of Michigan's Drinking Water Revolving Loan Funds, which feature low interest loans to Michigan water projects. Additional funding was obtained from the Federal Government through the American Resources and Recovery Act, which will reduce the loan amount by 40%. The project is expected to be complete by October of 2011. Upon completion of the filtration plant project, the existing plant will have an anticipated life span in excess of 50 years and will offer 14 million gallons of water per day to our area users.

2010 Benton Harbor Water Quality Report

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township and St. Joseph and the soon to be completed Benton Charter Township Water Plant. Lake Michigan is a surface water supply and is venerable to a wide range of contaminates. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. A copy of the full report can be obtained by calling the water plant at (269) 927-8471.



General Health Information Provided by EPA

To ensure that tap water is safe to drink, EPA prescribes limits on the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

A. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance

For more information about our water quality, or to receive an additional copy of this report, please contact the Water Superintendent, Michael O'Malley (269) 927-8471 or e-mail to momalley@bhcity.org.

Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2010 and ending December 31, 2010, unless otherwise noted. The test results show that these contaminants were found, but are well below the drinking water guidelines.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Arsenic*	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	ND	NA	No	9/6/10	Naturally present in the environment.
Fluoride (ppm)	4	4	1.1	1.1	No	9/6/10	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	1.51	1.23 to 1.97	No	2010	Disinfectant
TOC**	TT	N/A	1.8	1.5 to 2.0	No	2010	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	7.5	7.5	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.

Chlorodibromomethane (ppb)	80	N/A	2.8	2.8	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	13	13	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.
Total Tri-halomethanes (ppb)	80	N/A	23.6	23.6	No	9/6/10	Formed when chlorine is added to water containing naturally occurring organic material.

**The Total Organic Carbon (TOC) was measured each quarter and the system met all TOC removal requirements set by the State of Michigan.

Regulated Monitoring Distribution System (Stage 1 Disinfection Byproduct Rule)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected/ (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	54	28 to 54	NO	2010	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	33	17 to 33	NO	2010	Formed when chlorine is added to water containing naturally occurring organic material

Unregulated Monitoring Distribution System (Stage 2 Disinfection Byproduct Rule) Testing in 2008-2009

Detected Substance	Benton Harbor city Samples Avg/High	Benton Twp Samples Ave/High	Range Across System	Likely Source of Contaminants. This testing is being conducted over a 12 month period to determine the vulnerability of various points in the 2 largest distribution systems served by the Benton Harbor Water Plant. Results listed are for tests run October to December 2008 only.
TTHM (ppb)	57/78	39/71	21 to 79	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	19/21	26/35	3 to 56	Formed when chlorine is added to water containing naturally occurring organic material

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. We have completed a 1- year study of these Chlorine by-products in the City and Township distribution systems. The results will dictate what sites we will sample from in the coming years to better assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Long Term 2 (Enhanced Surface Water Treatment Rule) Testing in 2008-2009

Detected Substance	Largest Number Detected	Range of organisms detected	Likely Source of Contaminants is Lake Michigan. Lake Michigan testing is was conducted over a 24 month period that began April 2008. Testing is complete in 2009
Cryptosporidium (# of organisms)	3	0 to 3	Open Lake Michigan. Cryptosporidium are microbes found in open water sources.
E. *coli* (# of organisms)	7	1 to 82	Open Lake Michigan. E. *coli* are bacteria found in open water sources.
Giardia	3	0 to 3	Open Lake Michigan. Giardia are microbes found in open water sources.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effulent NTU	0.3* or no sample above 1.00	N/A	0.48 & 0.38	0.07 to 0.48	No	2010	Soil runoff.

* Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indication of the effectiveness of our filtration system. The turbidity level of the filtered water shall be less than or equal to 0.30 NTU in 95% of the samples taken each month and shall not exceed 1.0 NTU at any time.

Distribution System Monitoring Lead and Copper. Last required test date 2008.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb)	15.0	0	5	2.2 to 17	0	No	Corrosion of Household plumbing
Copper (ppb)	1300	1300	76	660 to 1.9	0	No	Corrosion of Household plumbing

The testing for lead and copper was conducted at 41 homes and completed in September of 2008. Lead and copper monitoring began in the early 1990's. Testing has been done with success every three years since 1996. The results of the 2008 test are excellent with all samples tested found to be below the action level (AL) of 15 ppb for Lead and 1300 ppb for Copper. The tri-annual testing will be done as required by September 30, 2011.

Unregulated and Special Monitoring

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	7	Naturally present in the environment
Sulfate	N/A	N/A	28	Naturally present in the environment

Definitions

MCL Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

PPM parts per million or milligrams per liter (mg/l)

PPB parts per billion, or micrograms per liter (ug/l)

NTU Nephelometric Turbidity Units, a measure of the cloudiness of water

N/A Not applicable

RAA Running Annual Average.

TT Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Other Water Quality Parameters of Interest

At the plant we routinely perform other water quality tests. These tests are not for official reporting, but are useful when describing the quality of our drinking water.

Parameter	**2010 Average**	**2010 Range**	**Units**
Chlorine, distribution	0.82	.06 to 1.45	Mg/L as free Cl-
PH	7.1	6.6to 7.7	pH units
Total Alkalinity	97.4	80 to 122	Mg/L as CaCO3
Total Hardness	145	127 to 184	Mg/L as CaCO3
Calcium Hardness	45	37 to 74	Mg/L as Ca
Magnesium Hardness	8.5	2 to 13	Mg/L as Mg
Chloride	10.5	3.1 to 17.3	Mg/L as Cl-

- For Customers owning a new dishwasher the Benton Harbor average water hardness is *8-10 grains per gallon.*

Other water testing in 2010 included full testing for synthetic and additional organic chemicals. There were no detectable levels found among any of the un-regulated contaminates tested. And no detects found among the list of the contaminates including: 2 types of Carbamates; 5 types of Chlorinated Acid Herbicides; and 20 types of Pesticides.

Other Water and Sewer Projects in and around Benton Harbor

- The MDOT Business Loop I-94 project was completed in 2010. Two years of construction to replace all water, sewer a sewer lift station and storm water infrastructure; new road and sidewalks and attractive landscaping and lighting.
- Benton Charter Township began construction of its treatment plant and distribution piping in 2010 and should be complete near September of 2011. The raw water intake and pump station is on Rocky Gap Road. The treatment plant is on North Shore Drive. Water main for distribution and separation from the City lines is complete or underway on North Shore, Paw Paw Ave, Waukonda Ave, Fair Ave, Emery St, and Donald Atkins. Projects that will begin soon include M-139, Pipestone, and Colfax Ave. The City and Benton Township water departments have worked closely together to minimize interruptions in service and the project is proceeding according to plan.
- The City of Benton Harbor Sewer Department will begin an important sewer and sewer lift station project after the summer. Some badly needed sewer lines, 3 new lift stations and quality control upgrades to the other lift stations will improve overall sewer service for the residents of Benton Harbor. Funding for this project is through the State Revolving Fund (SRF) and will be approved in early to mid October 2011.

Benton Harbor Water Plant
200 E. Wall Street
Benton Harbor, MI. 49022

PRSRT STD
ECRWSS
U.S.POSTAGE PAID
EDDM Retail

**********ECRWSS**********

Local
Postal Customer
Benton Harbor, MI. 49022

City of Benton Harbor Utility Services Department's 2011 Consumers Confidence Report

Contact Us: Michael O'Malley, Benton Harbor Water Plant (269) 927-8471
Darwin Watson, Benton Harbor Public Works/Utility Services Director (269) 927-8471
Kaye Jenkins, Utility Billing Payment Center (269) 934-7638
Tom Spitzner, Water/Sewer Superintendent, (269) 927-8471

Water Plant Renovations are Complete

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2011 Benton Harbor Water Quality Report

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township and St. Joseph and Benton Charter Township Water Plant. Lake Michigan is a surface water supply and is venerable to a wide range of contaminates. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. A copy of the full report can be obtained by calling the water plant at (269) 927-8471.

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B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
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National Primary Drinking Water Regulation Compliance

For more information about our water quality, or to receive an additional copy of this report, please contact the Water Superintendent, Michael O'Malley (269) 927-8471 or e-mail to momalley@cityofbentonharbormi.gov .

Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Public Notices Required in 2011

There were 3 events in the Benton Harbor Water System that required Public Notice to be made by the MDEQ.

1. A Filtered water turbidity sample that exceeded the 1 NTU rule on June 21, 2011.
2. A Coliform bacteria positive was found in the distribution system of St. Joseph Charter Township very near the border of the City of Benton Harbor on September 14, 2011.
3. The Water Department failed to sample all of the 30 lead and copper sites that have been collected over the past couple of years.

A Public notice for the turbidity event was distributed in 1 mass mailing by the end of July, 2011.

A Public notice for both the positive Coliform sample and the failure to complete all Lead & Copper sampling were combined into 1 notice and was distributed by mass mailing by mid-October, 2011.

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2011 and ending December 31, 2011, unless otherwise noted.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Arsenic	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	ND	NA	No	9/27/11	Naturally present in the environment.
Fluoride (ppm)	4	4	0.78	0.78	No	9/27/11	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	2.48	0.88 to 2.48	No	2011	Disinfectant
TOC**	TT	N/A	1.94	1.78 to 1.94	No	2011	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	7.2	7.2	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.
Chlorodibromomethane (ppb)	80	N/A	3.7	3.7	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	9.3	9.3	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.
Total Tri-halomethanes (ppb)	80	N/A	20	20	No	9/27/11	Formed when chlorine is added to water containing naturally occurring organic material.

Regulated Monitoring Distribution System (Stage 1 Disinfection Byproduct Rule)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected/ (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	45	40 to 50	NO	2011	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	33	22 to 39	NO	2011	Formed when chlorine is added to water containing naturally occurring organic material

Unregulated Monitoring Distribution System (Stage 2 Disinfection Byproduct Rule) Testing in 2008-2009

Detected Substance	Benton Harbor city Samples Avg/High	Benton Twp Samples Ave/High	Range Across System	Likely Source of Contaminants. This testing is being conducted over a 12 month period to determine the vulnerability of various points in the 2 largest distribution systems served by the Benton Harbor Water Plant. Results listed are for tests run October to December 2008 only.
TTHM (ppb)	57/78	39/71	21 to 79	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	19/21	26/35	3 to 56	Formed when chlorine is added to water containing naturally occurring organic material

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. We have completed a 1- year study of these Chlorine by-products in the City and Township distribution systems. The results will dictate what sites we will sample from in the coming years to better assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Long Term 2 (Enhanced Surface Water Treatment Rule) Testing in 2008-2009

Detected Substance	Largest Number Detected	Range of organisms detected	Likely Source of Contaminants is Lake Michigan. Lake Michigan testing is was conducted over a 24 month period that began April 2008. Testing is complete in 2009
Cryptosporidium (# of organisms)	3	0 to 3	Open Lake Michigan. Cryptosporidium are microbes found in open water sources.
E. *coli* (# of organisms)	7	1 to 82	Open Lake Michigan. E. *coli* are bacteria found in open water sources.
Giardia	3	0 to 3	Open Lake Michigan. Giardia are microbes found in open water sources.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effulent NTU	0.3* or no sample above 1.00	N/A	1.8 & 0.33	0.07 to 1.8	Yes, 1.8 NTU	2011 Violation 6/18/11	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

On June 18, 2011, our operators measured and recorded turbidity values in excess of the MDEQ standard of no sample greater than 1 NTU. This was an unusual and isolated event and has been attributed to contamination of the sample because of construction interference. Regardless of the reason for the improper result, the Water Department issued a public notice under the guidelines of the MDEQ and has to be reported in this 2011 Consumers Confidence Report (CCR).

Distribution System Monitoring Lead and Copper. Last Official Test Date 2008. And, Tests Not complete in 2011.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb) 2008	15.0	0	5	2.2 to 17	0	No	Corrosion of Household plumbing
Copper (ppb) 2008	1300	1300	76	660 to 1.9	0	No	Corrosion of Household plumbing
Lead (ppb) 2011	15.0	0	11	0 to 22	1	No	Corrosion of Household plumbing
Copper (ppb) 2011	1300	1300	70	0 to 100	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. Testing was conducted in September 2011. There were not enough homes participating in the testing and the Water Department received a violation for failing to monitor at 30 sites. Notice was sent in October, 2011 and testing is required by September 30, 2012. The results of the 2011 tests are not official but are included above.

Unregulated and Special Monitoring

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	10	Naturally present in the environment
Sulfate	N/A	N/A	33	Naturally present in the environment

Definitions

MCL Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

PPM parts per million or milligrams per liter (mg/l)

PPB parts per billion, or micrograms per liter (ug/l)

NTU Nephelometric Turbidity Units, a measure of the cloudiness of water

N/A Not applicable

RAA Running Annual Average.

TT Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Other Water Quality Parameters of Interest

At the plant we routinely perform other water quality tests. These tests are not for official reporting, but are useful when describing the quality of our drinking water.

Parameter	**2011Average**	**2011 Range**	**Units**
Chlorine	1.49	.88 to 2.48	Mg/L as free Cl-
PH	7.2	6.6to 7.7	pH units
Total Alkalinity	105	90 to 135	Mg/L as CaCO3
Total Hardness	150	130 to 197	Mg/L as CaCO3
Calcium Hardness	46	18 to 61	Mg/L as Ca
Magnesium Hardness	9	3 to 16	Mg/L as Mg
Chloride	11.5	1.4 to 19.5	Mg/L as Cl-

- For Customers owning a new dishwasher the Benton Harbor average water hardness is *8-10 grains per gallon.*

2014 Benton Harbor Water Quality Report

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 other water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township, St. Joseph, and Benton Charter Township. Lake Michigan is a surface water supply and is vulnerable to a wide range of contaminants. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State MDEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry, and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River.

General Health Information Provided by EPA

To ensure that tap water is safe to drink, EPA prescribes limits on the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

A. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance
For more information about our water quality, or to receive an additional copy of this report, please contact Director of Utility Services, Stewart A. Beach (269) 927-8471 or e-mail to sbeach@cityofbentonharbormi.gov (mailto:sbeach@cityofbentonharbormi.gov) .

Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater (http://www.epa.gov/safewater/)

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2014 and ending December 31, 2014, unless otherwise noted.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants

Arsenic	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	1.5	ND to1.5	No	2/27/14	Naturally present in the environment.
Fluoride (ppm)	4	4	0.67	0.67	No	2/27/14	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	1.73	0.9 to 3.8	No	2014	Disinfectant
TOC	TT	N/A	1.785	1.31 to 3.83	No	2014	Naturally present in the environment

Regulated Monitoring Distribution System (Stage 1 Disinfection Byproduct Rule)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected/ (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	31	25.2 to 35	NO	2014	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	64	13 to 139	YES*	2014	Formed when chlorine is added to water containing naturally occurring organic material

*See "**Public Notices Required for 2014**"

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. We have completed a 1- year study of these Chlorine by-products in the City distribution system. The results will dictate what sites we will sample from in the coming years to better assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effluent NTU	0.3* or no sample above 1.00	N/A	.21	0.03 to 0.21	No	2014	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

Distribution System Monitoring Lead and Copper. Last Official Test Date 2012

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb) 2012	15.0	0	5	0 to 38	1	No	Corrosion of Household plumbing
Copper (ppb) 2012	1300	1300	200	0 to 670	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. Testing was conducted in September 2012.

If present, elevated levels of lead cab cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at http://water.epa.gov/drink/info/lead/index.cfm (http://water.epa.gov/drink/info/lead/index.cfm)

Unregulated and Special Monitoring 2/26/2014

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	16	Naturally present in the environment
Sulfate	N/A	N/A	39	Naturally present in the environment
Chloride	N/A	N/A	34	Naturally present in the environment, storm water

Definitions

MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using th
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow
MRDL	Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that additi microbial contaminants.
MRDLG	Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to hea disinfectants to control microbial contaminants.
AL	Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.
PPM	parts per million or milligrams per liter (mg/l)
PPB	parts per billion, or micrograms per liter (ug/l)
NTU	Nephelometric Turbidity Units, a measure of the cloudiness of water
N/A	Not applicable
RAA	Running Annual Average.
TOC	Total Organic Carbon
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Public Notices Required for 2014

MONITORING VIOLATION

During the monitoring period July 1, 2014 to September 30, 2014, Benton Harbor did not collect the required number of routine samples for disinfection byproducts (TTHM and HAA5). We are required to collect these samples during the month of August. Additional samples were collected in the next monitoring period (October 1, 2014 to December 31, 2014), in the required sampling month of November, and our sampling returned to compliance. We are reviewing our monitoring schedule to ensure this does not happen again.

MCL VIOLATION

The City of Benton Harbor is required to sample for disinfection byproducts, which includes HAA5s, on a quarterly basis. The MCL for HAA5s is based on the Locational Running Annual Average (LRAA) which is the average of the past four quarter results. During May 2014, the City of Benton Harbor had a high irregular result but results since this sample have been below the MCL. Due to this irregular result, and the missed samples from the third quarter, we our running annual average for the fourth quarter 2014 was 64 ppb, which exceeds the MCL of 60 ppb. Some people who drink water containing haloacetic acids in excess of EPA's standard over many years may have an increased risk of getting cancer. The City of Benton Harbor collected additional samples, as required, on February 19, 2015, and the results have put the City of Benton Harbor back into compliance.

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Monitoring Requirements Not Met for City of Benton Harbor

We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During August 2014, we did not complete all monitoring for Total Trihalomethanes (TTHMs), and Haloacetic Acids (HAA5s); therefore, cannot be sure of the quality of our drinking water during that time.

What should I do? There is nothing you need to do at this time. This is not an emergency. You do not need to boil water or use an alternative source of water at this time.

The table below lists the contaminant we did not properly test for during August 2014, how often we are supposed to sample for this contaminant and how many samples we are supposed to take, how many samples we took, when samples should have been taken, and the date we collected follow-up samples.

Contaminant	Required sampling frequency	Number of samples taken	When all samples should have been taken	Date additional samples were (or will be) taken
TTHMs	2	0	8/1/2014 to 8/30/02014	11/1/2014 to 11/30/2014
HAA5s	2	0	8/1/2014 to 8/30/02014	11/1/2014 to 11/30/2014

What happened? What is being done? We failed to collect the necessary TTHMs and HAA5s samples for the monitoring period August 2014. Follow-up samples during the next compliance periods of November 2014 and February 2015 brought the City back into compliance. For more information, please contact: Stewart A. Beach at 269-927-8471

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you by the City of Benton Harbor.

<!--p>Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their healthcare providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

National Primary Drinking Water Regulation Compliance

For more information about our water quality, or to receive an additional copy of this report, please contact the Water Superintendent, Stewart A. Beach (269) 927-8471 or e-mail to sbeach@cityofbentonharbormi.gov (mailto:sbeach@cityofbentonharbormi.gov) .

2015 Benton Harbor Water Quality Report

This report covers the drinking water quality for Benton Harbor for the calendar year 2015. This information is a snapshot of the quality of the water that we provided to you in 2015. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. To receive a paper copy in the mail, contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.

We invite public participation in decisions that affect drinking water quality. Meetings are held on the 1st and 3rd Monday of each month in the Lula Lee Commission Chambers, 200 E. Wall Street, Benton Harbor. For more information about your water, or the contents of this report, contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.

The Benton Harbor Water Plant uses Lake Michigan as its source. There are presently 5 other water plants in Berrien County that use Lake Michigan as its source, including: New Buffalo, Bridgman, Lake Township, St. Joseph, and Benton Charter Township. Lake Michigan is a surface water supply and is vulnerable to a wide range of contaminants. Because of this the EPA and MDEQ have very strict guidelines for the proper operation and testing of the water processed in these types of plants. Our Lake Michigan water is collected through a 36" pipeline that extends 4800 feet west of the water plant's shoreline. The Benton Harbor Utility Service Department's number one priority is to provide safe, high quality water to all of its customers. In pursuit of that mission, we consistently meet, and often exceed, federal and state standards for safe water.

The State DEQ performed an assessment of our source water in 2003 to determine the susceptibility or the relative potential of contamination. The susceptibility rating is on a six-tiered scale from "very-low" to "high" based primarily on geologic sensitivity, water chemistry, and contaminant sources. The susceptibility of our source is moderately high. This is due to the fact that the source water area for the Benton Harbor intake includes 1,236 potential contaminant sources, 121 listed potential contaminant sources within the susceptible area, plus urban and agricultural runoff from the St. Joseph River watershed in the St. Joseph River. For additional information, or to obtain a copy of the source water study, please contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.

General Health Information Provided by EPA

To ensure that tap water is safe to drink, EPA prescribes limits on the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

A. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
B. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
D. Organic chemical contaminants, including synthetic and volatile organics, which are by-products of industrial processes and petroleum production, and can also, come from gas stations, urban storm-water runoff and septic systems.
E. Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations, which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

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National Primary Drinking Water Regulation Compliance
For more information about our water quality, or to receive an additional copy of this report, please contact Jay Ouzts at F&V Operations (616) 588-2900 or Darwin Watson, Benton Harbor City Manager (269) 927-8400.
Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Public Notices Required for 2015
Testing data from 2015 resulted in no public notices.

Water Quality Data Tables
Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists regulated contaminants detected in our water for the year beginning January 1, 2015 and ending December 31, 2015, unless otherwise noted.

Definitions

MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.
MRDL	Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MRDLG	Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
AL	Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.
PPM	parts per million or milligrams per liter (mg/l)
PPB	parts per billion, or micrograms per liter (ug/l)
NTU	Nephelometric Turbidity Units, a measure of the cloudiness of water
N/A	Not applicable
RAA	Running Annual Average.
TOC	Total Organic Carbon
TT	Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Regulated Monitoring at the Plant

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes, or No	Date of Sample	Likely Source of Contaminants
Fluoride (ppm)	4	4	0.15	N/A	No	2015	Water additive, which promotes strong teeth.
Chlorine Residual (ppm)	4	MRDL=4	1.38	0.64 to 2.16	No	2015	Disinfectant
TOC (ppm)	TT	N/A	2.11	0.79 to 2.11	No	2015	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	7.2	ND to 7.2	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.
Chlorodibromomethane (ppb)	80	N/A	2.9	ND to 2.9	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	11.0	ND to 11.0	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.

Total Trihalomethanes (ppb)	80	N/A	21.0	ND to 21.0	No	2015	Formed when chlorine is added to water containing naturally occurring organic material.

Regulated Monitoring Distribution System (Disinfection Byproduct)

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level (RAA)	Lowest-Highest Level Detected/	Violation Yes or No	Date of Sample	Likely Source of Contaminants
TTHM (ppb)	80	N/A	37	22.7 to 60.0	NO	2015	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	60	N/A	56	10 to 17	NO	2015	Formed when chlorine is added to water containing naturally occurring organic material

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effluent NTU	0.3* or no sample above 1.00	N/A	0.25	0.03 to 0.25	No	2015	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

Distribution System Monitoring Lead and Copper. Last Official Test Date 2015.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90th Percentile Detected	Range	Sites Found Above AL	Violation	Likely Source of Contaminants
Lead (ppb) 2015	15.0	0	12	0 to 38	2	No	Corrosion of Household plumbing
Copper (ppb) 2015	1300	1300	0	0 to 670	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. Testing was conducted in September 2015.

** Additional Information for Lead If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Andrews University is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Unregulated and Special Monitoring 2/26/2015

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	8	Naturally present in the environment
Sulfate	N/A	N/A	23	Naturally present in the environment
Chloride	N/A	N/A	12	Naturally present in the environment, storm water

A Notice to our Benton Harbor Drinking Water Community.

Please note that the following required lead language was missing from our 2016 Consumer Confidence Report:

Information about lead: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

We apologize for this omission. A copy of the full report is available on our website at www.BentonHarborCity.com Follow the links on the opening page to the Water Page and the Updated Consumers Confidence Report. If you would like a copy you can request a paper copy by contacting The Benton Harbor Water Plant (269) 927-8471-2 or the Water Payment Center at (269) 927-8400-2. We are open weekdays 8:30 am to 5:00 pm.

The limits have not changed from 15ppb for Lead and 1300ppb for Copper but the focus on Lead in drinking has increased dramatically. Benton Harbor and nearly all Cities in Michigan are working very hard to protect the City water supply and our residents.

The lead sampling shown in the table of the report indicates that Lead is at very low or non-existent levels at most homes, but any Lead is still our focus to eliminate.

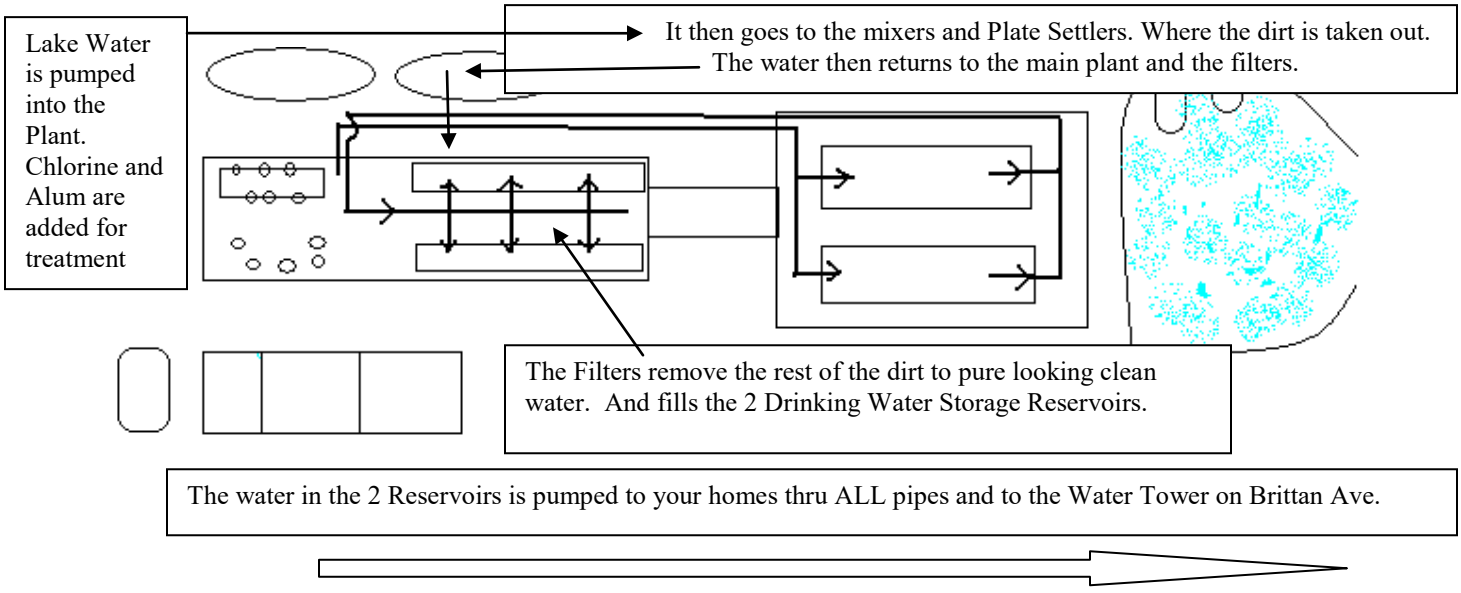
As stated above in the required MDEQ language, PLEASE, ALWAYS LET YOUR WATER RUN TILL COOL BEFORE YOU TAKE A DRINK. BE SURE TO TEACH YOUR CHILDREN AND GRANDCHILDREN TO DO THE SAME!

AND NOW OUR REVISED 2016 CCR

City of Benton Harbor Utility Services Department's 2016 Consumers Confidence Report

Contact Us: Michael O'Malley, Benton Harbor Water Plant (269) 927-8471
Darwin Watson, Benton Harbor City Manager (269) 927-
Kaye Jenkins, Utility Billing Payment Center (269) 934-7638

A diagram of the equipment and how we make Lake Michigan Safe for Drinking at the Benton Harbor Water Plant



2016 Benton Harbor Water Quality Report

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C. Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm-water runoff, and residential uses.
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National Primary Drinking Water Regulation Compliance

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Tours of the Water Plant are easily arranged for school or community groups by contacting the plant. For more information about safe drinking water, visit the U.S. Environmental Protection Agency (EPA) at www.epa.gov/safewater

Public Notices Required in 2016

There was one (1) event in the Benton Harbor Water System that required Public Notice to be made to you by MDEQ rules. The notice was a testing violation where, the water was not tested for Disinfection by Products in February of 2016 on the appropriate day, as was required.

Water Quality Detect Tables

Benton Harbor water personnel routinely monitor over 80 potential contaminants in our drinking water according to Federal and State laws. The following table lists detects of regulated contaminants found in our water for the year beginning January 1, 2016 and ending December 31, 2016, unless otherwise noted. Other contaminates are required as regulated monitoring, that the Water Plant

Test results in the next few tables are tests that our Water Plant personnel cannot do. These are sampled and sent to the MDEQ laboratory in Lansing and listed in the tables with various dates assigned. The last table in this report are tests routinely done at the water plant.

Regulated Monitoring at the Plant Done at the MDEQ Laboratory in Lansing, MI.

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected (RAA)	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Arsenic◀	10*	0*	Less than 2 ppb	NA	No	9/6/10	Erosion of natural deposits; Runoff from Orchards; Runoff from glass and electronics production waste.
Nitrate (ppm)	10	N/A	0.5	0.4 to 0.5	No	9/30/16& 11/21/16	Naturally present in the environment.
Fluoride (ppm)	4	4	0.78	0.6 to 0.78	No	9/30/16& 11/21/16	Water additive, which promotes strong teeth.
Chlorine Residual	4	MRDL=4	1.86	1.37 to 3.14	No	2016	Disinfectant
TOC**	TT	N/A	1.97	1.35 to 1.97	No	2016	Naturally present in the environment
Bromodichloromethane (ppb)	80	N/A	11	11	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.
Chlorodibromomethane (ppb)	80	N/A	4.8	4.8	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.
Chloroform (ppb)	80	N/A	18	18	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.
Total Tri-halomethanes (ppb)	80	N/A		34	No	9/30/16	Formed when chlorine is added to water containing naturally occurring organic material.

Regulated Monitoring Distribution System (Stage 2 Disinfection Byproduct Rule) Testing in 2016

Detected Substance	LRRA is locational Running Annual Average	Benton Harbor city Samples LRRA Site 1	Benton Harbor city Samples LRRA Site 2	Likely Source of Contaminants. This testing is being conducted over a 12 month period to determine the vulnerability of various points in the 2 largest distribution systems served by the Benton Harbor Water Plant. Results listed are for tests run October to December 2008 only.
TTHM (ppb)	Each site is measured in ppb	**51.5**	**48.1**	Formed when chlorine is added to water containing naturally occurring organic material
HAA5 (ppb)	19/21 Each site is measured in ppb	**14.5**	**12.0**	Formed when chlorine is added to water containing naturally occurring organic material

TTHM's are Total Trihalomethanes and HAA5's are Haleoacetic Acids. They form when Chlorine is in contact with organic matter over time. The results are averaged at each location as a running annual average (LRAA) to assure the community that the waters are properly disinfected and do not pose a threat from these by-products.

Long Term 2 (Enhanced Surface Water Treatment Rule) Testing in 2008-2009

Detected Substance	Largest Number Detected	Range of organisms detected	Likely Source of Contaminants is Lake Michigan. Lake Michigan testing is was conducted over a 24 month period that began April 2008. Testing is complete in 2009
Cryptosporidium (# of organisms)	3	0 to 3	Open Lake Michigan. Cryptosporidium are microbes found in open water sources.
E. *coli* (# of organisms)	7	1 to 82	Open Lake Michigan. E. *coli* are bacteria found in open water sources.
Giardia	3	0 to 3	Open Lake Michigan. Giardia are microbes found in open water sources.

Turbidity Monitoring at the Plant

Water Clarity	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Highest Level Detected	Range	Violation Yes or No	Date of Sample	Likely Source of Contaminants
Filter Effulent NTU	0.3* or no sample above 1.00	N/A	1.8 & 0.33	0.07 to 1.8	Yes, 1.8 NTU	2011 Violation 6/18/11	Soil runoff.

* Turbidity is a measure of the cloudiness of the water.

Distribution System Monitoring Lead and Copper. Last Official Test Date 2008. And, Tests Not complete in 2011.

Detected Substance	Highest Level Allowed (AL)	EPA Goal Level (AL)	90 th Percentile Result Detected	Range	Sites Found Above AL of 15 ppb.	Violation	Likely Source of Contaminants
Lead (ppb)	15.0	0	12	0 to 38	2	No	Corrosion of Household plumbing
Copper (ppb)	1300	1300	0	0 to 670	0	No	Corrosion of Household plumbing

Lead and copper monitoring began in the early 1990's. The 9th round of Benton Harbor testing was conducted in September 2015. The 2 sites above the EPA action level were more than 12 ppb and one at 38 ppb. All homes on the list of sites are notified of their results and the site with 38 ppb had their water line replaced with copper. The next round of testing #10 is due in 2018.

Information about lead: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Benton Harbor is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Unregulated and Special Monitoring

Detected Substance	Highest Level Allowed (MCL)	EPA Goal Level (MCLG)	Level Detected	Likely Source
Sodium	N/A	N/A	17	Naturally present in the environment
Sulfate	N/A	N/A	29	Naturally present in the environment
Fluoride	2 Secondary and 4 Primary	N/A	0.6	Water Additive to help protect teeth from Dental Caries and for Public Health

A sample was taken at the Water Plant on September 9, 2016. A laboratory in South Bend analyzed it for total Cyanide and did not detect any. Cyanide is a dangerous chemical and the EPA is determining how it may be monitored in water systems in the future.

Definitions

MCL Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG Maximum Contaminant Level Goal: The level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLG's allow for a margin of safety.

MRDL Maximum Residual Disinfectant Level or MRDL means the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG Maximum residual disinfectant level goal, or MRDLG, means the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL Action Level: The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

PPM parts per million or milligrams per liter (mg/l)

PPB parts per billion, or micrograms per liter (ug/l)

NTU Nephelometric Turbidity Units, a measure of the cloudiness of water

N/A Not applicable

RAA Running Annual Average.

LRAA Locational Running Annual Average.

TT Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Other Water Quality Parameters of Interest

At the plant we routinely perform other water quality tests. These tests are not for official reporting, but are useful when describing the quality of our drinking water.

Parameter	2016Average	2016 Range	Units
Chlorine	1.86	1.37 to 3.14	Mg/L as free Cl-
PH	7.67	7.3to 8.2	pH units
Total Alkalinity	105	93 to 133	Mg/L as CaCO3
Total Hardness	166	112 to 208	Mg/L as CaCO3
Calcium Hardness	48	30 to 67	Mg/L as Ca
Magnesium Hardness	11	2 to 18	Mg/L as Mg
Chloride	26.1	22.5 to 32.5	Mg/L as Cl-
Fluoride as F-ion	0.73	0.23 to 1.07	Mg/L as F-ion

- For Customers owning a new dishwasher the Benton Harbor average water hardness is *8-10 grains per gallon.*

APPENDIX E

SYSTEM ANALYSIS MAPS

Water Main Age

Remaining Useful Life

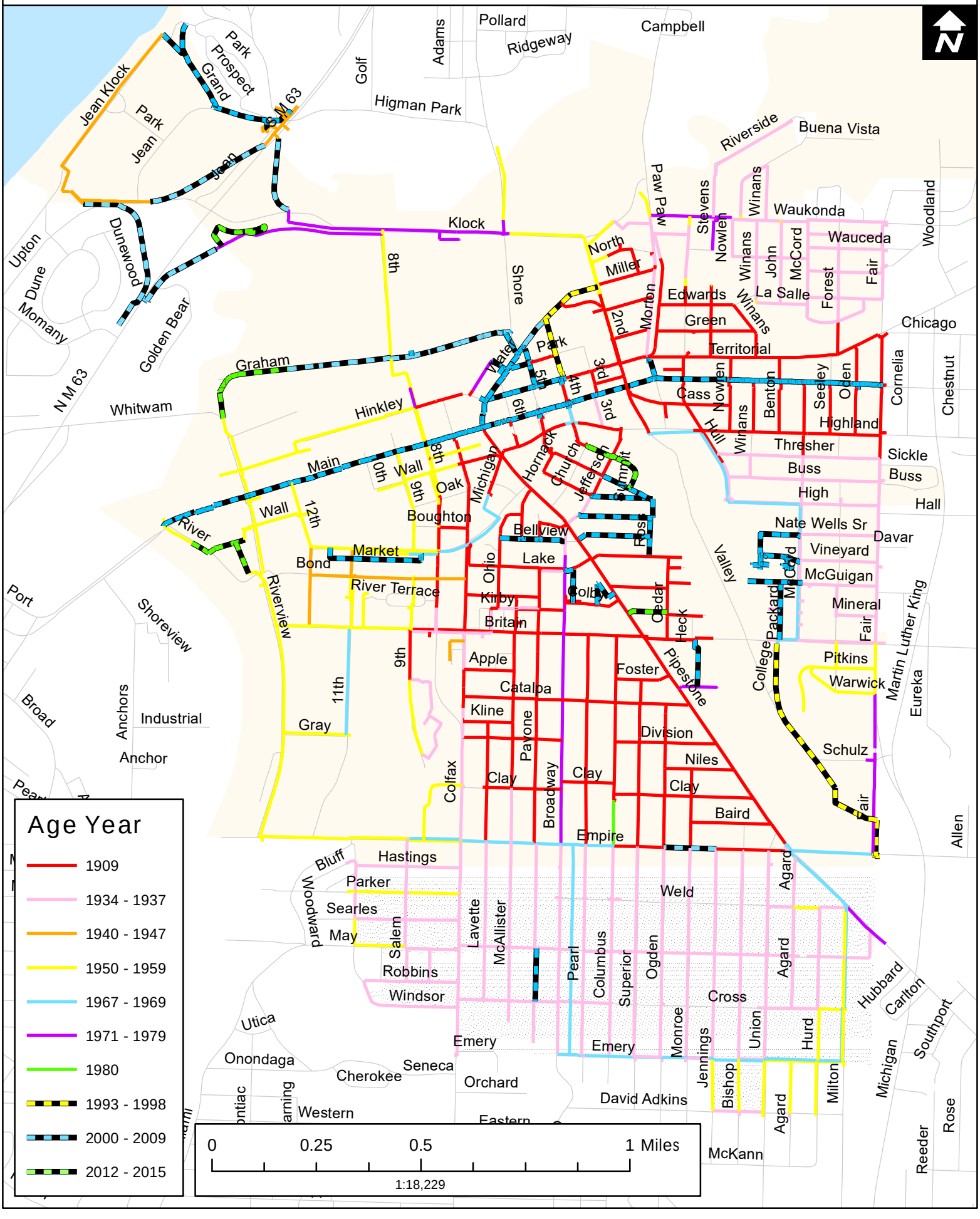
Probability of Failure

Consequence of Failure

Business Risk Evaluation Scores

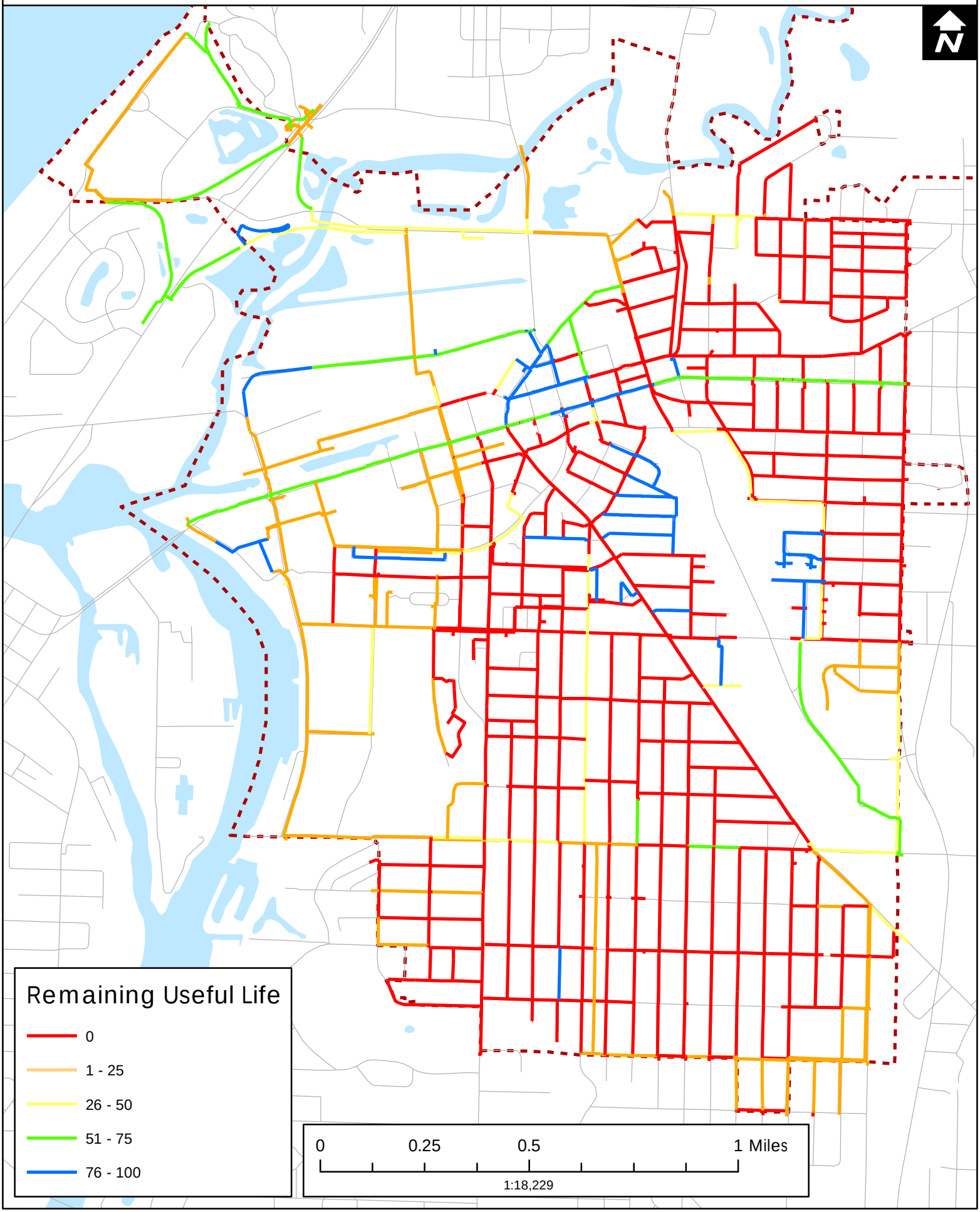
Water Mains

Benton Harbor, MI



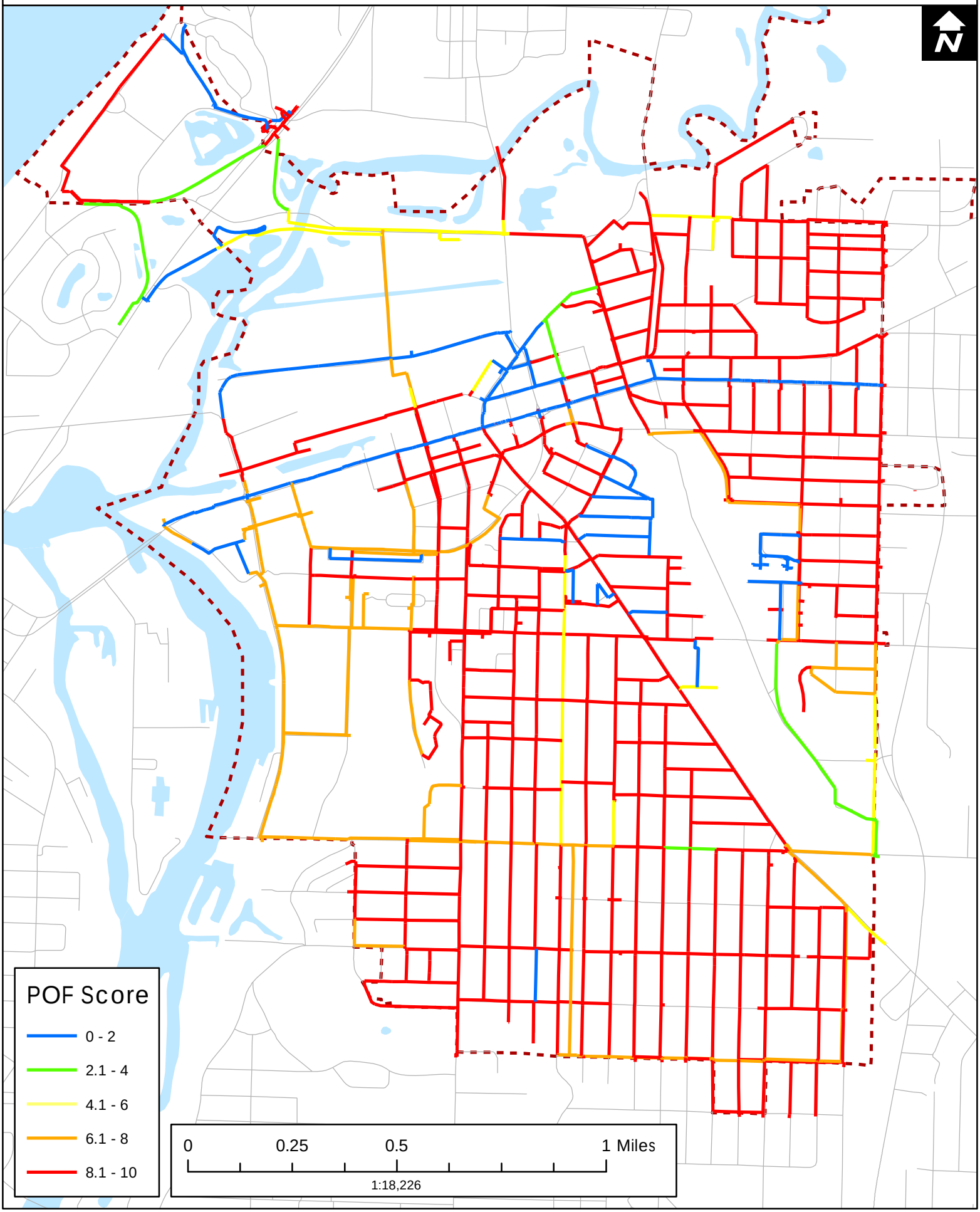
Water Mains

Benton Harbor, MI



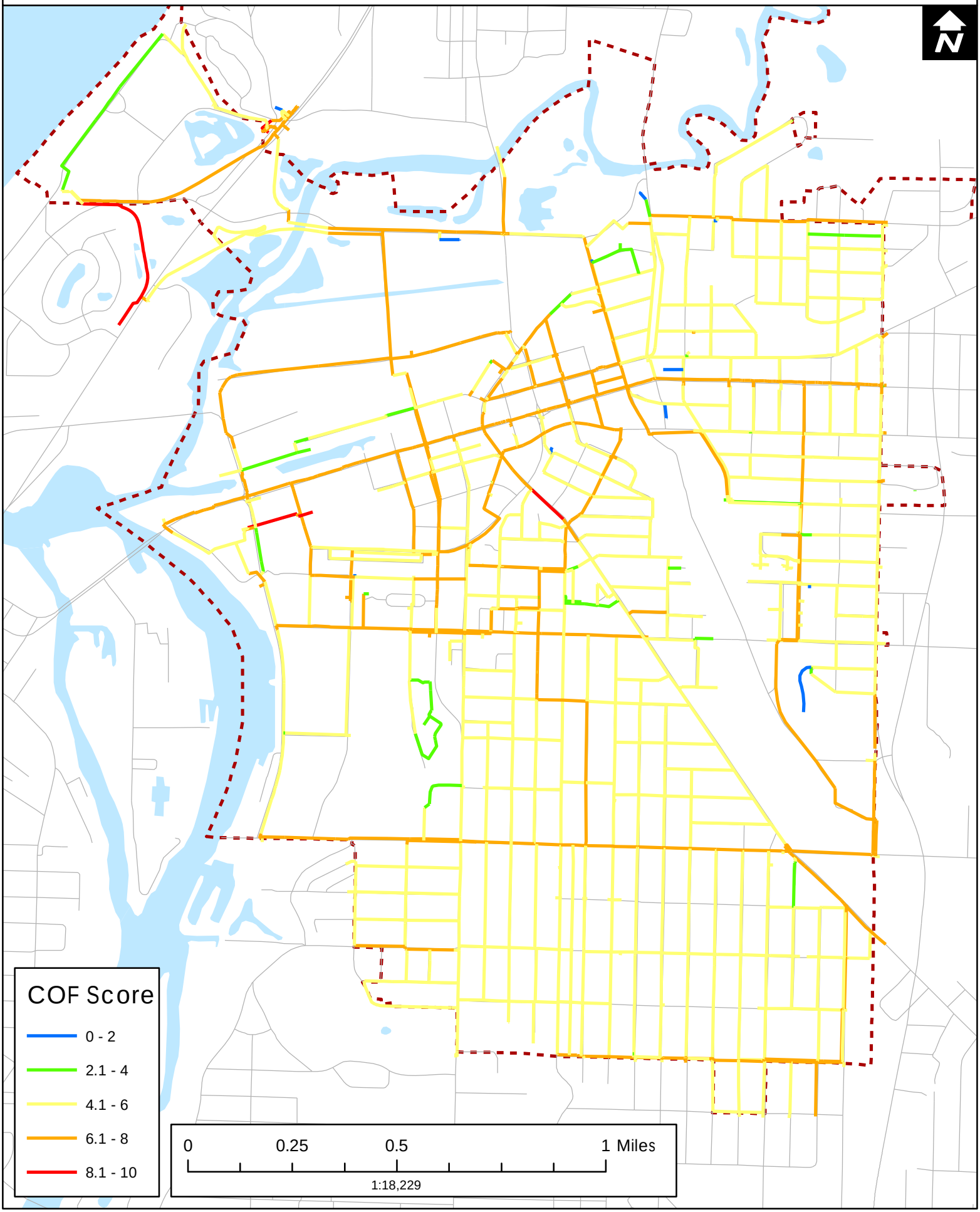
Water Mains

Benton Harbor, MI



Water Mains

Benton Harbor, MI



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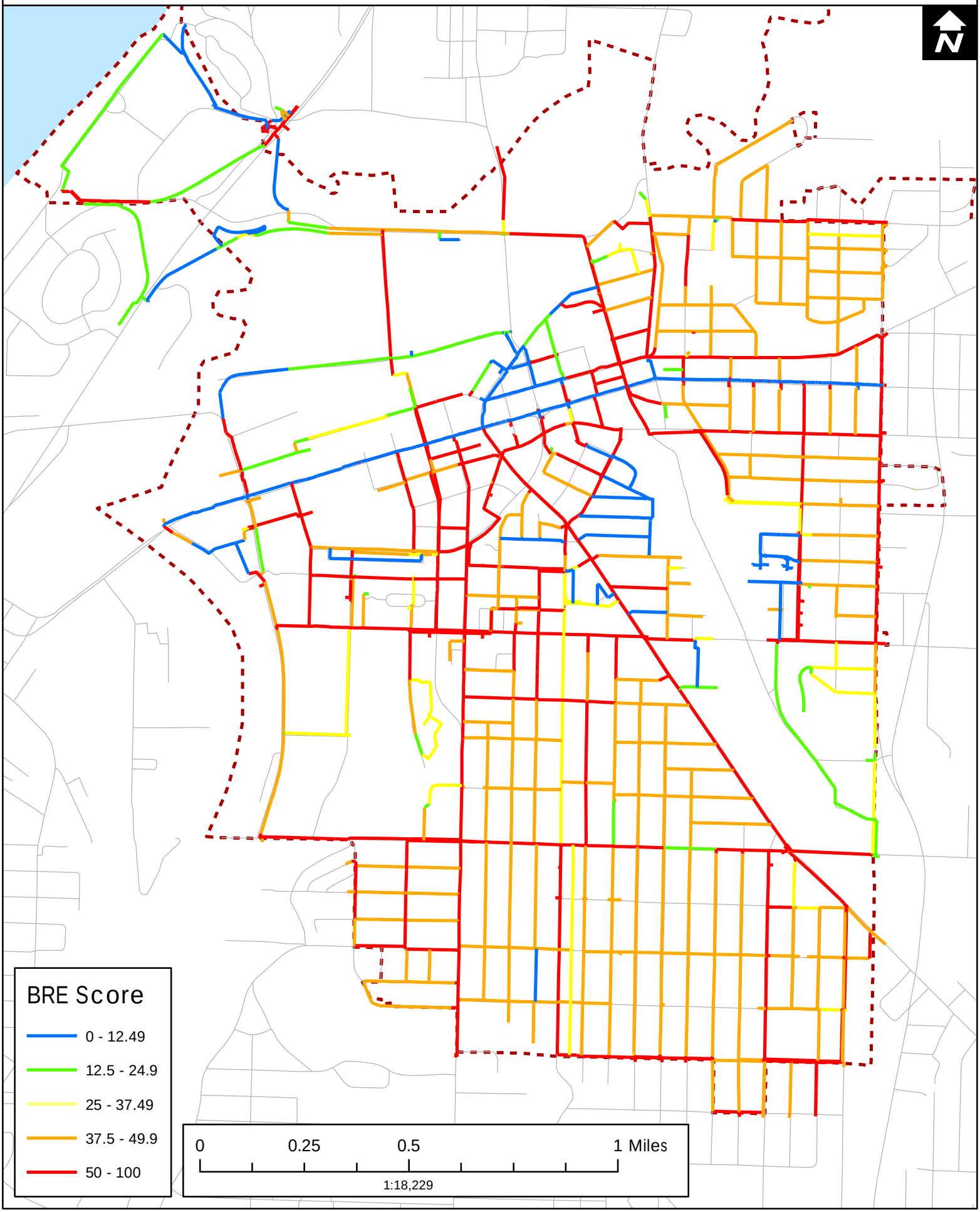
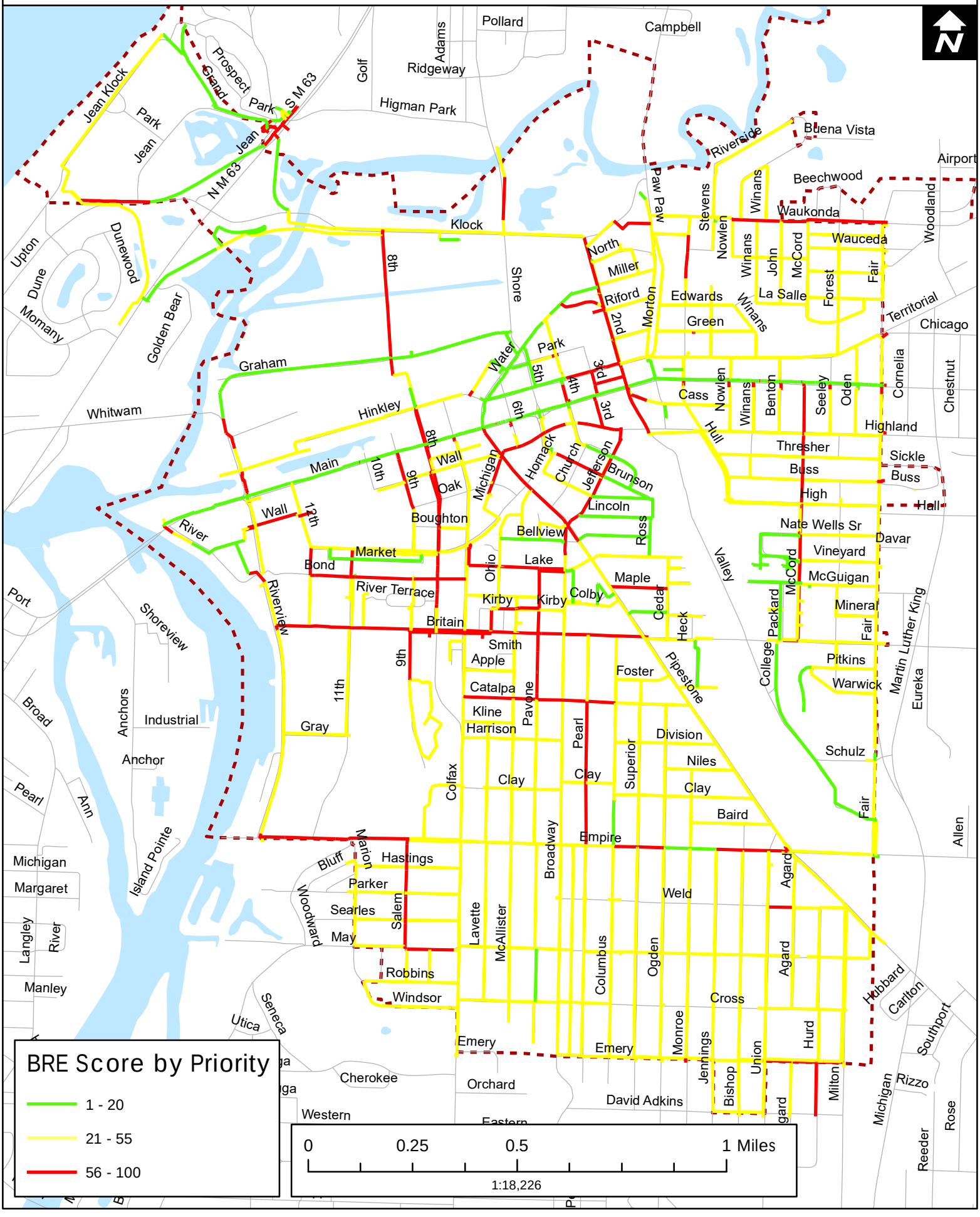
Benton Harbor, MI



Water Mains

Benton Harbor, MI



APPENDIX F

CIP PLAN ESTIMATES

5-Year CIP

20-Year CIP

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Britain Avenue (Riverview to Pipestone)
Prepared By: Aaron Townley, EIT

Britain Avenue (Riverview to Pipestone)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 203,600.00	$ 203,600.00
2	Traffic Control	LSum	1	$ 97,000.00	$ 97,000.00
3	Machine Grading	Sta	59.1	$ 1,200.00	$ 70,920.00
4	Pavt, Rem, Modified	Syd	7224	$ 9.00	$ 65,016.00
5	Aggregate Base, 8 inch	Syd	7224	$ 9.00	$ 65,016.00
6	Subbase, CIP (12 Inches)	Cyd	2408	$ 13.50	$ 32,508.00
7	HMA Surface	Ton	2086	$ 80.00	$ 166,880.00
8	Fire Hydrant Assembly	Ea	15	$ 4,000.00	$ 60,000.00
9	Gate Valve & Box, 16 Inch	Ea	17	$ 6,500.00	$ 110,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	5910	$ 200.00	$ 1,182,000.00
11	Water Service	Ea	79	$ 1,750.00	$ 138,250.00
12	Curb Stop and Box	Ea	79	$ 500.00	$ 39,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	1580	$ 5.00	$ 7,900.00
Britain Avenue (Riverview to Pipestone) Estimate					$ 2,239,090.00
Contingency				**15%**	$ 335,900.00
Engineering & Construction Administration				**20%**	$ 447,900.00
Total Estimated Water Main Construction Costs					$ 3,022,890.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 8th Street (Hinkley to Britain)
Prepared By: Aaron Townley, EIT

8th Street (Hinkley to Britain)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 119,300.00	$ 119,300.00
2	Traffic Control	LSum	1	$ 56,800.00	$ 56,800.00
3	Machine Grading	Sta	46.73	$ 1,200.00	$ 56,076.00
4	Pavt, Rem, Modified	Syd	5712	$ 9.00	$ 51,408.00
5	Aggregate Base, 8 inch	Syd	5712	$ 9.00	$ 51,408.00
6	Subbase, CIP (12 Inches)	Cyd	1904	$ 13.50	$ 25,704.00
7	HMA Surface	Ton	1650	$ 80.00	$ 132,000.00
8	Fire Hydrant Assembly	Ea	12	$ 4,000.00	$ 48,000.00
9	Gate Valve & Box, 12 Inch	Ea	14	$ 2,750.00	$ 38,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	4673	$ 125.00	$ 584,125.00
11	Water Service	Ea	63	$ 1,750.00	$ 110,250.00
12	Curb Stop and Box	Ea	63	$ 500.00	$ 31,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	1260	$ 5.00	$ 6,300.00
8th Street (Hinkley to Britain) Estimate					$ 1,311,371.00
Contingency				**15%**	$ 196,800.00
Engineering & Construction Administration				**20%**	$ 262,300.00
Total Estimated Water Main Construction Costs					$ 1,770,471.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Pipestone Rd (Main Street to Washington Street)
Prepared By: Aaron Townley, EIT

Pipestone Rd (Main Street to Washington Street)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 48,500.00	$ 48,500.00
2	Traffic Control	LSum	1	$ 23,100.00	$ 23,100.00
3	Machine Grading	Sta	18.86	$ 1,200.00	$ 22,632.00
4	Pavt, Rem, Modified	Syd	2306	$ 9.00	$ 20,754.00
5	Aggregate Base, 8 inch	Syd	2306	$ 9.00	$ 20,754.00
6	Subbase, CIP (12 Inches)	Cyd	769	$ 13.50	$ 10,381.50
7	HMA Surface	Ton	666	$ 80.00	$ 53,280.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1886	$ 125.00	$ 235,750.00
11	Water Service	Ea	26	$ 1,750.00	$ 45,500.00
12	Curb Stop and Box	Ea	26	$ 500.00	$ 13,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	520	$ 5.00	$ 2,600.00
Pipestone Rd (Main Street to Washington Street) Estimate					$ 532,751.50
Contingency				**15%**	$ 80,000.00
Engineering & Construction Administration				**20%**	$ 106,600.00
Total Estimated Water Main Construction Costs					$ 719,351.50

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Project Name:Benton Harbor Water Asset Management Plan
Project Location: Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson)
Prepared By: Aaron Townley, EIT

Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 50,800.00	$ 50,800.00
2	Traffic Control	LSum	1	$ 24,200.00	$ 24,200.00
3	Machine Grading	Sta	19.89	$ 1,200.00	$ 23,868.00
4	Pavt, Rem, Modified	Syd	2431	$ 9.00	$ 21,879.00
5	Aggregate Base, 8 inch	Syd	2431	$ 9.00	$ 21,879.00
6	Subbase, CIP (12 Inches)	Cyd	811	$ 13.50	$ 10,948.50
7	HMA Surface	Ton	702	$ 80.00	$ 56,160.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1989	$ 125.00	$ 248,625.00
11	Water Service	Ea	27	$ 1,750.00	$ 47,250.00
12	Curb Stop and Box	Ea	27	$ 500.00	$ 13,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	540	$ 5.00	$ 2,700.00
Michigan St. / E. Wall St / Highland Ave (Pipestone St to Jefferson) Estimate					$ 558,309.50
Contingency				**15%**	$ 83,800.00
Engineering & Construction Administration				**20%**	$ 111,700.00
Total Estimated Water Main Construction Costs					$ 753,809.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Whitwam-Riverview Dr (Main Street to Whitwam Dr)
Prepared By: Aaron Townley, EIT

Whitwam-Riverview Dr (Main Street to Whitwam Dr)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 19,700.00	$ 19,700.00
2	Traffic Control	LSum	1	$ 9,400.00	$ 9,400.00
3	Machine Grading	Sta	7.54	$ 1,200.00	$ 9,048.00
4	Pavt, Rem, Modified	Syd	922	$ 9.00	$ 8,298.00
5	Aggregate Base, 8 inch	Syd	922	$ 9.00	$ 8,298.00
6	Subbase, CIP (12 Inches)	Cyd	308	$ 13.50	$ 4,158.00
7	HMA Surface	Ton	267	$ 80.00	$ 21,360.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	754	$ 125.00	$ 94,250.00
11	Water Service	Ea	11	$ 1,750.00	$ 19,250.00
12	Curb Stop and Box	Ea	11	$ 500.00	$ 5,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	220	$ 5.00	$ 1,100.00
Whitwam-Riverview Dr (Main Street to Whitwam Dr) Estimate					$ 216,612.00
Contingency				**15%**	$ 32,500.00
Engineering & Construction Administration				**20%**	$ 43,400.00
Total Estimated Water Main Construction Costs					$ 292,512.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Empire Ave (Riverview Dr to Salem Ave)
Prepared By: Aaron Townley, EIT

Empire Ave (Riverview Dr to Salem Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 49,600.00	$ 49,600.00
2	Traffic Control	LSum	1	$ 23,600.00	$ 23,600.00
3	Machine Grading	Sta	19.42	$ 1,200.00	$ 23,304.00
4	Pavt, Rem, Modified	Syd	2374	$ 9.00	$ 21,366.00
5	Aggregate Base, 8 inch	Syd	2374	$ 9.00	$ 21,366.00
6	Subbase, CIP (12 Inches)	Cyd	792	$ 13.50	$ 10,692.00
7	HMA Surface	Ton	686	$ 80.00	$ 54,880.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1942	$ 125.00	$ 242,750.00
11	Water Service	Ea	26	$ 1,750.00	$ 45,500.00
12	Curb Stop and Box	Ea	26	$ 500.00	$ 13,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	520	$ 5.00	$ 2,600.00
Empire Ave (Riverview Dr to Salem Ave) Estimate					$ 545,158.00
Contingency				**15%**	$ 81,800.00
Engineering & Construction Administration				**20%**	$ 109,100.00
Total Estimated Water Main Construction Costs					$ 736,058.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Empire Ave (Columbus Ave to Ogden Ave)
Prepared By: Aaron Townley, EIT

Empire Ave (Columbus Ave to Ogden Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 12,900.00	$ 12,900.00
2	Traffic Control	LSum	1	$ 6,200.00	$ 6,200.00
3	Machine Grading	Sta	6.28	$ 1,200.00	$ 7,536.00
4	Pavt, Rem, Modified	Syd	768	$ 9.00	$ 6,912.00
5	Aggregate Base, 8 inch	Syd	768	$ 9.00	$ 6,912.00
6	Subbase, CIP (12 Inches)	Cyd	256	$ 13.50	$ 3,456.00
7	HMA Surface	Ton	222	$ 80.00	$ 17,760.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	628	$ 75.00	$ 47,100.00
11	Water Service	Ea	9	$ 1,750.00	$ 15,750.00
12	Curb Stop and Box	Ea	9	$ 500.00	$ 4,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	180	$ 5.00	$ 900.00
Empire Ave (Columbus Ave to Ogden Ave) Estimate					$ 141,426.00
Contingency				**15%**	$ 21,300.00
Engineering & Construction Administration				**20%**	$ 28,300.00
Total Estimated Water Main Construction Costs					$ 191,026.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Empire Ave (Jennings Ave to Pipestone St)
Prepared By: Aaron Townley, EIT

Empire Ave (Jennings Ave to Pipestone St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 20,500.00	$ 20,500.00
2	Traffic Control	LSum	1	$ 9,800.00	$ 9,800.00
3	Machine Grading	Sta	10.09	$ 1,200.00	$ 12,108.00
4	Pavt, Rem, Modified	Syd	1234	$ 9.00	$ 11,106.00
5	Aggregate Base, 8 inch	Syd	1234	$ 9.00	$ 11,106.00
6	Subbase, CIP (12 Inches)	Cyd	412	$ 13.50	$ 5,562.00
7	HMA Surface	Ton	357	$ 80.00	$ 28,560.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 8 Inch	Ea	3	$ 1,750.00	$ 5,250.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	1009	$ 75.00	$ 75,675.00
11	Water Service	Ea	14	$ 1,750.00	$ 24,500.00
12	Curb Stop and Box	Ea	14	$ 500.00	$ 7,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	280	$ 5.00	$ 1,400.00
Empire Ave (Jennings Ave to Pipestone St) Estimate					$ 224,567.00
Contingency				**15%**	$ 33,700.00
Engineering & Construction Administration				**20%**	$ 45,000.00
Total Estimated Water Main Construction Costs					$ 303,267.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Salem Ave (Empire Ave to May St to Colfax Ave)
Prepared By: Aaron Townley, EIT

Salem Ave (Empire Ave to May St to Colfax Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 40,500.00	$ 40,500.00
2	Traffic Control	LSum	1	$ 19,300.00	$ 19,300.00
3	Machine Grading	Sta	20.13	$ 1,200.00	$ 24,156.00
4	Pavt, Rem, Modified	Syd	2461	$ 9.00	$ 22,149.00
5	Aggregate Base, 8 inch	Syd	2461	$ 9.00	$ 22,149.00
6	Subbase, CIP (12 Inches)	Cyd	821	$ 13.50	$ 11,083.50
7	HMA Surface	Ton	711	$ 80.00	$ 56,880.00
8	Fire Hydrant Assembly	Ea	6	$ 4,000.00	$ 24,000.00
9	Gate Valve & Box, 8 Inch	Ea	6	$ 1,750.00	$ 10,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	2013	$ 75.00	$ 150,975.00
11	Water Service	Ea	27	$ 1,750.00	$ 47,250.00
12	Curb Stop and Box	Ea	27	$ 500.00	$ 13,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	540	$ 5.00	$ 2,700.00
Salem Ave (Empire Ave to May St to Colfax Ave) Estimate					$ 445,142.50
Contingency				**15%**	$ 66,800.00
Engineering & Construction Administration				**20%**	$ 89,100.00
Total Estimated Water Main Construction Costs					$ 601,042.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Emery Ave (Union St to Milton and Hurd Ave south)
Prepared By: Aaron Townley, EIT

Emery Ave (Union St to Milton and Hurd Ave south)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 35,000.00	$ 35,000.00
2	Traffic Control	LSum	1	$ 16,700.00	$ 16,700.00
3	Machine Grading	Sta	17.36	$ 1,200.00	$ 20,832.00
4	Pavt, Rem, Modified	Syd	2122	$ 9.00	$ 19,098.00
5	Aggregate Base, 8 inch	Syd	2122	$ 9.00	$ 19,098.00
6	Subbase, CIP (12 Inches)	Cyd	708	$ 13.50	$ 9,558.00
7	HMA Surface	Ton	613	$ 80.00	$ 49,040.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 8 Inch	Ea	5	$ 1,750.00	$ 8,750.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	1736	$ 75.00	$ 130,200.00
11	Water Service	Ea	24	$ 1,750.00	$ 42,000.00
12	Curb Stop and Box	Ea	24	$ 500.00	$ 12,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	480	$ 5.00	$ 2,400.00
Emery Ave (Union St to Milton and Hurd Ave south) Estimate					$ 384,676.00
Contingency				**15%**	$ 57,800.00
Engineering & Construction Administration				**20%**	$ 77,000.00
Total Estimated Water Main Construction Costs					$ 519,476.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Pearl St (Catalpa Ave to Empire Ave)
Prepared By: Aaron Townley, EIT

Pearl St (Catalpa Ave to Empire Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 43,300.00	$ 43,300.00
2	Traffic Control	LSum	1	$ 20,600.00	$ 20,600.00
3	Machine Grading	Sta	18.21	$ 1,200.00	$ 21,852.00
4	Pavt, Rem, Modified	Syd	2226	$ 9.00	$ 20,034.00
5	Aggregate Base, 8 inch	Syd	2226	$ 9.00	$ 20,034.00
6	Subbase, CIP (12 Inches)	Cyd	742	$ 13.50	$ 10,017.00
7	HMA Surface	Ton	386	$ 80.00	$ 30,880.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1821	$ 125.00	$ 227,625.00
11	Water Service	Ea	19	$ 1,750.00	$ 33,250.00
12	Curb Stop and Box	Ea	19	$ 500.00	$ 9,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	380	$ 5.00	$ 1,900.00
Pearl St (Catalpa Ave to Empire Ave) Estimate					$ 475,492.00
Contingency				**15%**	$ 71,400.00
Engineering & Construction Administration				**20%**	$ 95,100.00
Total Estimated Water Main Construction Costs					$ 641,992.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Catalpa Ave (Colfax Ave to Columbus Ave)
Prepared By: Aaron Townley, EIT

Catalpa Ave (Colfax Ave to Columbus Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 45,400.00	$ 45,400.00
2	Traffic Control	LSum	1	$ 21,700.00	$ 21,700.00
3	Machine Grading	Sta	19.22	$ 1,200.00	$ 23,064.00
4	Pavt, Rem, Modified	Syd	2350	$ 9.00	$ 21,150.00
5	Aggregate Base, 8 inch	Syd	2350	$ 9.00	$ 21,150.00
6	Subbase, CIP (12 Inches)	Cyd	784	$ 13.50	$ 10,584.00
7	HMA Surface	Ton	407	$ 80.00	$ 32,560.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1922	$ 125.00	$ 240,250.00
11	Water Service	Ea	20	$ 1,750.00	$ 35,000.00
12	Curb Stop and Box	Ea	20	$ 500.00	$ 10,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	400	$ 5.00	$ 2,000.00
Catalpa Ave (Colfax Ave to Columbus Ave) Estimate					$ 499,358.00
Contingency				**15%**	$ 75,000.00
Engineering & Construction Administration				**20%**	$ 99,900.00
Total Estimated Water Main Construction Costs					$ 674,258.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Pavone St (Lake Ave to Catalpa Ave)
Prepared By: Aaron Townley, EIT

Pavone St (Lake Ave to Catalpa Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 39,300.00	$ 39,300.00
2	Traffic Control	LSum	1	$ 18,700.00	$ 18,700.00
3	Machine Grading	Sta	16.52	$ 1,200.00	$ 19,824.00
4	Pavt, Rem, Modified	Syd	2020	$ 9.00	$ 18,180.00
5	Aggregate Base, 8 inch	Syd	2020	$ 9.00	$ 18,180.00
6	Subbase, CIP (12 Inches)	Cyd	674	$ 13.50	$ 9,099.00
7	HMA Surface	Ton	350	$ 80.00	$ 28,000.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	5	$ 2,750.00	$ 13,750.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1652	$ 125.00	$ 206,500.00
11	Water Service	Ea	17	$ 1,750.00	$ 29,750.00
12	Curb Stop and Box	Ea	17	$ 500.00	$ 8,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	340	$ 5.00	$ 1,700.00
Pavone St (Lake Ave to Catalpa Ave) Estimate					$ 431,483.00
Contingency				**15%**	$ 64,800.00
Engineering & Construction Administration				**20%**	$ 86,300.00
Total Estimated Water Main Construction Costs					$ 582,583.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Ohio St Alleys (Britain Ave to Pavone St)
Prepared By: Aaron Townley, EIT

Ohio St Alleys (Britain Ave to Pavone St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 21,100.00	$ 21,100.00
2	Traffic Control	LSum	1	$ 10,100.00	$ 10,100.00
3	Machine Grading	Sta	8.78	$ 1,200.00	$ 10,536.00
4	Pavt, Rem, Modified	Syd	1074	$ 9.00	$ 9,666.00
5	Aggregate Base, 8 inch	Syd	1074	$ 9.00	$ 9,666.00
6	Subbase, CIP (12 Inches)	Cyd	358	$ 13.50	$ 4,833.00
7	HMA Surface	Ton	186	$ 80.00	$ 14,880.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	878	$ 125.00	$ 109,750.00
11	Water Service	Ea	9	$ 1,750.00	$ 15,750.00
12	Curb Stop and Box	Ea	9	$ 500.00	$ 4,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	180	$ 5.00	$ 900.00
Ohio St Alleys (Britain Ave to Pavone St) Estimate					$ 231,931.00
Contingency				**15%**	$ 34,800.00
Engineering & Construction Administration				**20%**	$ 46,400.00
Total Estimated Water Main Construction Costs					$ 313,131.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Lake Ave (Market St to Broadway Ave)
Prepared By: Aaron Townley, EIT

Lake Ave (Market St to Broadway Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 47,500.00	$ 47,500.00
2	Traffic Control	LSum	1	$ 22,700.00	$ 22,700.00
3	Machine Grading	Sta	18.51	$ 1,200.00	$ 22,212.00
4	Pavt, Rem, Modified	Syd	2263	$ 9.00	$ 20,367.00
5	Aggregate Base, 8 inch	Syd	2263	$ 9.00	$ 20,367.00
6	Subbase, CIP (12 Inches)	Cyd	755	$ 13.50	$ 10,192.50
7	HMA Surface	Ton	654	$ 80.00	$ 52,320.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1851	$ 125.00	$ 231,375.00
11	Water Service	Ea	25	$ 1,750.00	$ 43,750.00
12	Curb Stop and Box	Ea	25	$ 500.00	$ 12,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	500	$ 5.00	$ 2,500.00
Lake Ave (Market St to Broadway Ave) Estimate					$ 522,283.50
Contingency				**15%**	$ 78,400.00
Engineering & Construction Administration				**20%**	$ 104,500.00
Total Estimated Water Main Construction Costs					$ 705,183.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Broadway Ave / Jefferson St (Lake Ave to Highland Ave)
Prepared By: Aaron Townley, EIT

Broadway Ave / Jefferson St (Lake Ave to Highland Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 48,600.00	$ 48,600.00
2	Traffic Control	LSum	1	$ 23,100.00	$ 23,100.00
3	Machine Grading	Sta	18.9	$ 1,200.00	$ 22,680.00
4	Pavt, Rem, Modified	Syd	2310	$ 9.00	$ 20,790.00
5	Aggregate Base, 8 inch	Syd	2310	$ 9.00	$ 20,790.00
6	Subbase, CIP (12 Inches)	Cyd	770	$ 13.50	$ 10,395.00
7	HMA Surface	Ton	668	$ 80.00	$ 53,440.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1890	$ 125.00	$ 236,250.00
11	Water Service	Ea	26	$ 1,750.00	$ 45,500.00
12	Curb Stop and Box	Ea	26	$ 500.00	$ 13,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	520	$ 5.00	$ 2,600.00
Broadway Ave / Jefferson St (Lake Ave to Highland Ave) Estimate					$ 533,645.00
Contingency				**15%**	$ 80,100.00
Engineering & Construction Administration				**20%**	$ 106,800.00
Total Estimated Water Main Construction Costs					$ 720,545.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: McCord St (Main St to Britain Ave)
Prepared By: Aaron Townley, EIT

McCord St (Main St to Britain Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 89,000.00	$ 89,000.00
2	Traffic Control	LSum	1	$ 42,400.00	$ 42,400.00
3	Machine Grading	Sta	34.91	$ 1,200.00	$ 41,892.00
4	Pavt, Rem, Modified	Syd	4267	$ 9.00	$ 38,403.00
5	Aggregate Base, 8 inch	Syd	4267	$ 9.00	$ 38,403.00
6	Subbase, CIP (12 Inches)	Cyd	1423	$ 13.50	$ 19,210.50
7	HMA Surface	Ton	1233	$ 80.00	$ 98,640.00
8	Fire Hydrant Assembly	Ea	9	$ 4,000.00	$ 36,000.00
9	Gate Valve & Box, 12 Inch	Ea	10	$ 2,750.00	$ 27,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	3491	$ 125.00	$ 436,375.00
11	Water Service	Ea	47	$ 1,750.00	$ 82,250.00
12	Curb Stop and Box	Ea	47	$ 500.00	$ 23,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	940	$ 5.00	$ 4,700.00
McCord St (Main St to Britain Ave) Estimate					$ 978,273.50
Contingency				**15%**	$ 146,800.00
Engineering & Construction Administration				**20%**	$ 195,700.00
Total Estimated Water Main Construction Costs					$ 1,320,773.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 2nd St, Klock Rd to Highland Ave
Prepared By: Aaron Townley, EIT

2nd St, Klock Rd to Highland Ave					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 107,500.00	$ 107,500.00
2	Traffic Control	LSum	1	$ 51,200.00	$ 51,200.00
3	Machine Grading	Sta	31.16	$ 1,200.00	$ 37,392.00
4	Pavt, Rem, Modified	Syd	3809	$ 9.00	$ 34,281.00
5	Aggregate Base, 8 inch	Syd	3809	$ 9.00	$ 34,281.00
6	Subbase, CIP (12 Inches)	Cyd	1270	$ 13.50	$ 17,145.00
7	HMA Surface	Ton	1100	$ 80.00	$ 88,000.00
8	Fire Hydrant Assembly	Ea	8	$ 4,000.00	$ 32,000.00
9	Gate Valve & Box, 16 Inch	Ea	9	$ 6,500.00	$ 58,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	3116	$ 200.00	$ 623,200.00
11	Water Service	Ea	42	$ 1,750.00	$ 73,500.00
12	Curb Stop and Box	Ea	42	$ 500.00	$ 21,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	840	$ 5.00	$ 4,200.00
2nd St, Klock Rd to Highland Ave Estimate					$ 1,182,199.00
Contingency				**15%**	$ 177,400.00
Engineering & Construction Administration				**20%**	$ 236,500.00
Total Estimated Water Main Construction Costs					$ 1,596,099.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Waukonda Ave (Nowlen St to Fair Ave)
Prepared By: Aaron Townley, EIT

Waukonda Ave (Nowlen St to Fair Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 48,000.00	$ 48,000.00
2	Traffic Control	LSum	1	$ 22,900.00	$ 22,900.00
3	Machine Grading	Sta	20.23	$ 1,200.00	$ 24,276.00
4	Pavt, Rem, Modified	Syd	2473	$ 9.00	$ 22,257.00
5	Aggregate Base, 8 inch	Syd	2473	$ 9.00	$ 22,257.00
6	Subbase, CIP (12 Inches)	Cyd	825	$ 13.50	$ 11,137.50
7	HMA Surface	Ton	429	$ 80.00	$ 34,320.00
8	Fire Hydrant Assembly	Ea	6	$ 4,000.00	$ 24,000.00
9	Gate Valve & Box, 12 Inch	Ea	6	$ 2,750.00	$ 16,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	2023	$ 125.00	$ 252,875.00
11	Water Service	Ea	21	$ 1,750.00	$ 36,750.00
12	Curb Stop and Box	Ea	21	$ 500.00	$ 10,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	420	$ 5.00	$ 2,100.00
Waukonda Ave (Nowlen St to Fair Ave) Estimate					$ 527,872.50
Contingency				**15%**	$ 79,200.00
Engineering & Construction Administration				**20%**	$ 105,600.00
Total Estimated Water Main Construction Costs					$ 712,672.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Bond St (Market St to Colfax Ave)
Prepared By: Aaron Townley, EIT

Bond St (Market St to Colfax Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 53,500.00	$ 53,500.00
2	Traffic Control	LSum	1	$ 25,500.00	$ 25,500.00
3	Machine Grading	Sta	26.77	$ 1,200.00	$ 32,124.00
4	Pavt, Rem, Modified	Syd	3272	$ 9.00	$ 29,448.00
5	Aggregate Base, 8 inch	Syd	3272	$ 9.00	$ 29,448.00
6	Subbase, CIP (12 Inches)	Cyd	1091	$ 13.50	$ 14,728.50
7	HMA Surface	Ton	945	$ 80.00	$ 75,600.00
8	Fire Hydrant Assembly	Ea	7	$ 4,000.00	$ 28,000.00
9	Gate Valve & Box, 8 Inch	Ea	8	$ 1,750.00	$ 14,000.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	2677	$ 75.00	$ 200,775.00
11	Water Service	Ea	36	$ 1,750.00	$ 63,000.00
12	Curb Stop and Box	Ea	36	$ 500.00	$ 18,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	720	$ 5.00	$ 3,600.00
Bond St (Market St to Colfax Ave) Estimate					$ 587,723.50
Contingency				**15%**	$ 88,200.00
Engineering & Construction Administration				**20%**	$ 117,600.00
Total Estimated Water Main Construction Costs					$ 793,523.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 9th St (Main St to Oak St)
Prepared By: Aaron Townley, EIT

9th St (Main St to Oak St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 19,800.00	$ 19,800.00
2	Traffic Control	LSum	1	$ 9,500.00	$ 9,500.00
3	Machine Grading	Sta	7.57	$ 1,200.00	$ 9,084.00
4	Pavt, Rem, Modified	Syd	926	$ 9.00	$ 8,334.00
5	Aggregate Base, 8 inch	Syd	926	$ 9.00	$ 8,334.00
6	Subbase, CIP (12 Inches)	Cyd	309	$ 13.50	$ 4,171.50
7	HMA Surface	Ton	268	$ 80.00	$ 21,440.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	757	$ 125.00	$ 94,625.00
11	Water Service	Ea	11	$ 1,750.00	$ 19,250.00
12	Curb Stop and Box	Ea	11	$ 500.00	$ 5,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	220	$ 5.00	$ 1,100.00
9th St (Main St to Oak St) Estimate					$ 217,388.50
Contingency				**15%**	$ 32,700.00
Engineering & Construction Administration				**20%**	$ 43,500.00
Total Estimated Water Main Construction Costs					$ 293,588.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Territorial Rd (4th St to 2nd St)
Prepared By: Aaron Townley, EIT

Territorial Rd (4th St to 2nd St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 19,300.00	$ 19,300.00
2	Traffic Control	LSum	1	$ 9,200.00	$ 9,200.00
3	Machine Grading	Sta	7.43	$ 1,200.00	$ 8,916.00
4	Pavt, Rem, Modified	Syd	909	$ 9.00	$ 8,181.00
5	Aggregate Base, 8 inch	Syd	909	$ 9.00	$ 8,181.00
6	Subbase, CIP (12 Inches)	Cyd	303	$ 13.50	$ 4,090.50
7	HMA Surface	Ton	263	$ 80.00	$ 21,040.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	3	$ 2,750.00	$ 8,250.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	743	$ 125.00	$ 92,875.00
11	Water Service	Ea	10	$ 1,750.00	$ 17,500.00
12	Curb Stop and Box	Ea	10	$ 500.00	$ 5,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	200	$ 5.00	$ 1,000.00
Territorial Rd (4th St to 2nd St) Estimate					$ 211,533.50
Contingency				**15%**	$ 31,800.00
Engineering & Construction Administration				**20%**	$ 42,400.00
Total Estimated Water Main Construction Costs					$ 285,733.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 3rd St / East Alley (Territorial to Highland Ave)
Prepared By: Aaron Townley, EIT

3rd St / East Alley (Territorial to Highland Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 28,200.00	$ 28,200.00
2	Traffic Control	LSum	1	$ 13,400.00	$ 13,400.00
3	Machine Grading	Sta	10.88	$ 1,200.00	$ 13,056.00
4	Pavt, Rem, Modified	Syd	1330	$ 9.00	$ 11,970.00
5	Aggregate Base, 8 inch	Syd	1330	$ 9.00	$ 11,970.00
6	Subbase, CIP (12 Inches)	Cyd	444	$ 13.50	$ 5,994.00
7	HMA Surface	Ton	384	$ 80.00	$ 30,720.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 12 Inch	Ea	4	$ 2,750.00	$ 11,000.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	1088	$ 125.00	$ 136,000.00
11	Water Service	Ea	15	$ 1,750.00	$ 26,250.00
12	Curb Stop and Box	Ea	15	$ 500.00	$ 7,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	300	$ 5.00	$ 1,500.00
3rd St / East Alley (Territorial to Highland Ave) Estimate					$ 309,560.00
Contingency				**15%**	$ 46,500.00
Engineering & Construction Administration				**20%**	$ 62,000.00
Total Estimated Water Main Construction Costs					$ 418,060.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 8th St (Klock Rd to Graham Ave)
Prepared By: Aaron Townley, EIT

8th St (Klock Rd to Graham Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 64,400.00	$ 64,400.00
2	Traffic Control	LSum	1	$ 30,700.00	$ 30,700.00
3	Machine Grading	Sta	18.48	$ 1,200.00	$ 22,176.00
4	Pavt, Rem, Modified	Syd	2259	$ 9.00	$ 20,331.00
5	Aggregate Base, 8 inch	Syd	2259	$ 9.00	$ 20,331.00
6	Subbase, CIP (12 Inches)	Cyd	753	$ 13.50	$ 10,165.50
7	HMA Surface	Ton	653	$ 80.00	$ 52,240.00
8	Fire Hydrant Assembly	Ea	5	$ 4,000.00	$ 20,000.00
9	Gate Valve & Box, 16 Inch	Ea	6	$ 6,500.00	$ 39,000.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	1848	$ 200.00	$ 369,600.00
11	Water Service	Ea	25	$ 1,750.00	$ 43,750.00
12	Curb Stop and Box	Ea	25	$ 500.00	$ 12,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	500	$ 5.00	$ 2,500.00
8th St (Klock Rd to Graham Ave) Estimate					$ 707,693.50
Contingency				**15%**	$ 106,200.00
Engineering & Construction Administration				**20%**	$ 141,600.00
Total Estimated Water Main Construction Costs					$ 955,493.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Wall St (Riverview Dr to 12th St)
Prepared By: Aaron Townley, EIT

Wall St (Riverview Dr to 12th St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 33,900.00	$ 33,900.00
2	Traffic Control	LSum	1	$ 16,200.00	$ 16,200.00
3	Machine Grading	Sta	9.73	$ 1,200.00	$ 11,676.00
4	Pavt, Rem, Modified	Syd	1190	$ 9.00	$ 10,710.00
5	Aggregate Base, 8 inch	Syd	1190	$ 9.00	$ 10,710.00
6	Subbase, CIP (12 Inches)	Cyd	397	$ 13.50	$ 5,359.50
7	HMA Surface	Ton	344	$ 80.00	$ 27,520.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 16 Inch	Ea	3	$ 6,500.00	$ 19,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	973	$ 200.00	$ 194,600.00
11	Water Service	Ea	13	$ 1,750.00	$ 22,750.00
12	Curb Stop and Box	Ea	13	$ 500.00	$ 6,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	260	$ 5.00	$ 1,300.00
Wall St (Riverview Dr to 12th St) Estimate					$ 372,725.50
Contingency				**15%**	$ 56,000.00
Engineering & Construction Administration				**20%**	$ 74,600.00
Total Estimated Water Main Construction Costs					$ 503,325.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Hull Ave (Frank St to ~350 ft North of Edwards Ave)
Prepared By: Aaron Townley, EIT

Hull Ave (Frank St to ~350 ft North of Edwards Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 10,300.00	$ 10,300.00
2	Traffic Control	LSum	1	$ 4,900.00	$ 4,900.00
3	Machine Grading	Sta	5.5	$ 1,200.00	$ 6,600.00
4	Pavt, Rem, Modified	Syd	673	$ 9.00	$ 6,057.00
5	Aggregate Base, 8 inch	Syd	673	$ 9.00	$ 6,057.00
6	Subbase, CIP (12 Inches)	Cyd	225	$ 13.50	$ 3,037.50
7	HMA Surface	Ton	117	$ 80.00	$ 9,360.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	550	$ 75.00	$ 41,250.00
11	Water Service	Ea	6	$ 1,750.00	$ 10,500.00
12	Curb Stop and Box	Ea	6	$ 500.00	$ 3,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	120	$ 5.00	$ 600.00
Hull Ave (Frank St to ~350 ft North of Edwards Ave) Estimate					$ 113,161.50
Contingency				**15%**	$ 17,000.00
Engineering & Construction Administration				**20%**	$ 22,700.00
Total Estimated Water Main Construction Costs					$ 152,861.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Klock Rd, Water Plant to East
Prepared By: Aaron Townley, EIT

Klock Rd, Water Plant to East					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 31,100.00	$ 31,100.00
2	Traffic Control	LSum	1	$ 14,800.00	$ 14,800.00
3	Machine Grading	Sta	8.8	$ 1,200.00	$ 10,560.00
4	Pavt, Rem, Modified	Syd	1076	$ 9.00	$ 9,684.00
5	Aggregate Base, 8 inch	Syd	1076	$ 9.00	$ 9,684.00
6	Subbase, CIP (12 Inches)	Cyd	359	$ 13.50	$ 4,846.50
7	HMA Surface	Ton	311	$ 80.00	$ 24,880.00
8	Fire Hydrant Assembly	Ea	3	$ 4,000.00	$ 12,000.00
9	Gate Valve & Box, 16 Inch	Ea	3	$ 6,500.00	$ 19,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	880	$ 200.00	$ 176,000.00
11	Water Service	Ea	12	$ 1,750.00	$ 21,000.00
12	Curb Stop and Box	Ea	12	$ 500.00	$ 6,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	240	$ 5.00	$ 1,200.00
Klock Rd, Water Plant to East Estimate					$ 341,254.50
Contingency				**15%**	$ 51,200.00
Engineering & Construction Administration				**20%**	$ 68,300.00
Total Estimated Water Main Construction Costs					$ 460,754.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: North Shore Dr, Klock Rd to North
Prepared By: Aaron Townley, EIT

North Shore Dr, Klock Rd to North					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 11,300.00	$ 11,300.00
2	Traffic Control	LSum	1	$ 5,400.00	$ 5,400.00
3	Machine Grading	Sta	5.41	$ 1,200.00	$ 6,492.00
4	Pavt, Rem, Modified	Syd	662	$ 9.00	$ 5,958.00
5	Aggregate Base, 8 inch	Syd	662	$ 9.00	$ 5,958.00
6	Subbase, CIP (12 Inches)	Cyd	221	$ 13.50	$ 2,983.50
7	HMA Surface	Ton	191	$ 80.00	$ 15,280.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	541	$ 75.00	$ 40,575.00
11	Water Service	Ea	8	$ 1,750.00	$ 14,000.00
12	Curb Stop and Box	Ea	8	$ 500.00	$ 4,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	160	$ 5.00	$ 800.00
North Shore Dr, Klock Rd to North Estimate					$ 124,246.50
Contingency				**15%**	$ 18,700.00
Engineering & Construction Administration				**20%**	$ 24,900.00
Total Estimated Water Main Construction Costs					$ 167,846.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Paw Paw Ave, West of Paw Paw Ave between Waukonda Ave and Frank St
Prepared By: Aaron Townley, EIT

Paw Paw Ave, West of Paw Paw Ave between Waukonda Ave and Frank St					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 18,000.00	$ 18,000.00
2	Traffic Control	LSum	1	$ 8,600.00	$ 8,600.00
3	Machine Grading	Sta	5.3	$ 1,200.00	$ 6,360.00
4	Pavt, Rem, Modified	Syd	648	$ 9.00	$ 5,832.00
5	Aggregate Base, 8 inch	Syd	648	$ 9.00	$ 5,832.00
6	Subbase, CIP (12 Inches)	Cyd	216	$ 13.50	$ 2,916.00
7	HMA Surface	Ton	113	$ 80.00	$ 9,040.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 16 Inch	Ea	2	$ 6,500.00	$ 13,000.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	530	$ 200.00	$ 106,000.00
11	Water Service	Ea	6	$ 1,750.00	$ 10,500.00
12	Curb Stop and Box	Ea	6	$ 500.00	$ 3,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	120	$ 5.00	$ 600.00
Paw Paw Ave, West of Paw Paw Ave between Waukonda Ave and Frank St Estimate					$ 197,680.00
Contingency				**15%**	$ 29,700.00
Engineering & Construction Administration				**20%**	$ 39,600.00
Total Estimated Water Main Construction Costs					$ 266,980.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Building Lot (Water St to 2nd St)
Prepared By: Aaron Townley, EIT

Building Lot (Water St to 2nd St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 12,000.00	$ 12,000.00
2	Traffic Control	LSum	1	$ 5,700.00	$ 5,700.00
3	Machine Grading	Sta	4.88	$ 1,200.00	$ 5,856.00
4	Pavt, Rem, Modified	Syd	597	$ 9.00	$ 5,373.00
5	Aggregate Base, 8 inch	Syd	597	$ 9.00	$ 5,373.00
6	Subbase, CIP (12 Inches)	Cyd	199	$ 13.50	$ 2,686.50
7	HMA Surface	Ton	104	$ 80.00	$ 8,320.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	2	$ 2,750.00	$ 5,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	488	$ 125.00	$ 61,000.00
11	Water Service	Ea	5	$ 1,750.00	$ 8,750.00
12	Curb Stop and Box	Ea	5	$ 500.00	$ 2,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	100	$ 5.00	$ 500.00
Building Lot (Water St to 2nd St) Estimate					$ 131,558.50
Contingency				**15%**	$ 19,800.00
Engineering & Construction Administration				**20%**	$ 26,400.00
Total Estimated Water Main Construction Costs					$ 177,758.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Maple St (Pipestone St to Cedar St)
Prepared By: Aaron Townley, EIT

Maple St (Pipestone St to Cedar St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 13,500.00	$ 13,500.00
2	Traffic Control	LSum	1	$ 6,500.00	$ 6,500.00
3	Machine Grading	Sta	7.32	$ 1,200.00	$ 8,784.00
4	Pavt, Rem, Modified	Syd	895	$ 9.00	$ 8,055.00
5	Aggregate Base, 8 inch	Syd	895	$ 9.00	$ 8,055.00
6	Subbase, CIP (12 Inches)	Cyd	299	$ 13.50	$ 4,036.50
7	HMA Surface	Ton	156	$ 80.00	$ 12,480.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	3	$ 1,750.00	$ 5,250.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	732	$ 75.00	$ 54,900.00
11	Water Service	Ea	8	$ 1,750.00	$ 14,000.00
12	Curb Stop and Box	Ea	8	$ 500.00	$ 4,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	160	$ 5.00	$ 800.00
Maple St (Pipestone St to Cedar St) Estimate					$ 148,360.50
Contingency				**15%**	$ 22,300.00
Engineering & Construction Administration				**20%**	$ 29,700.00
Total Estimated Water Main Construction Costs					$ 200,360.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Riverview Dr and River St
Prepared By: Aaron Townley, EIT

Riverview Dr and River St					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 9,700.00	$ 9,700.00
2	Traffic Control	LSum	1	$ 4,600.00	$ 4,600.00
3	Machine Grading	Sta	2.67	$ 1,200.00	$ 3,204.00
4	Pavt, Rem, Modified	Syd	327	$ 9.00	$ 2,943.00
5	Aggregate Base, 8 inch	Syd	327	$ 9.00	$ 2,943.00
6	Subbase, CIP (12 Inches)	Cyd	109	$ 13.50	$ 1,471.50
7	HMA Surface	Ton	95	$ 80.00	$ 7,600.00
8	Fire Hydrant Assembly	Ea	1	$ 4,000.00	$ 4,000.00
9	Gate Valve & Box, 16 Inch	Ea	1	$ 6,500.00	$ 6,500.00
10	Water Main, DI, 16 Inch, Tr Det G	Ft	267	$ 200.00	$ 53,400.00
11	Water Service	Ea	4	$ 1,750.00	$ 7,000.00
12	Curb Stop and Box	Ea	4	$ 500.00	$ 2,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	80	$ 5.00	$ 400.00
Riverview Dr and River St Estimate					$ 105,761.50
Contingency				**15%**	$ 15,900.00
Engineering & Construction Administration				**20%**	$ 21,200.00
Total Estimated Water Main Construction Costs					$ 142,861.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 9th St, Britain Ave to South
Prepared By: Aaron Townley, EIT

9th St, Britain Ave to South					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 15,400.00	$ 15,400.00
2	Traffic Control	LSum	1	$ 7,300.00	$ 7,300.00
3	Machine Grading	Sta	6.39	$ 1,200.00	$ 7,668.00
4	Pavt, Rem, Modified	Syd	781	$ 9.00	$ 7,029.00
5	Aggregate Base, 8 inch	Syd	781	$ 9.00	$ 7,029.00
6	Subbase, CIP (12 Inches)	Cyd	261	$ 13.50	$ 3,523.50
7	HMA Surface	Ton	136	$ 80.00	$ 10,880.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 12 Inch	Ea	2	$ 2,750.00	$ 5,500.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	639	$ 125.00	$ 79,875.00
11	Water Service	Ea	7	$ 1,750.00	$ 12,250.00
12	Curb Stop and Box	Ea	7	$ 500.00	$ 3,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	140	$ 5.00	$ 700.00
9th St, Britain Ave to South Estimate					$ 168,654.50
Contingency				**15%**	$ 25,300.00
Engineering & Construction Administration				**20%**	$ 33,800.00
Total Estimated Water Main Construction Costs					$ 227,754.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Brunson Ave (Hornack Rd to Jefferson St)
Prepared By: Aaron Townley, EIT

Brunson Ave (Hornack Rd to Jefferson St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 12,100.00	$ 12,100.00
2	Traffic Control	LSum	1	$ 5,800.00	$ 5,800.00
3	Machine Grading	Sta	6.57	$ 1,200.00	$ 7,884.00
4	Pavt, Rem, Modified	Syd	803	$ 9.00	$ 7,227.00
5	Aggregate Base, 8 inch	Syd	803	$ 9.00	$ 7,227.00
6	Subbase, CIP (12 Inches)	Cyd	268	$ 13.50	$ 3,618.00
7	HMA Surface	Ton	140	$ 80.00	$ 11,200.00
8	Fire Hydrant Assembly	Ea	2	$ 4,000.00	$ 8,000.00
9	Gate Valve & Box, 8 Inch	Ea	2	$ 1,750.00	$ 3,500.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	657	$ 75.00	$ 49,275.00
11	Water Service	Ea	7	$ 1,750.00	$ 12,250.00
12	Curb Stop and Box	Ea	7	$ 500.00	$ 3,500.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	140	$ 5.00	$ 700.00
Brunson Ave (Hornack Rd to Jefferson St) Estimate					$ 132,281.00
Contingency				**15%**	$ 19,900.00
Engineering & Construction Administration				**20%**	$ 26,500.00
Total Estimated Water Main Construction Costs					$ 178,681.00

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: Weld St (Union St to Agard Ave)
Prepared By: Aaron Townley, EIT

Weld St (Union St to Agard Ave)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 6,200.00	$ 6,200.00
2	Traffic Control	LSum	1	$ 3,000.00	$ 3,000.00
3	Machine Grading	Sta	3.3	$ 1,200.00	$ 3,960.00
4	Pavt, Rem, Modified	Syd	404	$ 9.00	$ 3,636.00
5	Aggregate Base, 8 inch	Syd	404	$ 9.00	$ 3,636.00
6	Subbase, CIP (12 Inches)	Cyd	135	$ 13.50	$ 1,822.50
7	HMA Surface	Ton	70	$ 80.00	$ 5,600.00
8	Fire Hydrant Assembly	Ea	1	$ 4,000.00	$ 4,000.00
9	Gate Valve & Box, 8 Inch	Ea	1	$ 1,750.00	$ 1,750.00
10	Water Main, DI, 8 Inch, Tr Det G	Ft	330	$ 75.00	$ 24,750.00
11	Water Service	Ea	4	$ 1,750.00	$ 7,000.00
12	Curb Stop and Box	Ea	4	$ 500.00	$ 2,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	80	$ 5.00	$ 400.00
Weld St (Union St to Agard Ave) Estimate					$ 67,754.50
Contingency				**15%**	$ 10,200.00
Engineering & Construction Administration				**20%**	$ 13,600.00
Total Estimated Water Main Construction Costs					$ 91,554.50

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Project Name: Benton Harbor Water Asset Management Plan
Project Location: 4th St (Territorial Rd to Main St)
Prepared By: Aaron Townley, EIT

4th St (Territorial Rd to Main St)					
#	Item Description	Unit	Quantity	Unit Price	Total
1	Mobilization	LSum	1	$ 6,700.00	$ 6,700.00
2	Traffic Control	LSum	1	$ 3,200.00	$ 3,200.00
3	Machine Grading	Sta	2.45	$ 1,200.00	$ 2,940.00
4	Pavt, Rem, Modified	Syd	300	$ 9.00	$ 2,700.00
5	Aggregate Base, 8 inch	Syd	300	$ 9.00	$ 2,700.00
6	Subbase, CIP (12 Inches)	Cyd	100	$ 13.50	$ 1,350.00
7	HMA Surface	Ton	87	$ 80.00	$ 6,960.00
8	Fire Hydrant Assembly	Ea	1	$ 4,000.00	$ 4,000.00
9	Gate Valve & Box, 12 Inch	Ea	1	$ 2,750.00	$ 2,750.00
10	Water Main, DI, 12 Inch, Tr Det G	Ft	245	$ 125.00	$ 30,625.00
11	Water Service	Ea	4	$ 1,750.00	$ 7,000.00
12	Curb Stop and Box	Ea	4	$ 500.00	$ 2,000.00
13	Restoration (Grass, Seed, & Topsoil)	Syd	80	$ 5.00	$ 400.00
4th St (Territorial Rd to Main St) Estimate					$ 73,325.00
Contingency				**15%**	$ 11,000.00
Engineering & Construction Administration				**20%**	$ 14,700.00
Total Estimated Water Main Construction Costs					$ 99,025.00

APPENDIX G

BENTON HARBOR WATER SYSTEM

CASH FLOW

City of Benton Harbor, Michigan

Historical and Projected Water System Operating Cash Flow and Debt Service Coverage
Fiscal Years Ended or Ending June 30, 2014 Through 2037

	2014 (1)	2015 (1)	2016 (1)	Preliminary 2017 (2)	Projected 2018 (2)	Projected 2019 (3)	Projected 2020 (3)	Projected 2021 (3)	Projected 2022 (3)	Projected 2023 (3)	Projected 2024
Operating Revenues											
Water RTS/Commodity	$ 1,854,525	$ 2,028,776	$ 1,970,829	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024	$ 1,631,024
Water Capital Charge		-	-	253,385	253,385	253,385	253,385	253,385	253,385	253,385	253,385
Sprinkler, Hydrant, Fire		-	-	37,333	37,333	37,333	37,333	37,333	37,333	37,333	37,333
Other		-	-	32,540	32,540	32,540	32,540	32,540	32,540	32,540	32,540
Fines	17,160	177	-	20,340	20,340	20,340	20,340	20,340	20,340	20,340	20,340
Total Operating Revenues	$ 1,871,685	$ 2,028,953	$ 1,970,829	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622	$ 1,974,622
Operating Expenses (4)											
Utility Administration	$ 564,359	$ 416,835	$ 487,463	$ 570,662	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Customer Service	178,106	63,627	54,432	51,079	-	-	-	-	-	-	-
Water Treatment	721,683	414,240	457,036	408,751	-	-	-	-	-	-	-
Water Distribution	893,856	554,709	585,567	622,208	-	-	-	-	-	-	-
Other	8,994	5,138	5,336	-	-	-	-	-	-	-	-
Depreciation	306,949	296,727	299,373	-	-	-	-	-	-	-	-
Total Operating Expenses	$ 2,673,947	$ 1,751,275	$ 1,889,207	$ 1,652,700	$ 1,702,281	$ 1,753,349	$ 1,805,950	$ 1,860,128	$ 1,915,932	$ 1,915,932	$ 1,915,932
Operating Income (Loss)	$ (802,262)	$ 277,678	$ 81,623	$ 321,922	$ 272,341	$ 221,273	$ 168,672	$ 114,494	$ 58,690	$ 58,690	$ 58,690
Non-Operating Revenues (Expenses)											
Interest Income	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
State Grants/FDCVT Proceeds	-	185,108	194,777	300,000	-	-	-	-	-	-	-
Gain from sale of capital assets	-	-	2,309	-	-	-	-	-	-	-	-
Repayment of federal debt previously forgiven	(141,358)	-	-	-	-	-	-	-	-	-	-
Income From Joint Venture	153,247	172,888	(40,562)	-	-	-	-	-	-	-	-
Depreciation	306,949	296,727	299,373	-	-	-	-	-	-	-	-
Total Non-Operating Revenues (Expenses)	$ 318,838	$ 654,722	$ 455,896	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NET INCOME AVAILABLE FOR DEBT SERVICE	$ (483,425)	$ 932,400	$ 537,519	$ 621,922	$ 272,341	$ 221,273	$ 168,672	$ 114,494	$ 58,690	$ 58,690	$ 58,690
Debt Service Requirements											
Drinking Water Revolving Fund Revenue Bonds, Series 2009	$ 11,125	$ 8,105	$ 7,980	$ 7,855	$ 7,730	$ 7,605	$ 7,480	$ 7,335	$ 7,230	$ 7,105	$ 6,980
Drinking Water Revolving Fund Revenue Bonds, Series 2010	410,375	410,250	410,000	409,625	414,125	413,375	412,500	411,500	410,375	414,125	412,625
Water Storage Projects						15,279 #	15,279 #	15,279 #	15,279 #	15,279 #	15,279
Water Supply Projects							47,777	47,777 #	47,777 #	47,777 #	47,777
Water Distribution Projects							-			691,765	691,765
Water Supply System Revenue Bonds, Series 2018, for SAW	-	-	-	-	-	41,600	41,243	45,887	45,412	44,937	44,462
Water Supply System Revenue Bonds, Series 2023, for SAW						-	-	-	-	-	50,875
Total	$ 421,500	$ 418,355	$ 417,980	$ 417,480	$ 421,855	$ 477,859	$ 524,279	$ 527,778	$ 526,073	$ 1,220,988	$ 1,269,763
Debt Service Coverage Ratio	**(1.15x)**	**2.23x**	**1.29x**	**1.49x**	**0.65x**	**0.46x**	**0.32x**	**0.22x**	**0.11x**	**0.05x**	**0.05x**

Utilities Revenue and SRF Bonds

Annual Excess with 1.2x Coverage.	**# $ 84,370**	**$ 95,571**	**$ 104,855**	**$ 105,554**	**$ 105,213**	**$ 244,196**	**$ 253,951**		
Cumulative Excess with 1.2x Coverage.	**# $ 84,370**	**$ 179,941**	**$ 284,795**	**$ 390,350**	**$ 495,563**	**$ 739,759**	**$ 993,711**		
Annual Increase in Revenue Necessary for 1.2x Coverage.	**$233,884**	**$118,273**	**$108,304**	**$58,377**	**$53,758**	**$833,898**	**$58,530**		
Annual Increase Necessary to Produce 1.2x Coverage.	**14.34%**	**6.34%**	**5.46%**	**2.79%**	**2.50%**	**37.84%**	**1.93%**		

(1) Actual.
(2) As projected, pursuant to the May 2017 Revenue Test Update.
(3) Operating revenues for the fiscal years ending June 30, 2018 and thereafter are not assumed to change.
Projected rate increases applied only to RTS and Commodity Charges.
(4) Operating expenditures, excluding depreciation, as projected for the fiscal years ending June 30, 2018 through 2022 are assumed to grow 3% annually.

Source: City of Benton Harbor

(3)	Projected 2025	(3)	Projected 2026	(3)	Projected 2027	(3)	Projected 2028	(3)	Projected 2029	(3)	Projected 2030	(3)	Projected 2031	(3)	Projected 2032	(3)	Projected 2033	(3)	Projected 2034	(3)	Projected 2035	(3)	Projected 2036	(3)	Projected 2037	(3)
	$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024		$ 1,631,024	
	253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385		253,385	
	37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333		37,333	
	32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540		32,540	
	20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340		20,340	
	$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622		$ 1,974,622	
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	-		-		-		-		-		-		-		-		-		-		-		-		-	
	$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932		$ 1,915,932	
	$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690	
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	$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690		$ 58,690	
	$ 6,855		$ 6,730		$ 6,605		$ 6,480		$ 6,355		$ 6,230		$ 6,105		$ 5,980		$ 5,855		$ 5,730		$ 5,605		$ 5,480		$ 5,355	
	411,000		409,250		412,375		410,250		413,000		410,500		412,875		410,000		412,000		413,750		410,250		411,625		412,750	
#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	15,279	#	158,610	#	158,610	#	158,610	#	158,610	#	158,610	
#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	47,777	#	71,665	#	71,665	#	71,665	#	71,665	#	71,665	
#	691,765	#	691,765	#	691,765	#	691,765	#	691,765	#	691,765	#	691,765	#	691,765		2,219,336		2,219,336	#	2,219,336	#	2,219,336	#	2,219,336	
	43,987		43,512		43,037		42,562		42,087		41,612		46,137		45,544		44,950		44,356		43,762		43,169		42,575	
	50,400		49,925		49,450		48,975		48,500		53,025		52,431		51,837		51,244		50,650		50,056		49,462		48,868	
	$ 1,267,063		$ 1,264,238		$ 1,266,288		$ 1,263,088		$ 1,264,763		$ 1,266,188		$ 1,272,369		$ 1,268,182		$ 2,963,660		$ 2,964,097		$ 2,959,284		$ 2,959,347		$ 2,959,159	
	0.05x		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.05x**		**0.02x**		**0.02x**		**0.02x**		**0.02x**		**0.02x**	
	$ 256,651		**$ 259,476**		**$ 257,426**		**$ 260,626**		**$ 258,951**		**$ 257,526**		**$ 254,473**		**$ 258,660**		**$ 592,731**		**$ 592,818**		**$ 597,631**		**$ 597,568**		**$ 597,756**	
	$ 1,250,362		**$ 1,509,839**		**$ 1,767,265**		**$ 2,027,892**		**$ 2,286,843**		**$ 2,544,370**		**$ 2,798,842**		**$ 3,057,502**		**$ 3,650,233**		**$ 4,243,051**		**$ 4,840,682**		**$ 5,438,251**		**$ 6,036,007**	
	$0		**$0**		**$0**		**$0**		**$0**		**$0**		**$3,127**		**$0**		**$2,029,549**		**$524**		**$0**		**$0**		**$0**	
	0.00%		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.00%**		**0.10%**		**0.00%**		**65.49%**		**0.01%**		**0.00%**		**0.00%**		**0.00%**	

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

LIESL EICHLER CLARK
DIRECTOR

November 1, 2019

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

WSSN: **00600**

Dear Mr. Mitchell:

SUBJECT: Administrative Consent Order: Progress Update and Revised Schedule

This letter is in response to discussions with Benton Harbor staff regarding the compliance schedule established in the Administrative Consent Order (ACO) effective March 5, 2019. Extensions for Section II - Compliance Schedule (Compliance Schedule) of the ACO were granted on April 1, 2019, May 16, 2019, and July 2, 2019. On October 17, 2019, the Department of Environment, Great Lakes, and Energy (EGLE) received another request for extensions of additional items in the Compliance Schedule. EGLE staff would like to acknowledge the competing timelines in the Compliance Schedule by granting the requested extension, and also reiterating the terms of the ACO.

Allowing sufficient time to complete tasks in the Compliance Schedule is necessary; however, timely implementation of items that will directly result in greater protection of public health must be prioritized. The table below includes an updated Compliance Schedule that satisfies the recent extension request from the City and sets interim deadlines for items requiring permitting.

Item	Initial Deadline	Extended Deadline	Status/Comment
Submit a rate study	4/1/2019	(completed)	
Submit plan to implement rate increases	4/1/2019	7/1/2020	Needs approval of Commission
Upgrade SCADA system for data access and storage	4/1/2019	(completed)	
Install flow meter on finished water	4/1/2019	12/15/2019	Needs further integration into SCADA
Install continuous chlorine analyzer on WTP tap	4/1/2019	(completed)	
Distribution Operator in charge	4/1/2019	(completed)	
Corrosion Treatment Study	4/1/2019	(completed)	
Submit updated rate collections plan	5/1/2019	12/31/2019	Coordinating with staff
Updated cross connection program including residential accounts	6/1/2019	3/31/2020	
Permit and Construct coagulant feed to existing rapid mix	6/1/2019	(completed)	
Submit maintenance plan for valves and hydrants	6/1/2019	06/30/2020	Allow time for staff to improve rate collections

Conduct professional inspection of water tower, or conduct cleaning and repaint interior	6/30/2019	12/31/2020	Delayed to allow for funding process
Install/repair mussel control system at intake	6/30/2019	4/1/2020	Submit permit application by 3/1/2020
Repair filter to waste valves	1/31/2020	9/1/2020	

Be advised that, per Paragraph 1.3 of the ACO, the City of Benton Harbor remains obligated to pay stipulated penalties of $500 per violation per day for failure to comply with a specific deadline set forth in the Compliance Program, including the extended deadlines set forth above.

It is our intention to work with you on resolving these issues in a timely manner. We anticipate and appreciate your cooperation in working together to resolve these matters. Additionally, if you have any questions regarding this Violation Notice, please contact me below or at sarkipatoe@michigan.gov.

Sincerely,

Ernie Sarkipato, Surface Water Treatment Specialist
Grand Rapids District Office
Drinking Water and Environmental Health Division
616-307-0261

cc/email: Mr. Mike O'Malley, Water Superintendent, Benton Harbor
Mr. Darold Harlan, Distribution Operator
Mr. Mike Bolf, P.E., Engineering Unit Supervisor, EGLE
Ms. Maureen Nelson, Enforcement Specialist, EGLE

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
GRAND RAPIDS DISTRICT OFFICE

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 17, 2020

Mr. Mike O'Malley, Water Superintendent
City of Benton Harbor
200 Wall Street
Benton Harbor, Michigan 49022

WSSN: **00600**

Dear Mr. O'Malley:

SUBJECT: Response to Draft ACO – Corrosion Study

The City of Benton Harbor (City) received a letter from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) dated February 13, 2020, regarding required changes to the Water System Corrosion Treatment. In addition to requiring an updated chemical formula and higher dose, the letter also required the City have a third-party consultant submit a corrosion control study proposal following the requirements of Rule 325.106.04f(3)(c) from Act 399. The study plan must focus on identifying optimum corrosion control treatment for the City's water system. The City also received a draft Administrative Consent Order (ACO) with cover letter from EGLE dated March 20, 2020. The draft ACO also references the required corrosion control study proposal.

EGLE received a letter from the City dated May 19, 2020, regarding the requirement to submit a corrosion control optimization study proposal. The letter included a data analysis of lead samples in the City, and a project scope for a corrosion control study from Elhorn Engineering. The corrosion control study scope is not detailed but describes the creation of pipe loops from harvested lead and galvanized service lines in the City. The loops would be installed at the water treatment plant for the purpose of determining optimum corrosion control in accordance with EPA guidance.

While the approach for the corrosion control study plan has merit, we have two concerns with the proposed plan.

First, the department requests to see a fully detailed corrosion control study plan. A fully detailed corrosion study plan must include at a minimum the following items: the treatment schemes to be studied; the standard operating procedures as they pertain to sample collection and routine maintenance of the pile loop rig(s); a detailed timeline of anticipated sample collection activities; a detailed layout of the pipe loop rig including all appurtenances; and all methods of analyses that will be utilized to support the outcome of the study. As required in EGLE letter dated February 13, 2020, the corrosion control study plan must be submitted within six months of the date of the change in phosphate treatment.

Second, the department is concerned that the pipe loop study proposal relies on City water operations staff to conduct daily supervision, testing, and sample collection. The concern is not with operations staff's technical ability, but in the current lack of managerial capacity to perform the requirements of the study while completing other routine water system duties. The study of this nature requires careful timing and quality control to maintain data integrity and a successful outcome.

Current Corrosion Treatment Status

The City is reminded of the designation under R325.10604f(3)(d) in EGLE's February 13, 2020 letter to adopt a new treatment rate, such that a minimum of 3.0 mg/L orthophosphate (as phosphate) residual is maintained throughout the distribution system at all times. While phosphate levels have increased significantly, the target of 3.0 mg/L orthophosphate is not being met in the distribution system.

Please accept these comments and concerns as part of a constructive conversation. We continue to offer our assistance to help the City in any way we can to maintain compliance. If you have any questions regarding this letter, please contact me below, or in writing at EGLE-Drinking Water and Environmental Health Division, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato
Surface Water Treatment Specialist
Drinking Water and Environmental Health Division
616-307-0261
sarkipatoe@michigan.gov

cc/via email: Mr. Ellis Mitchell, City Manager, City of Benton Harbor
Mr. Todd Luks, President, Elhorn Engineering
Mr. Mike Bolf, Engineering Unit Supervisor, EGLE
Mr. Brandon Onan, Lead and Copper Unit Supervisor, EGLE

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

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Sincerely,

Mike Enlow
Elhorn Engineering Company

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION
REVOLVING LOAN SECTION

PILOT DRINKING WATER COMMUNITY WATER SUPPLY GRANT PROGRAM
REQUEST FOR DISBURSEMENT OF FUNDS

THIS INFORMATION IS REQUIRED UNDER AUTHORITY OF PA 201 of 2017.

DOCUMENTATION TO SUPPORT THE INCURRED COSTS MUST BE INCLUDED WITH EACH REQUEST
PLEASE SEE OTHER SIDE FOR INSTRUCTIONS TO COMPLETE REQUEST

A. Project #	B. Request #	C. Period Covered by Request	D. Request Type	E. Grantee's EIN	F. Grant Amount
1901-01	1	7/1/2018 (M/D/Y) to 6/13/2018 (M/D/Y)	☒ partial ☐ final	38-6004537	$284,000

G. Grantee Name:	Phone #
City of Benton Harbor	269-927-8455
Address: 200 East Wall Street, Benton Harbor, MI 49022	**Email:** dwatson@cityofbentonharbormi.gov

H. Grantee's Bank Name:	Phone #
Fifth Third	
Address: 1295 East Napier, Benton Harbor, MI 49022	
Account Name: City of Benton Harbor-Utility Services	**ABA #** 072400052 / **Account #** 7161395665
Special Instructions:	

I. Budget Items (Include Eligible Costs Only Using Dollars and Cents)	Requested Incurred Costs This Period	Cumulative Costs Incurred To Date
1. PLANNING COSTS – DISTRIBUTION SYSTEM MATERIAL INVENTORY	$ 35,260	$ 35,260
2. DRINKING WATER ASSET MANAGEMENT PLAN COSTS	$ 30,000	$ 30,000
3. LEAD AND GALVANIZED SERVICE LINE CONSTRUCTION COSTS/Corrosion Control	$ 163,710	$ 163,710
4. TOTAL CUMULATIVE AMOUNT FOR PERIOD COVERED BY THIS REQUEST (add totals in 1st column)	$ 228,970	
5. TOTAL CUMULATIVE ELIGIBLE COSTS INCURRED TO DATE (add totals in 2nd column)		$ 228,970
6. LESS AMOUNT PREVIOUSLY DISBURSED		($ 0)
7. AMOUNT REQUESTED FOR DISBURSEMENT		$ 228,970

J. For each request, describe the scope of work completed to date. Attach separate sheet if more space is needed. Discuss the progress made on the services not yet complete and a schedule for their completion by the grant period end date. The incurred grant expense cannot exceed one (1) year from your grant agreement date.

Work completed to date includes developing bid packages for Lead Service Replacement and Service verification and inventories, completing construction contracts to replace 17 existing lead services and 94 water service verifications, and work completed in preparation for corrosion control protection at the Water Treatment Plant. Construction contracts with B&Z and Meeks are completed, except for the payment of retainage.

I certify that I am an authorized representative of the grantee and am authorized to make the following certifications on behalf of the grantee: (i) there is no pending litigation or event which will materially and adversely affect the project or the prospects for its completion; (ii) the representations, warranties and covenants contained in the grant agreement for the obligations pursuant to which this request for disbursement is submitted continue to be true and accurate in all material respects as of the date hereof; (iii) to the best of my knowledge and belief, the costs above were incurred in accordance with the terms of the grant agreement and the application for assistance for this project; and (iv) the amount requested for disbursement has not previously been requested.

Authorized Representative Name (Print or Type): Darwin Watson **Title:** City Manager

Authorized Representative Signature (Original): Darwin Watson **Date:** 6/21/2019

EMAIL THIS COMPLETED REQUEST TO YOUR DEQ PROJECT MANAGER OR
MAIL TO THE ADDRESS SHOWN ON THE REVERSE SIDE

(3/2018)

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH JUNE 13, 2019
REQUEST FOR DISBURSEMENT OF FUNDS - #1

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	THRU 12/31/18	2/14/19	70292	181239	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			9,000.00		9,000.00
	THRU 1/31/19	2/14/19	70292	190149/50/51	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			19,237.50		19,237.50
	THRU 2/28/19	3/14/19	70478	190256/57/58/59	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			21,060.00		21,060.00
	THRU 4/26/2019	5/23/19	70855	190437	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			5,895.00		5,895.00
					TOTAL B&Z CONTRACT	-	-	**55,192.50**	-	**55,192.50**
MEEKS-CONTRACT	THRU 12/31/18	2/13/19	70285	2116	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			5,265.00		5,265.00
	THRU 1/31/19	2/13/19	70285	2128	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			9,369.90		9,369.90
	THRU 2/28/19	3/28/19	70577	2131/2137/2138/2139	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			33,165.00		33,165.00
	THRU 3/31/19	4/11/19	70641	2143	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			9,000.10		9,000.10
	THRU 5/9/19	5/30/19	70902	2150/2151/PART RETAINAGE	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5			16,162.20		16,162.20
					TOTAL MEEKS CONTRACT	-	-	**72,962.20**	-	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				$85.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL SPENT THROUGH 6/13/2019						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	-	**49,199.30**	**6,090.66**	**55,029.50**

DWatson 8/8/18

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 122581
07/31/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Christopher J. Cook CJC 591-570-801.000

Professional services through 7/15/18:

Update Atlas - $ 2,478.75
Grant Administration/Project Management/Meetings - $ 2,837.50

Invoice Amount **$5,316.25**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

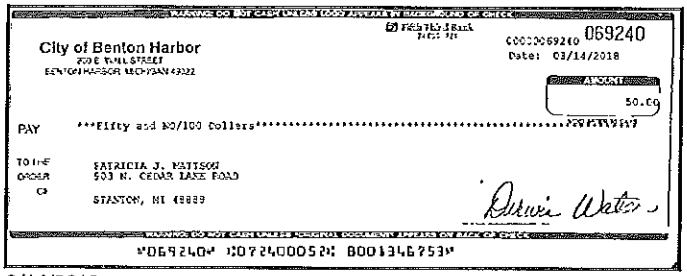
Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

Vendor: 4899 ABONMARCHE CONSULTANTS, INC. Check #: 00000069288 08/23/2018

Date	Invoice	Description/Detail	Amount
07/31/18	122647	CULVERT ASSESSMENT PROGRAM-CITY WIDE	5,189.00
08/13/18	122756	STEVENS ST STORM SEWER IMPROVEMENTS	1,156.25
08/08/18	122718	PIPESTONE/JEFFERSON/BROADWAY TRAFFIC SIG	420.00
08/07/18	122689	18-0200 GENERAL ENGINEERING	3,855.00
08/08/18	122712	18-0972 WATER METERING FOR CITY HALL & P	2,121.25
08/08/18	122711	18-0971 SIDEWALK ASSESSMENT FOR CITY	4,518.75
07/31/18	122581	18-0942 PILOT DRINKING WATER GRANT	5,316.25
07/31/18	122579	18-0200 GENERAL ENGINEERING	2,090.00

Total: 24,666.50

FIFTH THIRD BANK


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069240
Date: 08/14/2018

AMOUNT
50.00

PAY ***Fifty and 00/100 Dollars

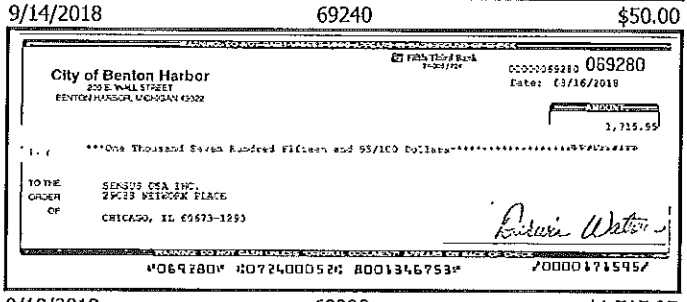
TO THE ORDER OF
PATRICIA J. WATTSON
503 N. CEDAR LAKE ROAD
STANTON, MI 48888

Derwin Watson

⑈069240⑈ ⑆072400052⑆ 8001346753⑈

9/14/2018 69240 $50.00

9/14/2018 69240 $50.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069280
Date: 08/16/2018

AMOUNT
1,715.95

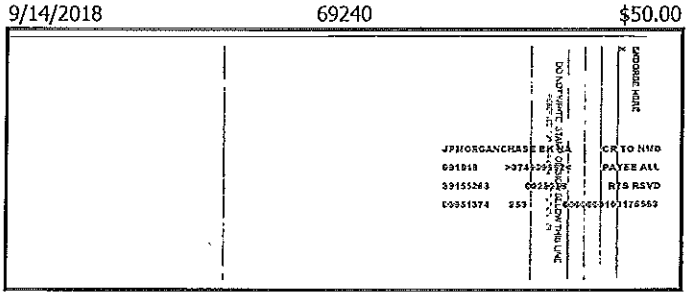
PAY ***One Thousand Seven Hundred Fifteen and 95/100 Dollars

TO THE ORDER OF
SENSUS USA INC.
2525 NETWORK PLACE
CHICAGO, IL 60673-1253

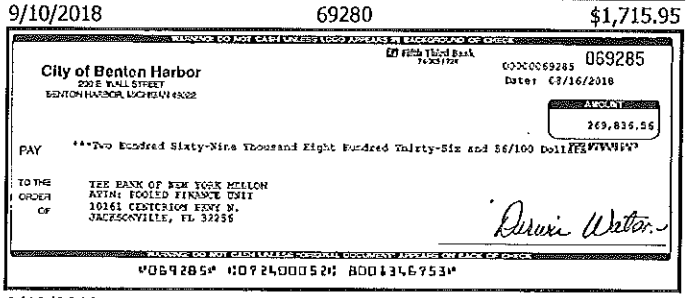
Derwin Watson

⑈069280⑈ ⑆072400052⑆ 8001346753⑈ ⑈0000171595⑈

9/10/2018 69280 $1,715.95


JPMORGANCHASE BK, NA
CR TO NYD
PAYEE ALL
R/S RSVD

9/10/2018 69280 $1,715.95


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069285
Date: 08/16/2018

AMOUNT
269,836.56

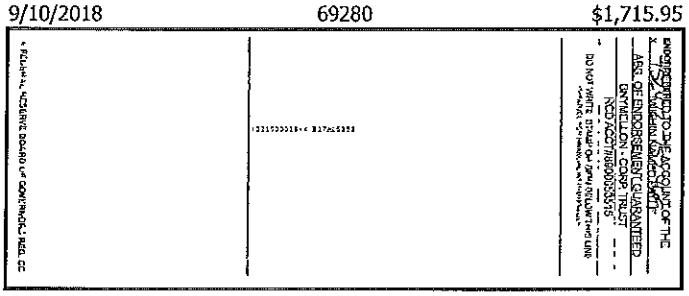
PAY ***Two Hundred Sixty-Nine Thousand Eight Hundred Thirty-Six and 56/100 Dollars

TO THE ORDER OF
THE BANK OF NEW YORK MELLON
ATTN: ESCROW FINANCE UNIT
10161 CENTURION PKWY N.
JACKSONVILLE, FL 32256

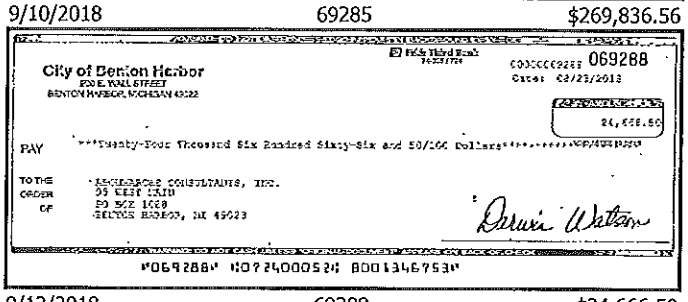
Derwin Watson

⑈069285⑈ ⑆072400052⑆ 8001346753⑈

9/10/2018 69285 $269,836.56


ABA, OR ENDORSEMENT GUARANTEED
BNY MELLON - CORP. TRUST
RCD ACCT/7880035315
DO NOT WRITE, STAMP OR MARK BELOW THIS LINE

9/10/2018 69285 $269,836.56


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069288
Date: 08/23/2018

AMOUNT
24,666.50

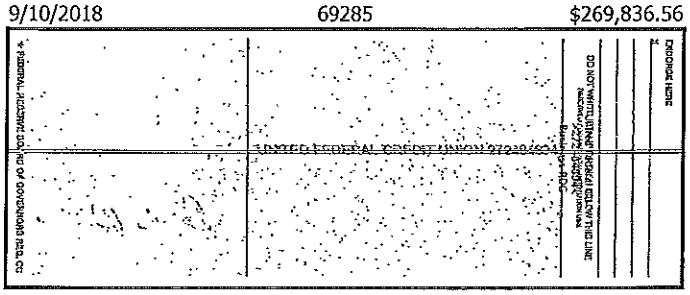
PAY ***Twenty-Four Thousand Six Hundred Sixty-Six and 50/100 Dollars

TO THE ORDER OF
ARCHDEACON CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1020
BELTON HARBOR, MI 49023

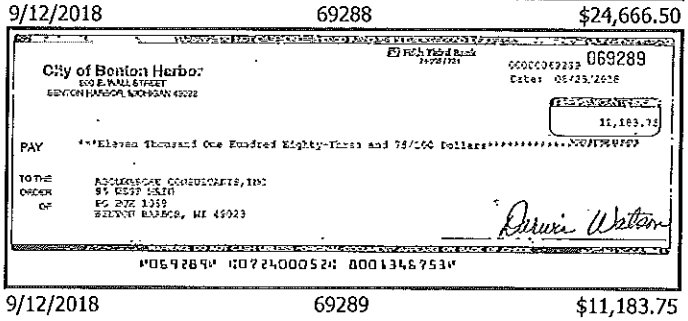
Derwin Watson

⑈069288⑈ ⑆072400052⑆ 8001346753⑈

9/12/2018 69288 $24,666.50


UNITED FEDERAL CREDIT UNION 272210604
DO NOT WRITE, STAMP OR MARK BELOW THIS LINE

9/12/2018 69288 $24,666.50


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

069289
Date: 08/23/2018

AMOUNT
11,183.75

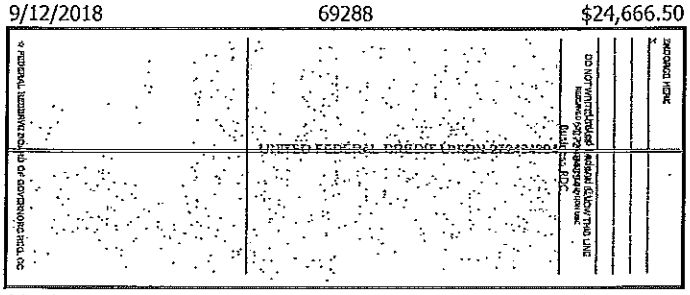
PAY ***Eleven Thousand One Hundred Eighty-Three and 75/100 Dollars

TO THE ORDER OF
ARCHDEACON CONSULTANTS, INC
95 WEST MAIN
PO BOX 1020
BELTON HARBOR, MI 49023

Derwin Watson

⑈069289⑈ ⑆072400052⑆ 8001346753⑈

9/12/2018 69289 $11,183.75


UNITED FEDERAL CREDIT UNION 272210604
DO NOT WRITE, STAMP OR MARK BELOW THIS LINE

9/12/2018 69289 $11,183.75

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE
No. 123120
09/10/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 8/31/18:

Update Atlas - $ 5,741.25
Grant Administration/Project Management/Meetings - $ 2,672.50
Construction Documents - $ 2,260.00

Invoice Amount **$10,673.75**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

591-571-977.300

FIFTH THIRD BANK
(WESTERN MICHIGAN)
P.O. BOX 630900 CINCINNATI OH 45263-0900

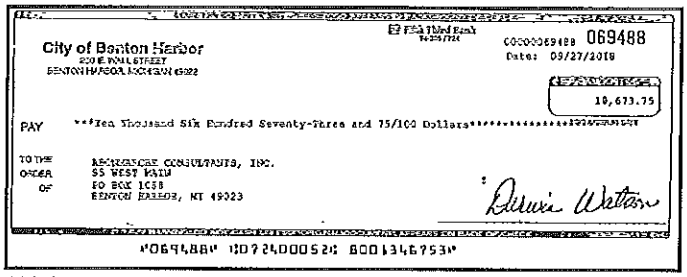
CITY OF BENTON HARBOR
GENERAL ACCT
ATTN FINANCE DIRECTOR
PO BOX 648
BENTON HARBOR MI 49023-0648

0

1560

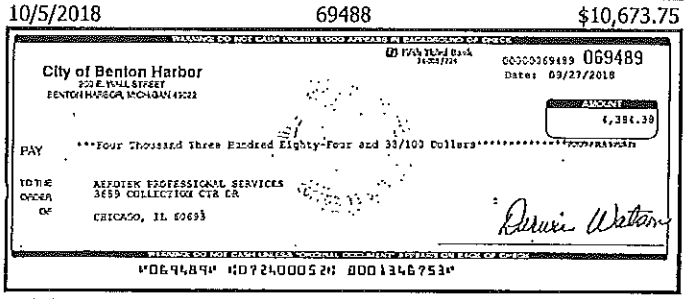
Statement Period Date: 10/1/2018 - 10/31/2018
Account Type: COMM'L 53 ANALYZED
Account Number: 8001346753

Banking Center: St Joseph South
Banking Center Phone: 269-983-0983
Commercial Client Services: 866-475-0729



City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069488 069488
Date: 09/27/2018
10,673.75
PAY ***Ten Thousand Six Hundred Seventy-Three and 75/100 Dollars
TO THE ORDER OF RECOMMENCE CONSULTANTS, INC.
55 WEST MAIN
PO BOX 1058
BENTON HARBOR, MI 49023
Derwin Watson
⑈069488⑈ ⑆072400052⑆ 8001346753⑈

10/5/2018 69488 $10,673.75

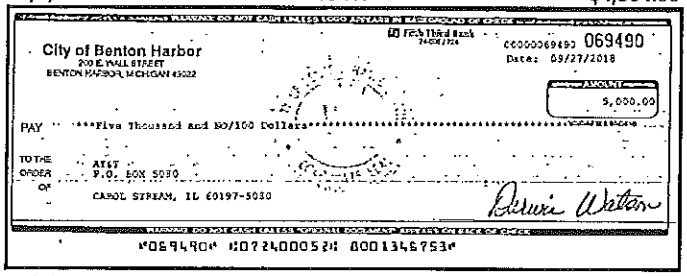


City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069489 069489
Date: 09/27/2018
4,384.38
PAY ***Four Thousand Three Hundred Eighty-Four and 38/100 Dollars
TO THE ORDER OF AEROTEK PROFESSIONAL SERVICES
3659 COLLECTION CTR DR
CHICAGO, IL 60693
Derwin Watson
⑈069489⑈ ⑆072400052⑆ 8001346753⑈

10/4/2018 69489 $4,384.38

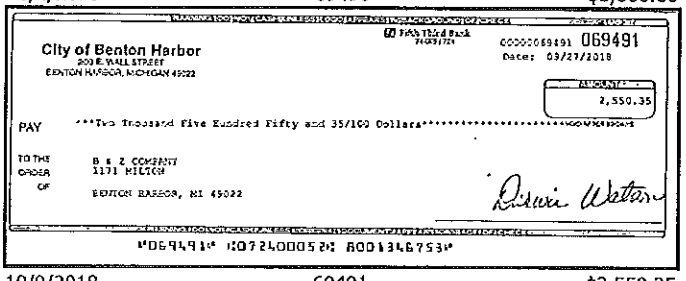
City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069490 069490
Date: 09/27/2018
5,000.00
PAY ***Five Thousand and 00/100 Dollars
TO THE ORDER OF AT&T
P.O. BOX 5080
CAROL STREAM, IL 60197-5080
Derwin Watson
⑈069490⑈ ⑆072400052⑆ 8001346753⑈

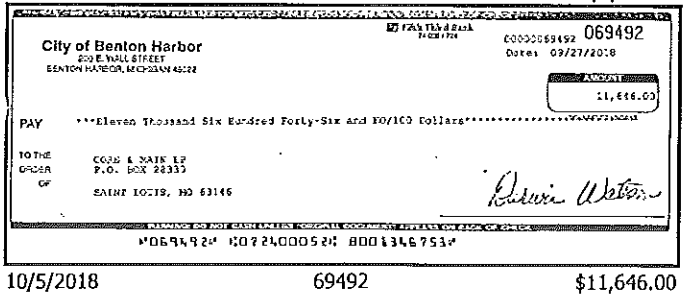
10/4/2018 69490 $5,000.00



City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069491 069491
Date: 09/27/2018
2,550.35
PAY ***Two Thousand Five Hundred Fifty and 35/100 Dollars
TO THE ORDER OF B & Z COMPANY
1171 HILTON
BENTON HARBOR, MI 49022
Derwin Watson
⑈069491⑈ ⑆072400052⑆ 8001346753⑈

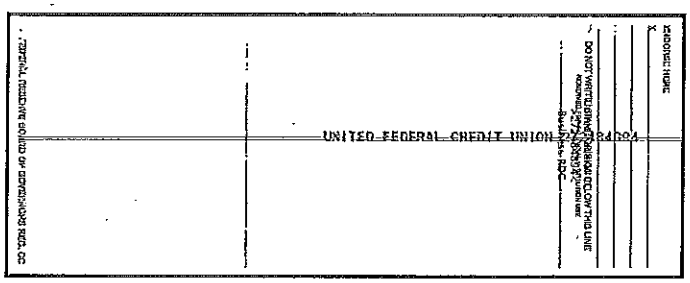
10/9/2018 69491 $2,550.35

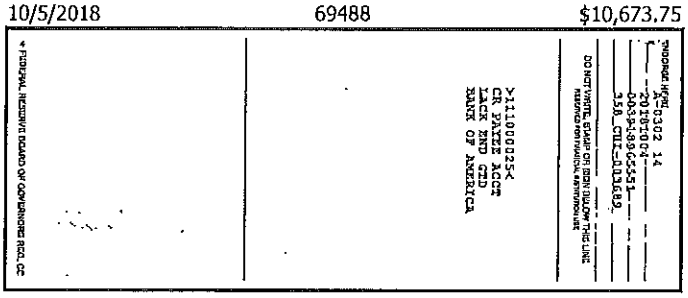


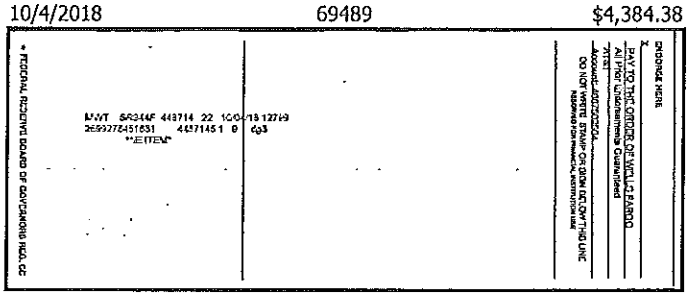


City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022
Fifth Third Bank
00000069492 069492
Date: 09/27/2018
11,646.00
PAY ***Eleven Thousand Six Hundred Forty-Six and 00/100 Dollars
TO THE ORDER OF CORE & MAIN LP
P.O. BOX 28330
SAINT LOUIS, MO 63146
Derwin Watson
⑈069492⑈ ⑆072400052⑆ 8001346753⑈

10/5/2018 69492 $11,646.00





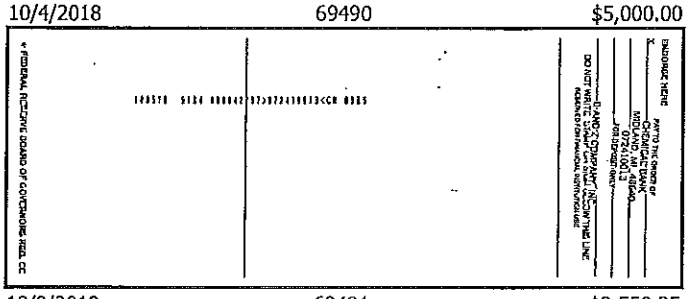


FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
UNITED FEDERAL CREDIT UNION
ENDORSE HERE
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/5/2018 69488 $10,673.75

FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
>111000025<
CR PAYEE ACCT
LACK END GTD
BANK OF AMERICA
ENDORSE HERE
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/4/2018 69489 $4,384.38

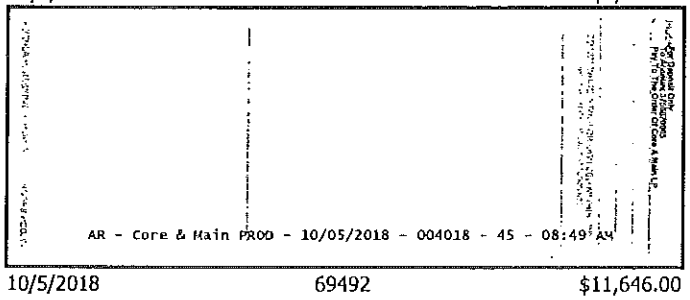


FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
MWT SR344F 448714 22 10/04/18 12749
2699278451831 44371451 9 dg3
ITEM
ENDORSE HERE
PAY TO THE ORDER OF WELLS FARGO
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/4/2018 69490 $5,000.00

FEDERAL RESERVE BOARD OF GOVERNORS REG. CC
ENDORSE HERE
PAY TO THE ORDER OF
CHEMICAL BANK
MIDLAND, MI 48640
07241001
DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/9/2018 69491 $2,550.35



AR - Core & Main PROD - 10/05/2018 - 004018 - 45 - 08:49 AM

10/5/2018 69492 $11,646.00

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 123487
10/01/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 9/30/18:

Update Atlas - $ 4,095.00
Grant Administration/Project Management/Meetings - $ 3,591.60
Construction Documents - $ 3,450.00

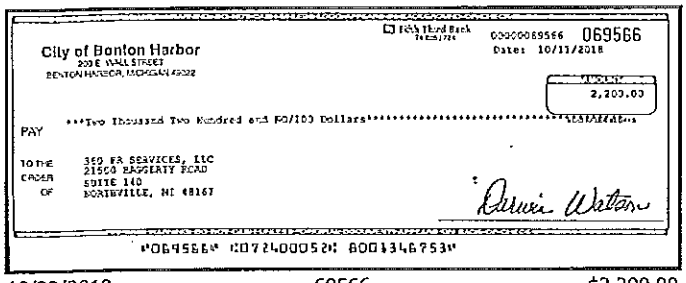
Invoice Amount **$11,136.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

FIFTH THIRD BANK


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069566 069566
Date 10/11/2018

AMOUNT 2,200.00

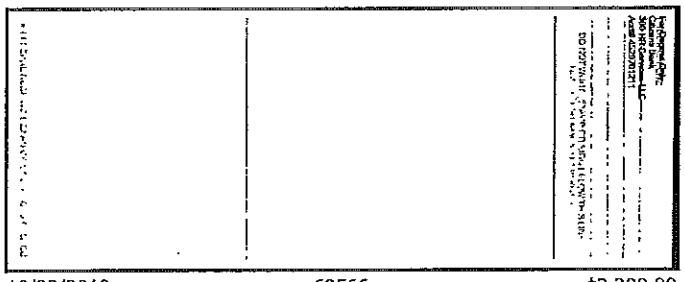
PAY ***Two Thousand Two Hundred and 00/100 Dollars***

TO THE ORDER OF 360 FA SERVICES, LLC
21500 HAGGERTY ROAD
SUITE 140
NORTHVILLE, MI 48167

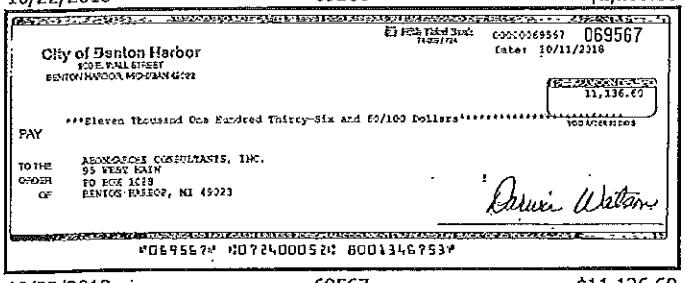
Darwin Watson

⑈069566⑈ ⑆072400052⑆ 8001346753⑈

10/22/2018 69566 $2,200.00



10/22/2018 69566 $2,200.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069567 069567
Date 10/11/2018

AMOUNT 11,136.60

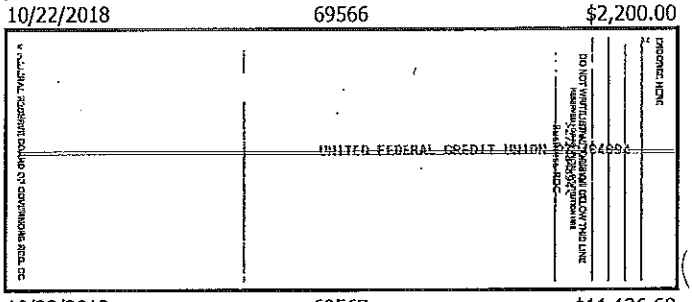
PAY ***Eleven Thousand One Hundred Thirty-Six and 60/100 Dollars***

TO THE ORDER OF ASSOCIATES CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

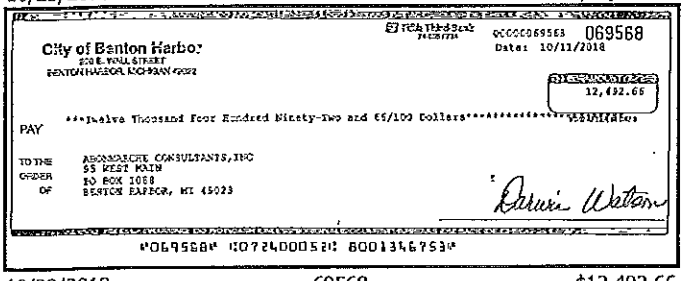
Darwin Watson

⑈069567⑈ ⑆072400052⑆ 8001346753⑈

10/23/2018 69567 $11,136.60


UNITED FEDERAL CREDIT UNION

10/23/2018 69567 $11,136.60


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069568 069568
Date 10/11/2018

AMOUNT 12,492.66

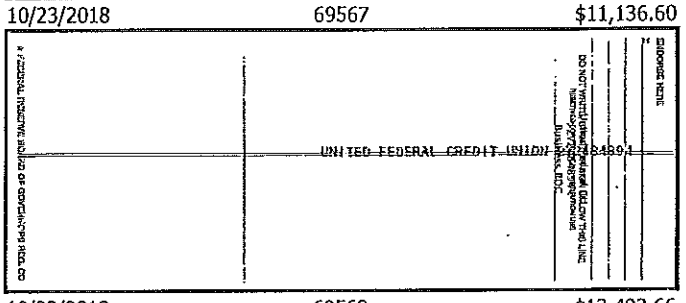
PAY ***Twelve Thousand Four Hundred Ninety-Two and 66/100 Dollars***

TO THE ORDER OF ASSOCIATES CONSULTANTS,INC
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

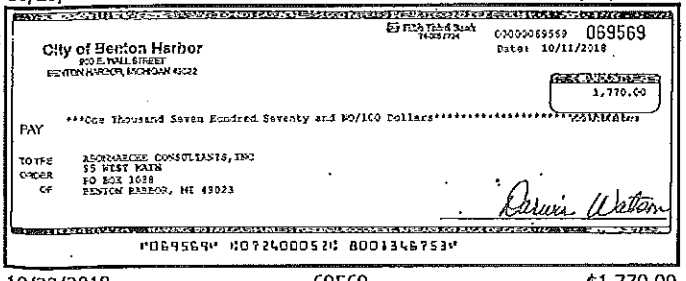
Darwin Watson

⑈069568⑈ ⑆072400052⑆ 8001346753⑈

10/23/2018 69568 $12,492.66


UNITED FEDERAL CREDIT UNION

10/23/2018 69568 $12,492.66


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069569 069569
Date 10/11/2018

AMOUNT 1,770.00

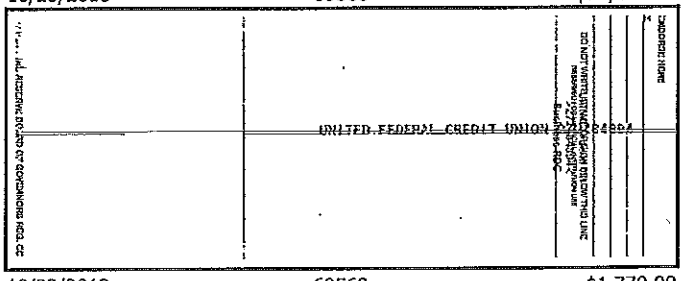
PAY ***One Thousand Seven Hundred Seventy and 00/100 Dollars***

TO THE ORDER OF ASSOCIATES CONSULTANTS,INC
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

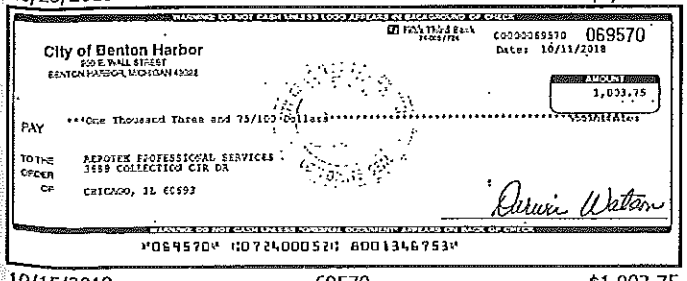
Darwin Watson

⑈069569⑈ ⑆072400052⑆ 8001346753⑈

10/23/2018 69569 $1,770.00


UNITED FEDERAL CREDIT UNION

10/23/2018 69569 $1,770.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank 74-68/724 00000069570 069570
Date 10/11/2018

AMOUNT 1,003.75

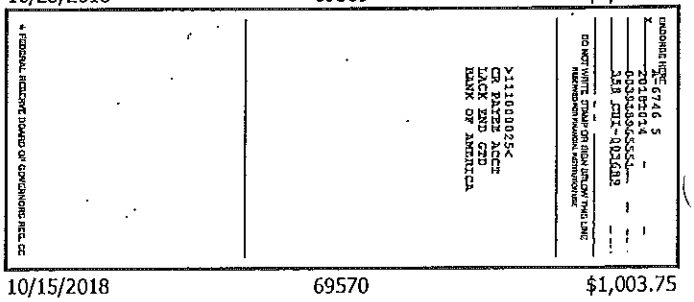
PAY ***One Thousand Three and 75/100 Dollars***

TO THE ORDER OF AEROTEK PROFESSIONAL SERVICES
3689 COLLECTION CTR DR
CHICAGO, IL 60693

Darwin Watson

⑈069570⑈ ⑆072400052⑆ 8001346753⑈

10/15/2018 69570 $1,003.75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CR PAYEE ACCT
LOCK BND GRD
BANK OF AMERICA

10/15/2018 69570 $1,003.75

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

12/19/18

INVOICE

No. 124254
11/28/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt

Professional services through 11/15/18:

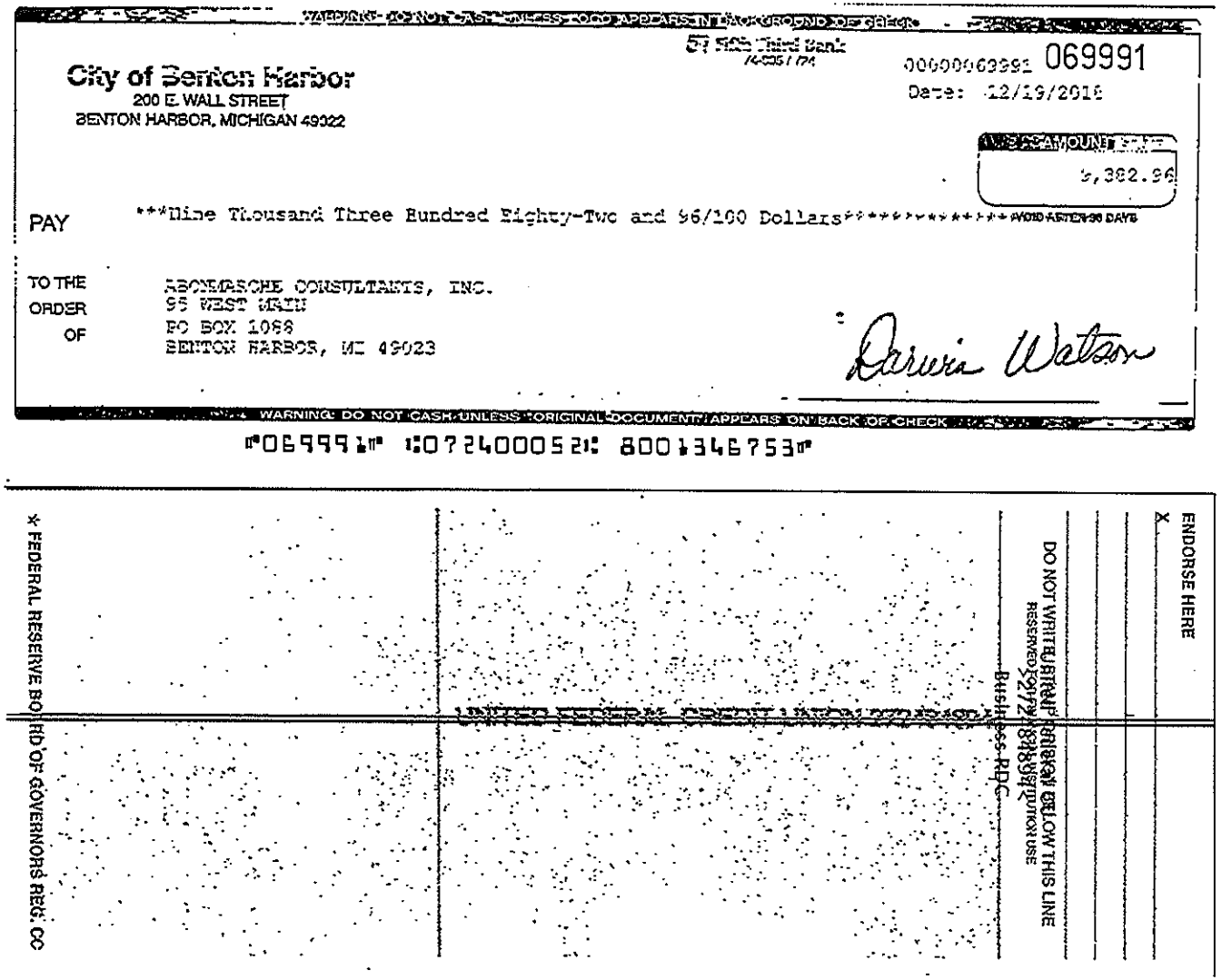
		Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101	Update Distribution System Inventory	$35,260.46	$12,315.00	$7,674.10	$15,271.36
	Herald Palladium Ad - $ 260.46				
102	Update/Improve Asset Management Program	$30,000.00	$9,101.60	$516.36	$20,382.04
103	Lead Service Line Construction	$10,000.00	$5,710.00	$1,192.50	$3,097.50
	Totals:	$75,260.46	$27,126.60	$9,382.96	$38,750.90

Invoice Amount **$9,382.96**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS IN BACK GROUND OF CHECK

5/3rd Third Bank
74-535/724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

000000069991 069991
Date: 12/19/2018

VOID AFTER 90 DAYS
AMOUNT
$ 9,382.96

PAY ***Nine Thousand Three Hundred Eighty-Two and 96/100 Dollars**********

TO THE ORDER OF
ABONMARCHE CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1068
BENTON HARBOR, MI 49023

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈069991⑈ ⑆072400052⑆ 800134675 3⑈

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

UNITED FEDERAL CREDIT UNION

DO NOT WRITE BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE

Business RDC

ENDORSE HERE
X

Transaction Type: Check	Customer Reference #: 69991
Transaction Date: 2019-01-11	Bank Reference #: 600474207372
Amount: 9382.96	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

1/9/19

INVOICE

No. 124634
12/31/2018

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 12/15/18, including construction kickoffs with contractors, reviewing progress, and distributing door notices.

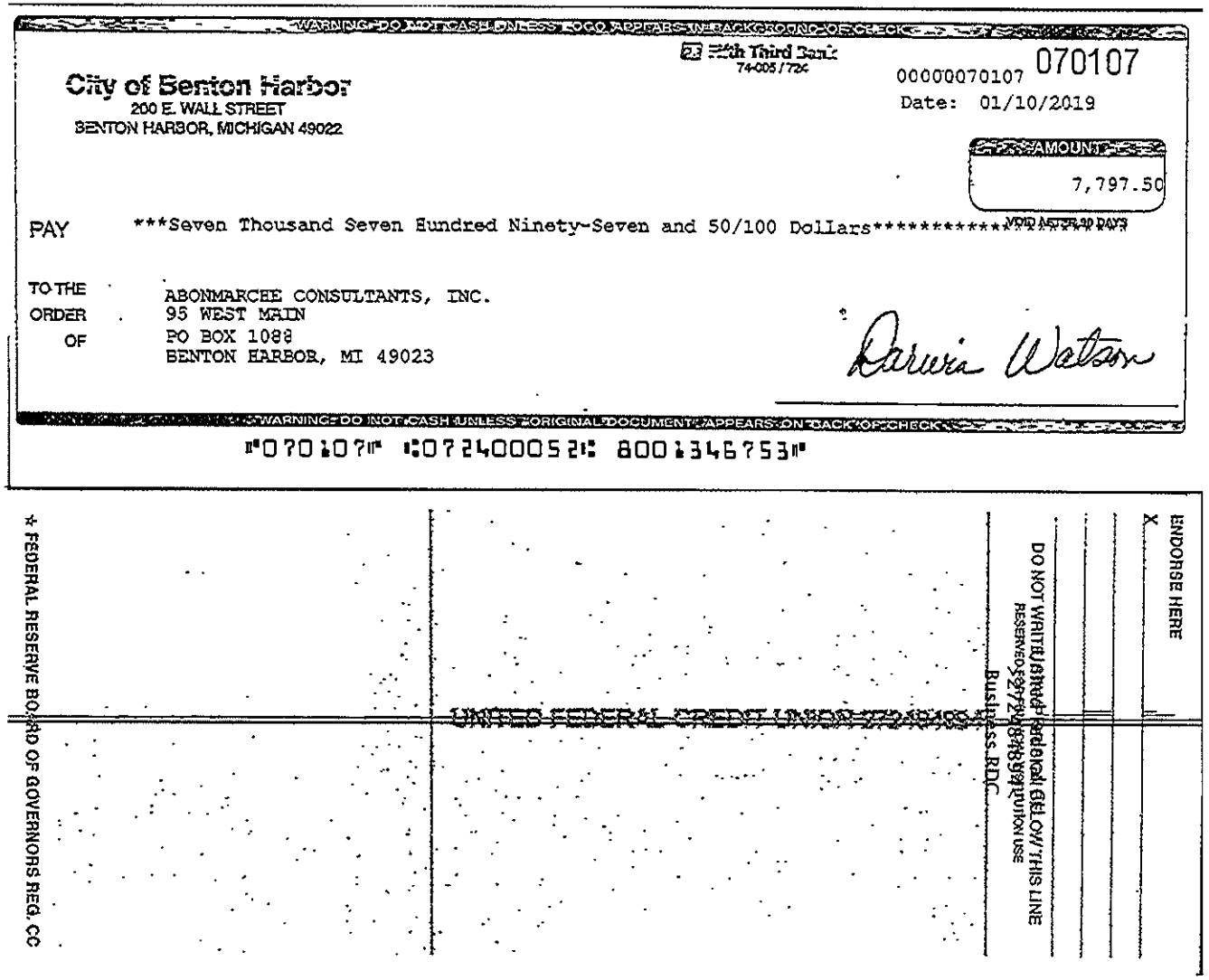
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$19,989.10	$4,945.00	$10,326.36
102 Update/Improve Asset Management Program	$30,000.00	$9,617.96	$2,517.50	$17,864.54
103 Lead Service Line Construction	$10,000.00	$6,902.50	$335.00	$2,762.50
Totals:	$75,260.46	$36,509.56	$7,797.50	$30,953.40

Invoice Amount **$7,797.50**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



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Transaction Date: 2019-01-28	Bank Reference #: 600479374077
Amount: 7797.50	
Description:	

ABONMARCHE

Engineering • Architecture • Lond Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

11/16/19

INVOICE

No. 124749
01/08/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 12/31/18, including construction review, construction estimates, project summary, grant review and field work locating curb stops.

	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$24,934.10	$1,552.50	$8,773.86
102 Update/Improve Asset Management Program	$30,000.00	$12,135.46	$5,590.00	$12,274.54
103 Lead Service Line Construction	$10,000.00	$7,237.50	$0.00	$2,762.50
Totals:	$75,260.46	$44,307.06	$7,142.50	$23,810.90

Invoice Amount **$7,142.50**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

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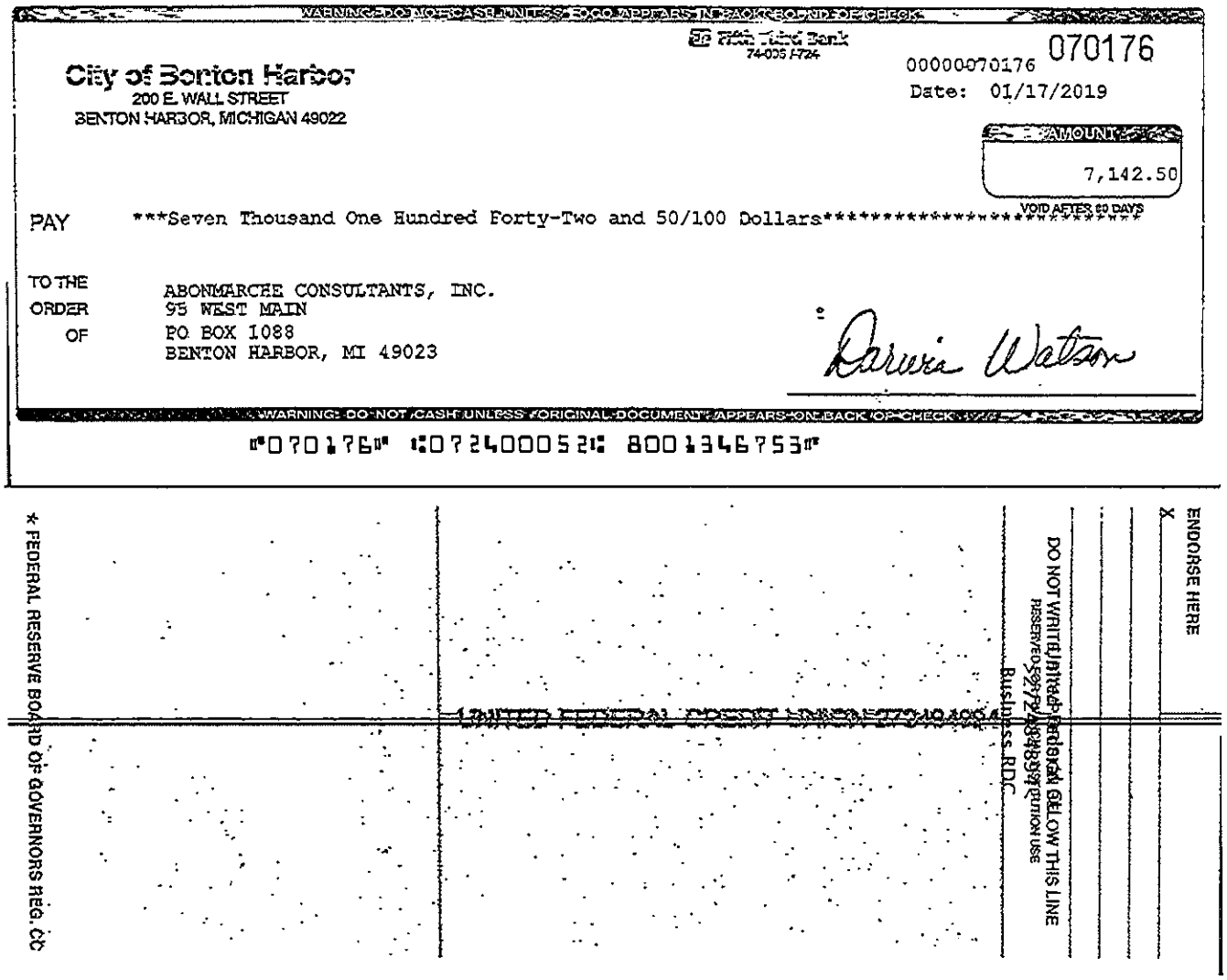
Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



Transaction Type: Check	Customer Reference #: 70176
Transaction Date: 2019-01-28	Bank Reference #: 600479374074
Amount: 7142.50	
Description:	

DWatson
2/21/19

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 125102
02/13/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 1/31/19, including construction administration, construction estimates, project summary, grant review and on-site inspections and easement execution.

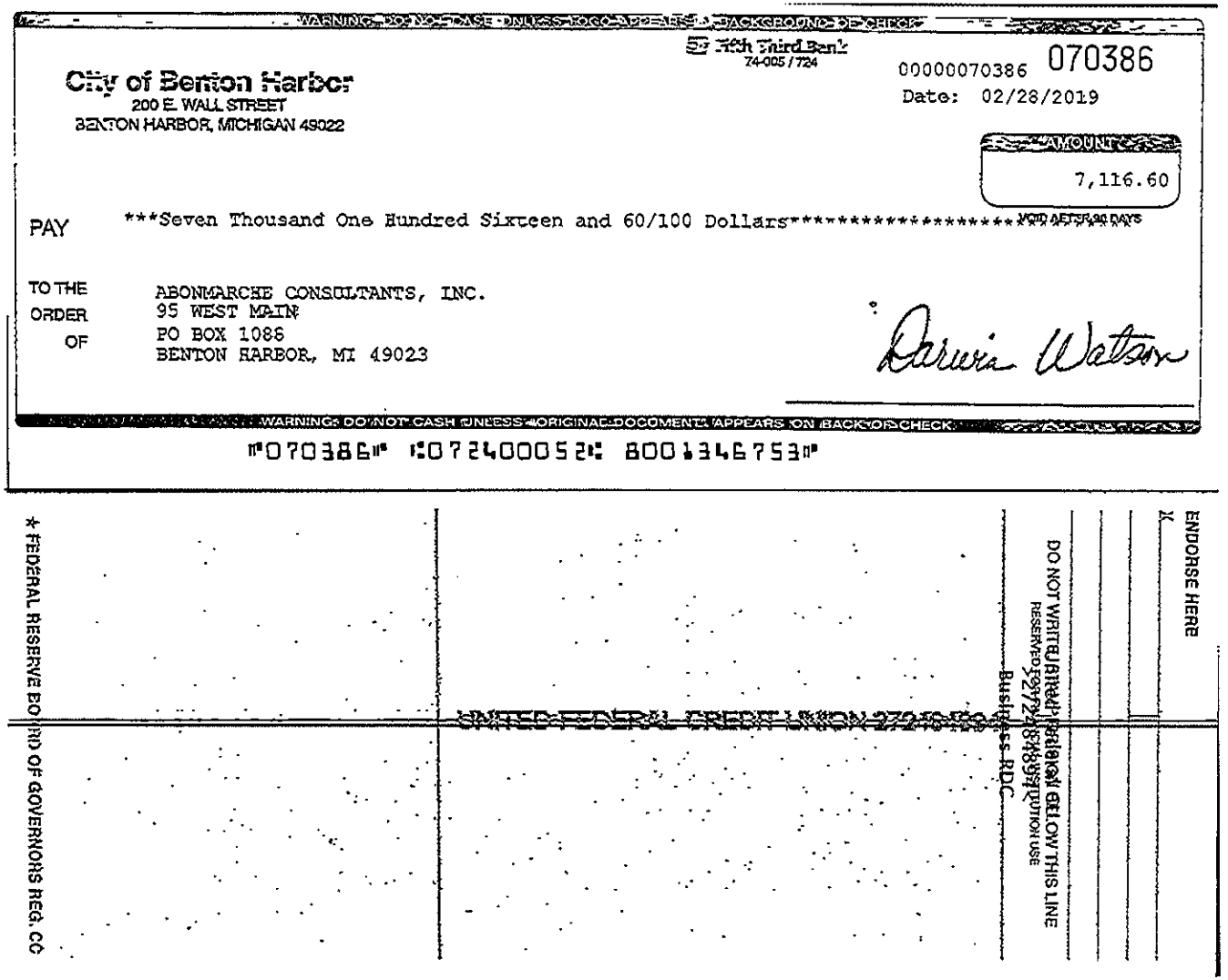
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$26,486.60	$5,929.25	$2,844.61
102 Update/Improve Asset Management Program	$30,000.00	$17,725.46	$0.00	$12,274.54
103 Lead Service Line Construction	$10,000.00	$7,237.50	$1,187.35	$1,575.15
Totals:	$75,260.46	$51,449.56	$7,116.60	$16,694.30

Invoice Amount **$7,116.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



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Transaction Date: 2019-03-14	Bank Reference #: 600479129412
Amount: 7116.60	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

3/21/19

INVOICE

No. 125391
03/11/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 2/28/19, including construction administration, construction estimates, project summary, grant review, on-site inspections, easement execution, working with contractors on lead service replacement, service verification, and construction inspections.

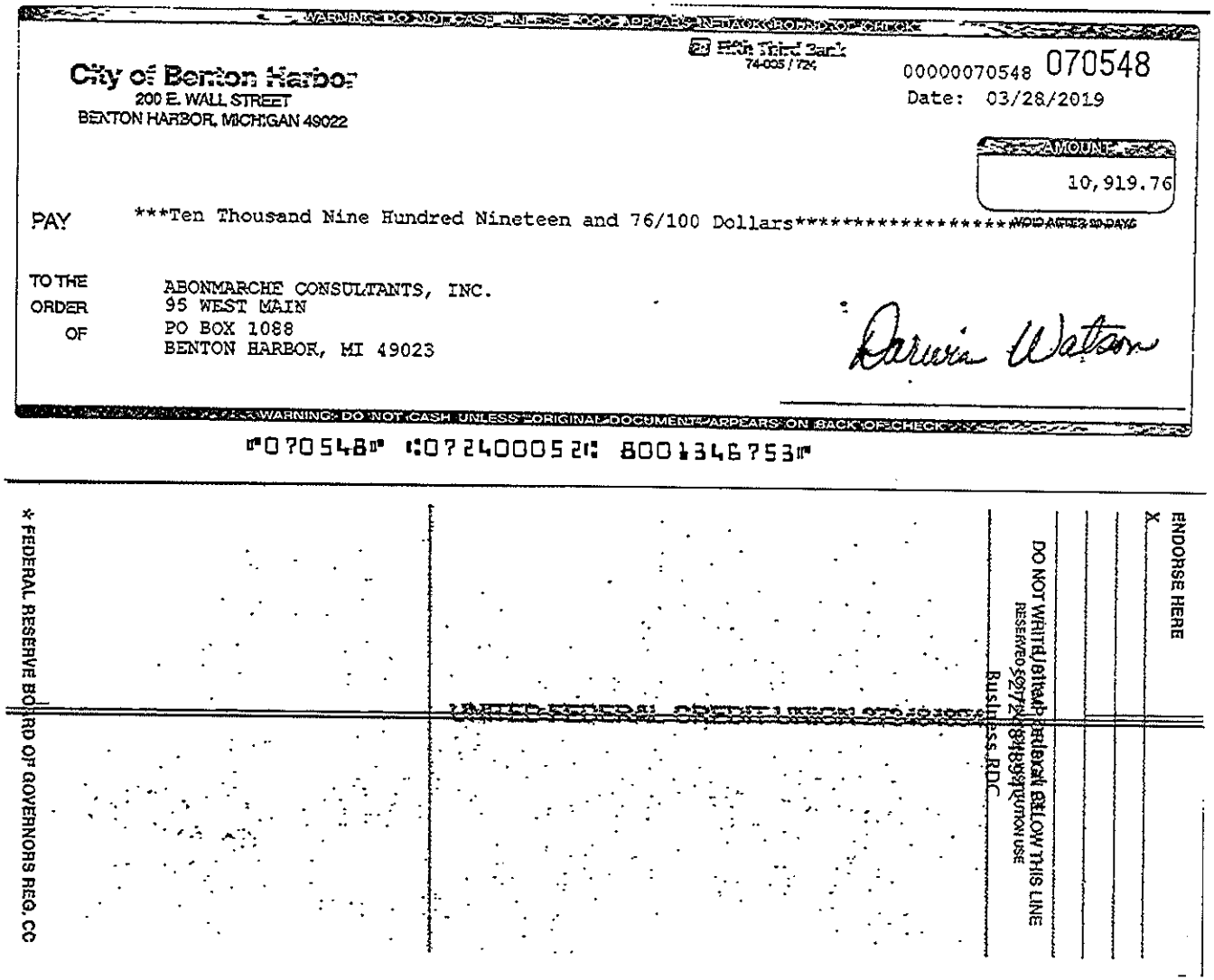
	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$32,415.85	$2,844.61	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$17,725.46	$6,500.00	$5,774.54
103 Lead Service Line Construction	$10,000.00	$8,424.85	$1,575.15	$0.00
Totals:	$75,260.46	$58,566.16	$10,919.76	$5,774.54

Invoice Amount **$10,919.76**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



Transaction Type: Check	Customer Reference #: 70548
Transaction Date: 2019-04-10	Bank Reference #: 600478717366
Amount: 10919.76	
Description:	

Rec'd 05/24/19

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

5/29/19

INVOICE

No. 126139
05/15/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt JWM

Professional services through 5/15/19, including construction administration, construction estimates, project summary, grant review, on-site inspections, easement execution, working with contractors on lead service replacement, service verification, and construction inspections. Compiling LSLR Review webinar and MDEQ memorandum.

	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$35,260.46	$0.00	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$24,225.46	$5,774.54	$0.00
103 Lead Service Line Construction	$10,000.00	$10,000.00	$0.00	$0.00
600 Deleted Phase	$0.00	$0.00	$0.00	$0.00
900 Deleted Phase	$0.00	$0.00	$0.00	$0.00
Totals:	$75,260.46	$69,485.92	$5,774.54	$0.00

Invoice Amount **$5,774.54** ✓

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

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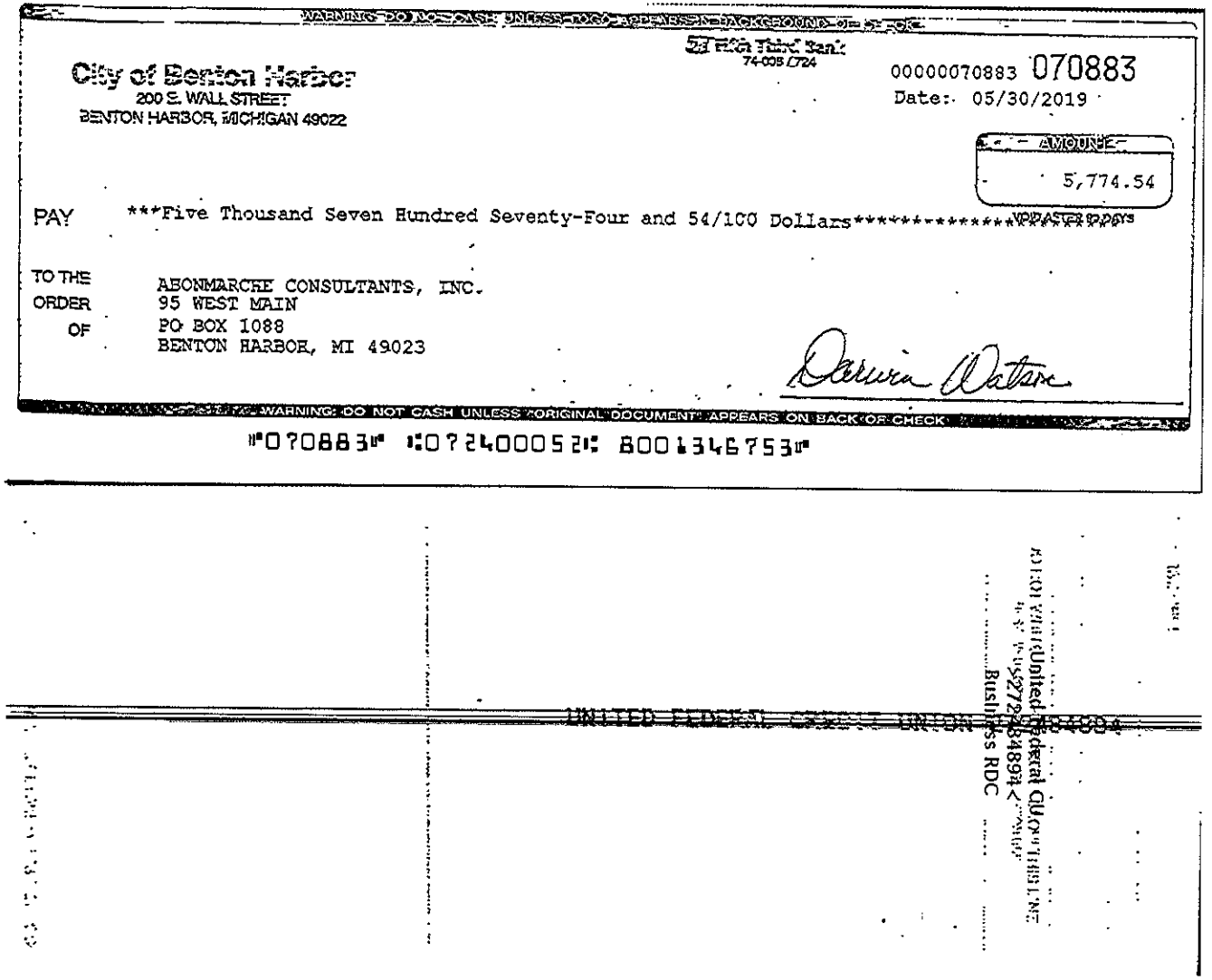
Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023



City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-0058/724

00000070883 070883
Date: 05/30/2019

AMOUNT
5,774.54

PAY ***Five Thousand Seven Hundred Seventy-Four and 54/100 Dollars**********

TO THE ORDER OF
ABONMARCHE CONSULTANTS, INC.
95 WEST MAIN
PO BOX 1088
BENTON HARBOR, MI 49023

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070883⑈ ⑆072400052⑆ 800134675 3⑈

UNITED FEDERAL CREDIT UNION

(United Federal Credit Union)
Business RDC

Transaction Type: Check	Customer Reference #: 70883
Transaction Date: 2019-06-10	Bank Reference #: 600478304791
Amount: 5774.54	
Description:	

pd

ABONMARCHE

Engineering • Architecture • Land Surveying

January 2, 2019

PAYMENT REQUEST NO. 1
For Work Completed Through 12/31/2018

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	0.00
Current Contract Amount	$	10,000.00
Work Completed	$	10,000.00
Retainage (10%)	$	1,000.00
Amount Earned	$	9,000.00
Less Previous Payments	$	0.00
Amount Due Contractor This Payment	$	9,000.00

RECOMMENDED BY: Contractor

Bruce Binger (B & Z) — 1-14-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 1/14/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 1/15/19 Date

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
12/27/2018	181239

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
Verbal	Multiple Locations	Net 10	1/6/2019

Date	Item	Description	Quan.	Units	Rate	Amount
		Lead service lines				
	Proposed Work	Dug up and inspected waterline to check for lead services	20	ea	500.00	10,000.00

An unpaid balance after the due date may be subject to a late payment charge of 1 5% per month
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$10,000.00**

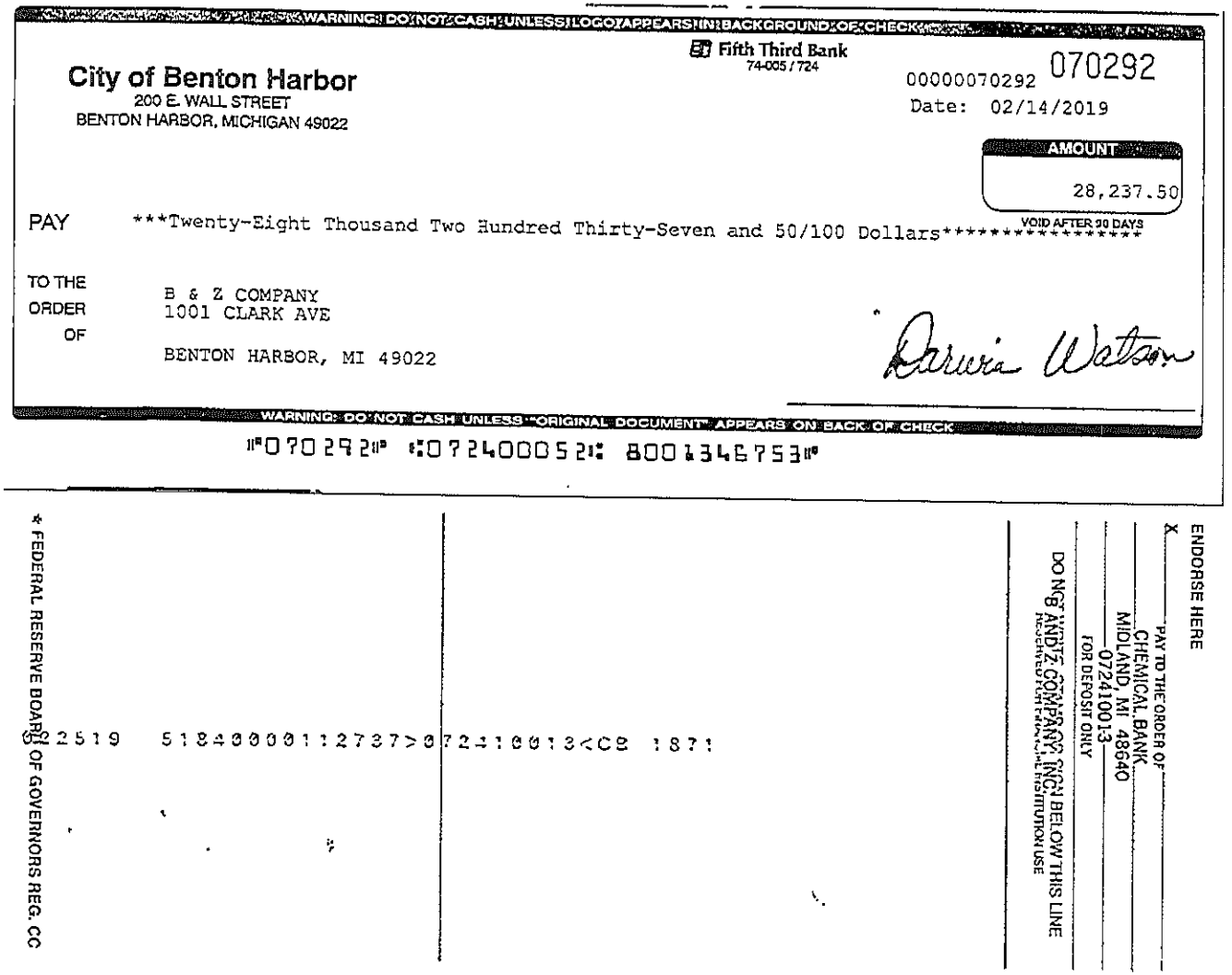
Phone #
269-925-6999

Fax #
269-925-0578

Vendor: 0686 B & Z COMPANY Check #: 00000070292 02/14/2019

Date	Invoice	Description/Detail	Amount
01/31/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	9,000.00
01/31/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	19,237.50

Total: 28,237.50



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070292 070292
Date: 02/14/2019

AMOUNT
28,237.50
VOID AFTER 90 DAYS

PAY ***Twenty-Eight Thousand Two Hundred Thirty-Seven and 50/100 Dollars**********

TO THE ORDER OF
B & Z COMPANY
1001 CLARK AVE
BENTON HARBOR, MI 49022

Darwin Watson

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⑈070292⑈ ⑆072400052⑆ 8001346753⑈

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022519 518400001127 37>072410013<CB 1871

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

Transaction Type: Check	Customer Reference #: 70292
Transaction Date: 2019-02-26	Bank Reference #: 600471951867
Amount: 28237.50	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

V70292
pd 2-14-19

February 01, 2019

PAYMENT REQUEST NO. 2

For Work Completed Through 01/31/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders (#1)	$	44,775.00
Current Contract Amount	$	54,775.00
Work Completed (Inv #s 181239, 190149, 190150 & 190151)	$	31,375.00
Retainage (10%)	$	3,137.50
Amount Earned	$	28,237.50
Less Previous Payments (PR#1)	$	9,000.00
Amount Due Contractor This Payment	$	19,237.50

RECOMMENDED BY: Contractor

Bruce Binger (B & Z) — Date: 2-1-2019

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 2/2/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 2/5/19

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
1/29/2019	190149

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
Verbal	Multiple Locations	Net 10	2/8/2019

Date	Item	Description	Quan.	Units	Rate	Amount
		Lead service lines				
	Proposed Work	Dug up and inspected waterline to check for lead services	25	ea	400.00	10,000.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$10,000.00**

Phone #
269-925-6999

Fax #
269-925-0578

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
1/29/2019	190150

Bill To

City of Benton Harbor
Attn: Accounts Payble
200 E. Wall St.
Benton Harbor, MI 49022

Project
Columbus

Phone	Fax

P.O. No.	Location	Terms	Due Date
5209	554 Columbus	Net 10	2/8/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main and disconnected the old line, ran a new line under the street to the curb stop where we ran a new waterline from the curb stop into the house and have a plumber do the interior connections. We kept the sidewalk intact and restore gravel or topsoil where needed for restoration along with patching the road.	1	ls	6,400.00	6,400.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$6,400.00**

Phone #
269-925-6999

Fax #
269-925-0578

B and Z Company

1001 Clarke Ave
Benton Harbor, MI 49022

Invoice

Date	Invoice #
1/29/2019	190151

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5211	884 Wauceda	Net 10	2/8/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	We retired the waterline running under the tree. Then we tapped a new line and ran it into the house where a plumber did the interior connections. We will then asphalt patch the road and finish with any yard restoration that is needed	1	ls	4,975.00	4,975.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$4,975.00**

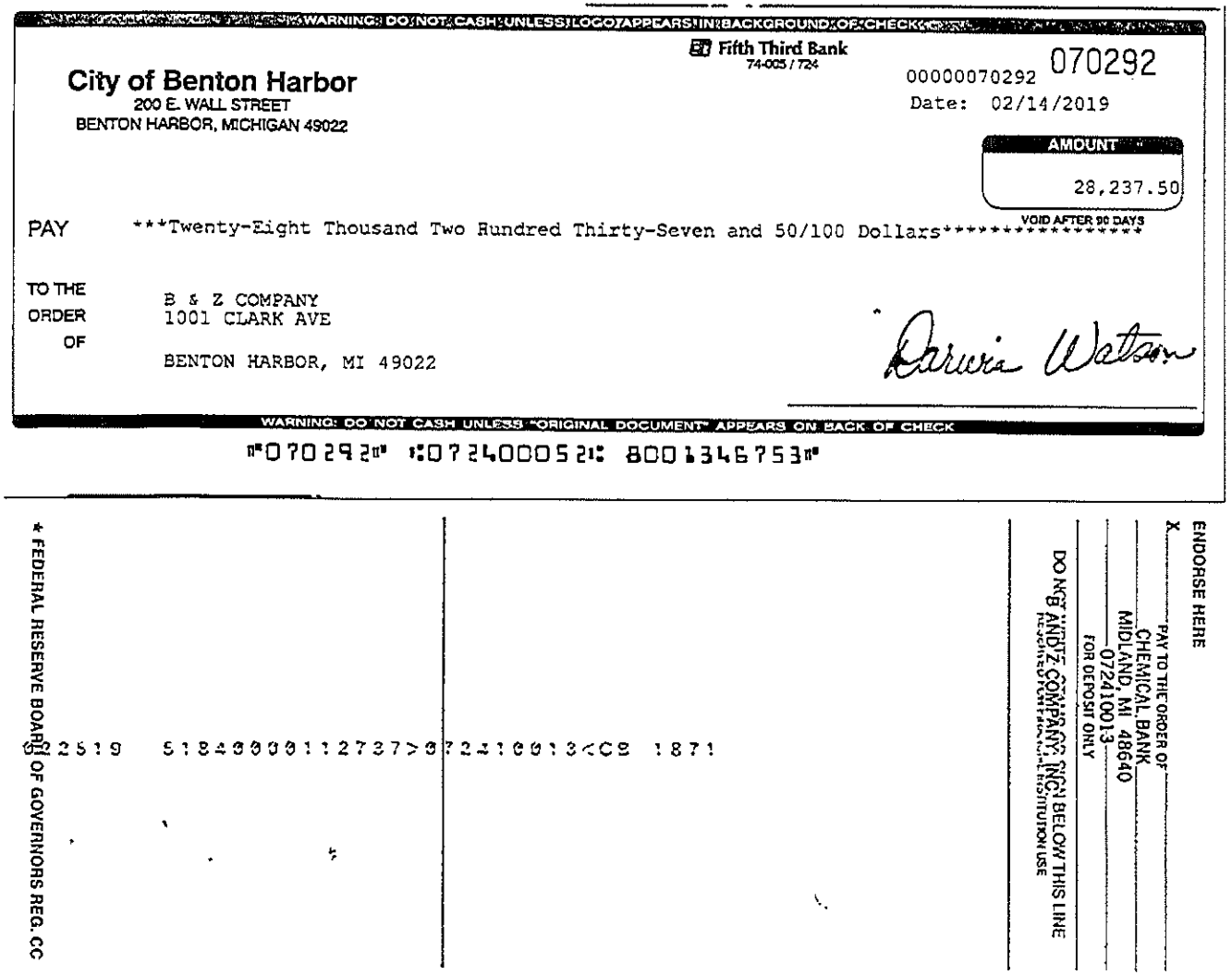
Phone #
269-925-6999

Fax #
269-925-0578

Vendor: 0686 B & Z COMPANY Check #: 00000070292 02/14/2019

Date	Invoice	Description/Detail	Amount
01/31/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	9,000.00
01/31/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS	19,237.50

Total: 28,237.50



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Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070292 070292
Date: 02/14/2019

AMOUNT
28,237.50
VOID AFTER 90 DAYS

PAY ***Twenty-Eight Thousand Two Hundred Thirty-Seven and 50/100 Dollars**********

TO THE ORDER OF
B & Z COMPANY
1001 CLARK AVE
BENTON HARBOR, MI 49022

Darwin Watson

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* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

Transaction Type: Check	Customer Reference #: 70292
Transaction Date: 2019-02-26	Bank Reference #: 600471951867
Amount: 28237.50	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

March 01, 2019

PAYMENT REQUEST NO. 3

For Work Completed Through 02/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders (#1)	$	44,775.00
Current Contract Amount	$	54,775.00 w/p 23,400
Work Completed	$	54,775.00
Retainage (10%)	$	5,477.50 retainage $2340
Amount Earned	$	49,297.50
Less Previous Payments (PR#1 & #2)	$	28,237.50
Amount Due Contractor This Payment	$	21,060.00 = pmt

RECOMMENDED BY: Contractor

Bruce Binger (B & Z) — Date: 3-1-2019

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 3/4/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 3/5/19

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	190256

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
Verbal	Multiple Locations	Net 10	3/10/2019

Date	Item	Description	Quan.	Units	Rate	Amount
		Lead service lines				
	Proposed Work	Dug up and inspected waterline to check for lead services (Final 12 of Phase 2, 37 lead lines total)	12	ea	400.00	4,800.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$4,800.00**

Phone #	Fax #

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	190257

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5210	1180 Lavette	Net 10	3/10/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main, disconnect the old waterline, tap a new line and ran it under the street to the curb stop. We then ran a new waterline from the curb stop into the house where we had a plumber do the interior connections. We will replace concrete sidewalk where we excavated around the curb stop, place topsoil, seed for restoration and patching of the road	1	ls	6,575.00	6,575.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$6,575.00**

Phone #	Fax #

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	190258

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5207	1093 Superior	Net 10	3/10/2019

Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main, disconnected the old line, tapped a new line and ran it under the road into the curb stop. Patched the road, finished with topsoil and seed for yard restoration	1	ls	6,925.00	6,925.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$6,925.00**

Phone #	Fax #

B and Z Company

1001 Clarke Ave
Benton Harbor, MI 49022

Invoice

Date	Invoice #
2/28/2019	190259

Bill To

City of Benton Harbor
Attn: Account Payable
200 E. Wall St.
Benton Harbor, MI 49022

Project

Phone	Fax

P.O. No.	Location	Terms	Due Date
5208	791 Buss	Net 10	3/10/2019

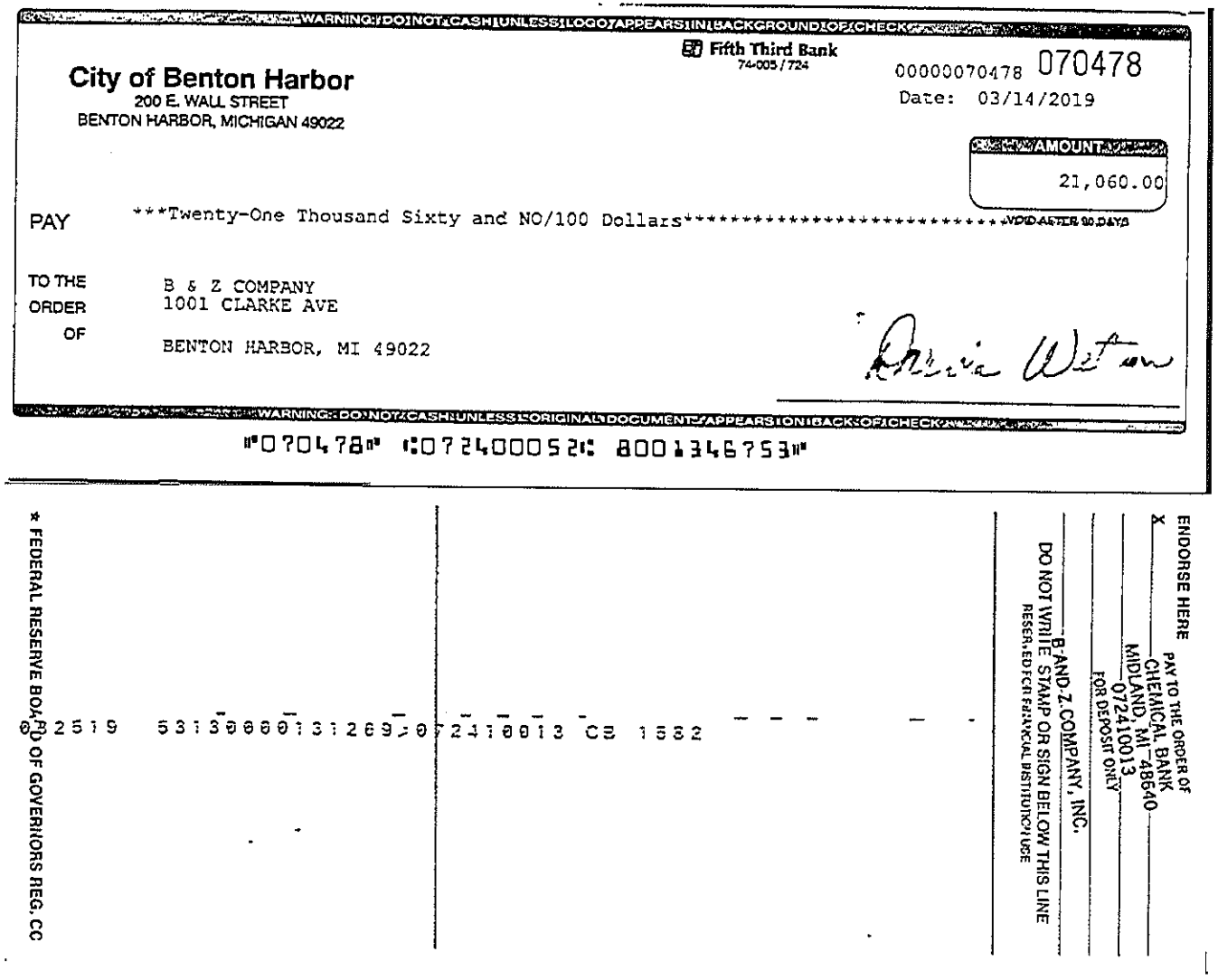
Date	Item	Description	Quan.	Units	Rate	Amount
	Proposed Work	Excavated at the main, disconnected the old line, tapped and ran a new waterline under the street to the curb stop. Excavate and haul off concrete to run a new waterline from the curb stop into the house where we had a plumber do the interior connections. We will form and pour concrete driveway to replace where we excavated, we will finish with road patch and yard restoration	1	ls	7,150.00	7,150.00

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases

Total **$7,150.00**

Phone #

Fax #



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City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005 / 724

00000070478 070478
Date: 03/14/2019

AMOUNT
21,060.00

PAY ***Twenty-One Thousand Sixty and NO/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
B & Z COMPANY
1001 CLARKE AVE
BENTON HARBOR, MI 49022

Dennis Weston

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0 82519 5313000013126 9 072410013 CB 1582

Transaction Type: Check	Customer Reference #: 70478
Transaction Date: 2019-03-26	Bank Reference #: 600472602180
Amount: 21060.00	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

May 2, 2019

PAYMENT REQUEST NO. 4
For Work Completed Through 04/26/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	51,325.00
Current Contract Amount	$	61,325.00
Work Completed	$	61,325.00
Retainage (10%)	$	6,132.50
Amount Earned	$	55,192.50
Less Previous Payments	$	49,297.50
Amount Due Contractor This Payment	$	5,895.00

6550.0
retainage 655.0
5895.0

RECOMMENDED BY: Contractor

Bruce Bringer

Bruce Bringer (B & Z)

5-8-2019
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/8/19
Date

ACCEPTED BY: Owner

Darwin Watson

Darwin Watson (Benton Harbor)

5/14/19
Date

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
4/25/2019	190437

Bill To

City of Benton Harbor
Attn: Mike O'Malley
200 E. Wall St.
Benton Harbor, MI 49022

Job Name / Location
385 Britain

Phone

Fax

P.O. No.	Project	Terms	Due Date
		Net 10	5/5/2019

Date	Item	Description	Quan.	Units	Rate	Amount
4/17/2019	Work Complete	Per proposal #5259 dated 3-19-19 - Replace water line at 385 E. Britain	1	ls	6,550.00	6,550.00

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APR 29 2019
ABONMARCHE
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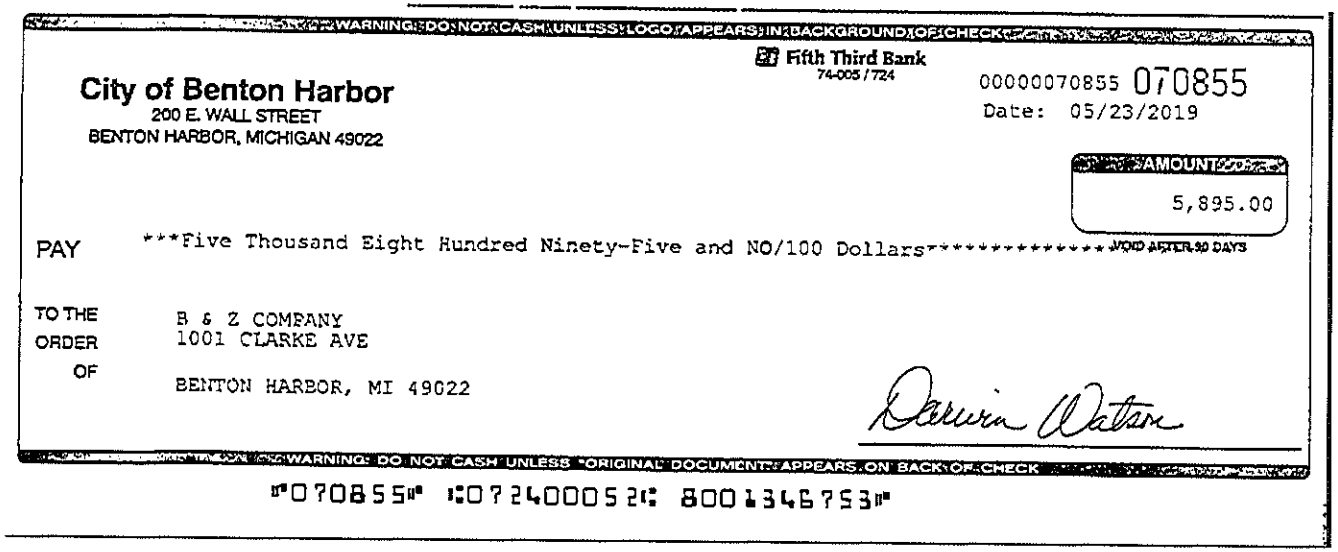
BB

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases.

Total	$6,550.00
Payments/Credits	$0.00
Balance Due	$6,550.00

Phone #

Fax #



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Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070855 070855
Date: 05/23/2019

AMOUNT
5,895.00

PAY ***Five Thousand Eight Hundred Ninety-Five and NO/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
B & Z COMPANY
1001 CLARKE AVE
BENTON HARBOR, MI 49022

Darwin Watson

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⑈070855⑈ ⑆072400052⑆ 8001346753⑈

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B AND Z COMPANY, INC.

Transaction Type: Check	Customer Reference #: 70855
Transaction Date: 2019-06-03	Bank Reference #: 600479064453
Amount: 5895.00	
Description:	

Copy

ABONMARCHE

Engineering • Architecture • Land Surveying

January 2, 2019

PAYMENT REQUEST NO. 1

For Work Completed Through 12/31/2018

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00
Change Orders	$	0.00
Current Contract Amount	$	6,500.00
Work Completed	$	5,850.00
Retainage	$	585.00
Amount Earned	$	5,265.00
Less Previous Payments	$	0.00
Amount Due Contractor This Payment	$	5,265.00

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — Date: 1-14-19

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 1/14/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 1/15/19

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
12/21/2018	2116

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

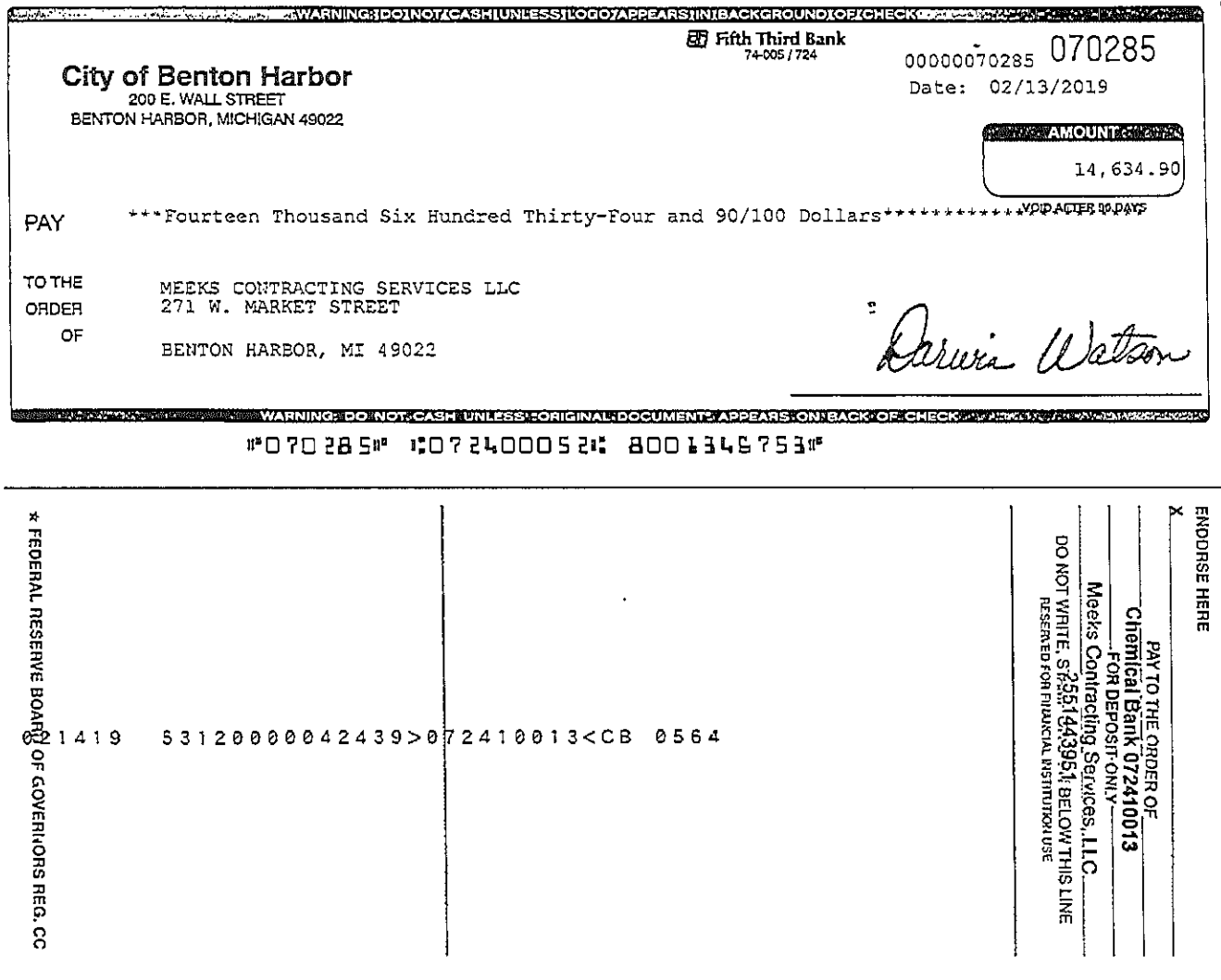
Quantity	Description	Rate	Amount
	Invoice for lead Verifications at the following Addresses		
1	277 Hastings	325.00	325.00
1	261 Searlos	325.00	325.00
1	274 Parker	325.00	325.00
1	191 Searles	325.00	325.00
1	1084 Salem	325.00	325.00
1	127 Searles	325.00	325.00
1	142 Searles	325.00	325.00
1	150 parker	325.00	325.00
1	1165 Hannan	325.00	325.00
~~1~~	~~1134 LaVatte~~ (SKIPPED DUE TO TREE ROOTS & GAS MAIN)	~~325.00~~	~~325.00~~
1	754 LaVatte	325.00	325.00
1	732 McAllister	325.00	325.00
1	846 McAlister	325.00	325.00
1	964 McAlister	325.00	325.00
1	1067 McAlister	325.00	325.00
1	1134 Pavone	325.00	325.00
1	839 Pavone	325.00	325.00
1	831 Pavone	325.00	325.00
~~1~~	~~828 Broadway~~ (SKIPPED, UNABLE TO LOCATE)	~~325.00~~	~~325.00~~
1	830 Broadway	325.00	325.00

Total ~~$6,500.00~~ $5,850.00

Vendor: 0798 MEEKS CONTRACTING SERVICES LLC Check #: 00000070285 02/13/2019

Date	Invoice	Description/Detail	Amount
01/02/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-1	5,265.00
02/01/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-2	9,369.90

Total: 14,634.90



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Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070285 070285
Date: 02/13/2019

AMOUNT
14,634.90

PAY ***Fourteen Thousand Six Hundred Thirty-Four and 90/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

Darwin Watson

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021419 53120000042439>072410013<CB 0564

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Transaction Type: Check	Customer Reference #: 70285
Transaction Date: 2019-02-15	Bank Reference #: 600471111186
Amount: 14634.90	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

February 01, 2019

PAYMENT REQUEST NO. 2
For Work Completed Through 01/31/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00
Change Orders (#1)	$	49,950.00
Current Contract Amount	$	56,450.00
Work Completed (INV 2116 + INV 2128)	$	16,261.00
Retainage (10%)	$	1,626.10
Amount Earned	$	14,634.90
Less Previous Payments (PR#1)	$	5,265.00
Amount Due Contractor This Payment	$	9,369.90

pd
✓ 70285
2-13-19

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — Date: 2.1.19

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — Date: 2/1/19

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — Date: 2/5/19

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
1-23-2019	2128

Bill To

City of Benton Harbor Water dept
200 E Wall St.
Benton Harbor, MI 49022

P O No	Terms	Project
	Due on receipt	

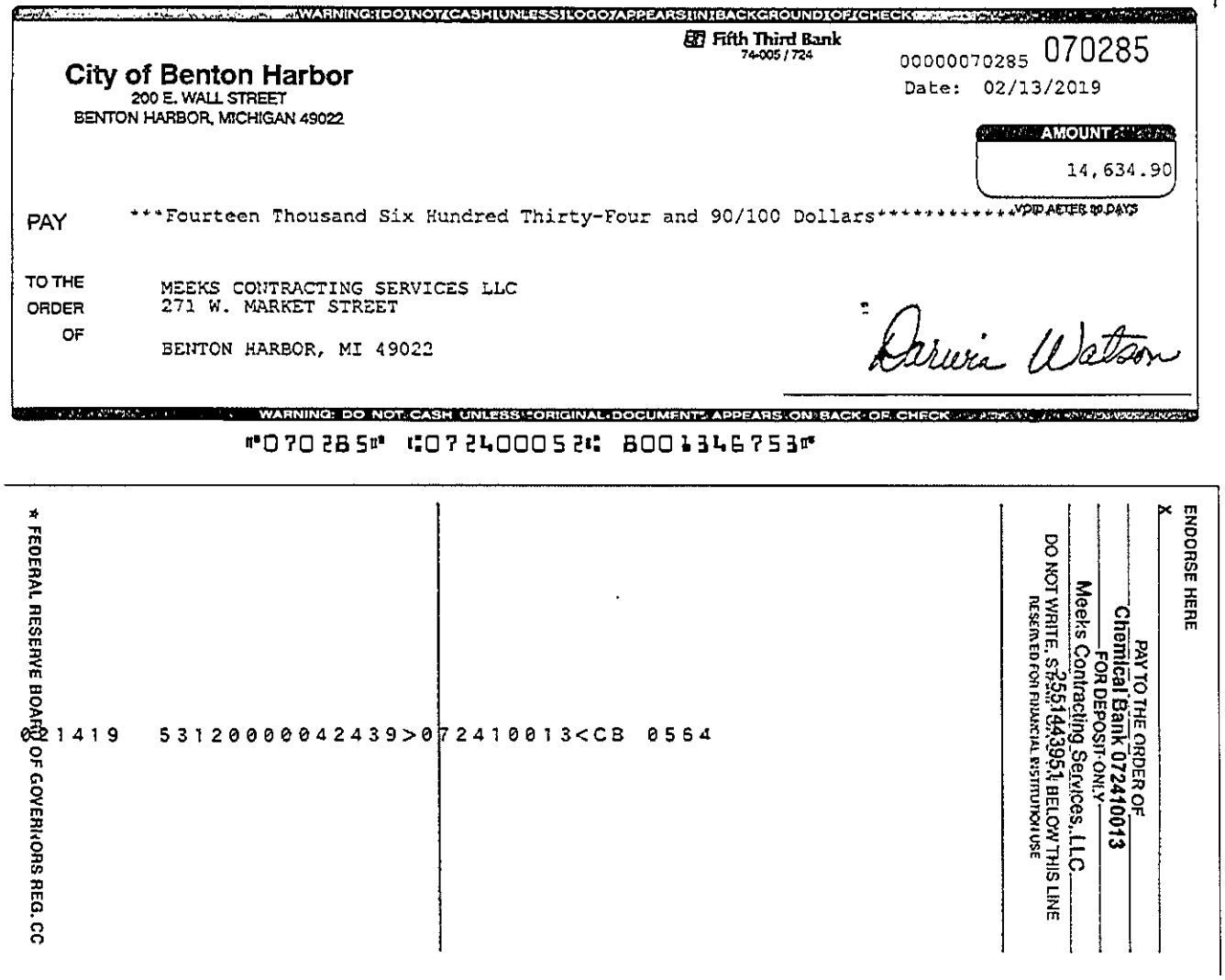
Quantity	Description	Rate	Amount
1	Lead Verification 1053 Jennings	325.00	325.00
1	Lead Verification 1050 Jennings	325.00	325.00
1	Line replacement main to house 1053 Jennings	5,000.00	5,000.00
1	Line replacement main to house 1050 Jennings	5,000.00	5,000.00
1	Refund for Caps Supplied 3/4" Copper pipe	-230.00	-230.00

Total $10,411.00

Vendor: 0798 MEEKS CONTRACTING SERVICES LLC Check #: 00000070285 02/13/2019

Date	Invoice	Description/Detail	Amount
01/02/19	01022019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-1	5,265.00
02/01/19	02012019	LEAD PILOT GRANT-SERVICE VERIFICATIONS-2	9,369.90

Total: 14,634.90



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070285 070285
Date: 02/13/2019

AMOUNT
14,634.90

PAY ***Fourteen Thousand Six Hundred Thirty-Four and 90/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET

BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070285⑈ ⑆072400052⑆ 800134675 3⑈

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Chemical Bank 072410013
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Meeks Contracting Services, LLC
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⑈ FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

⑈1419 5312000042439>072410013<CB 0564

Transaction Type: Check	Customer Reference #: 70285
Transaction Date: 2019-02-15	Bank Reference #: 600471111186
Amount: 14634.90	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

March 01, 2019

PAYMENT REQUEST NO. 3
For Work Completed Through 02/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00	
Change Orders (#1)	$	49,950.00	
Current Contract Amount	$	56,450.00	Pay
Work Completed	$	53,111.00 16,261.00	36,850
Retainage (10%)	$	5,311.10 1626.10	< 3,685 >
Amount Earned	$	47,799.90	
Less Previous Payments (PR#1 & #2)	$	14,634.90	
Amount Due Contractor This Payment	$	33,165.00	33,165.00

RECOMMENDED BY: Contractor

Dorrie Meeks (Meeks Contracting Services, LLC) — 3-4-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 3/25/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 3/20/19 Date

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/6/2019	2131

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Lead Verification 669 Ogden	325.00	325.00
1	Line replacement main to meter 669 Ogden	5,000.00	5,000.00
	Total		$5,325.00

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/26/2019	2137

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Line Replacement from main to meter 831 Pavone	5,000.00	5,000.00
1	Line Replacement from main to meter 839 Pavone	5,000.00	5,000.00
1	Line Replacement from main to meter 838 LaVette	5,000.00	5,000.00
1	Line Replacement from main to meter 155 Kline	5,000.00	5,000.00

Total $20,000.00

Invoice

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/26/2019	2138

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Lead Verifications	325.00	325.00
1	582 Pearl	325.00	325.00
1	664 Superior	325.00	325.00
1	753 Broadway	325.00	325.00
1	582 Niles	325.00	325.00
1	759 Ogden	325.00	325.00
1	776 Monroe	325.00	325.00
1	870 Ogden	325.00	325.00
1	1008 Pearl	325.00	325.00
1	1118 Broadway		

Total $2,925.(

Invoice

Meeks Contracting Services LLC

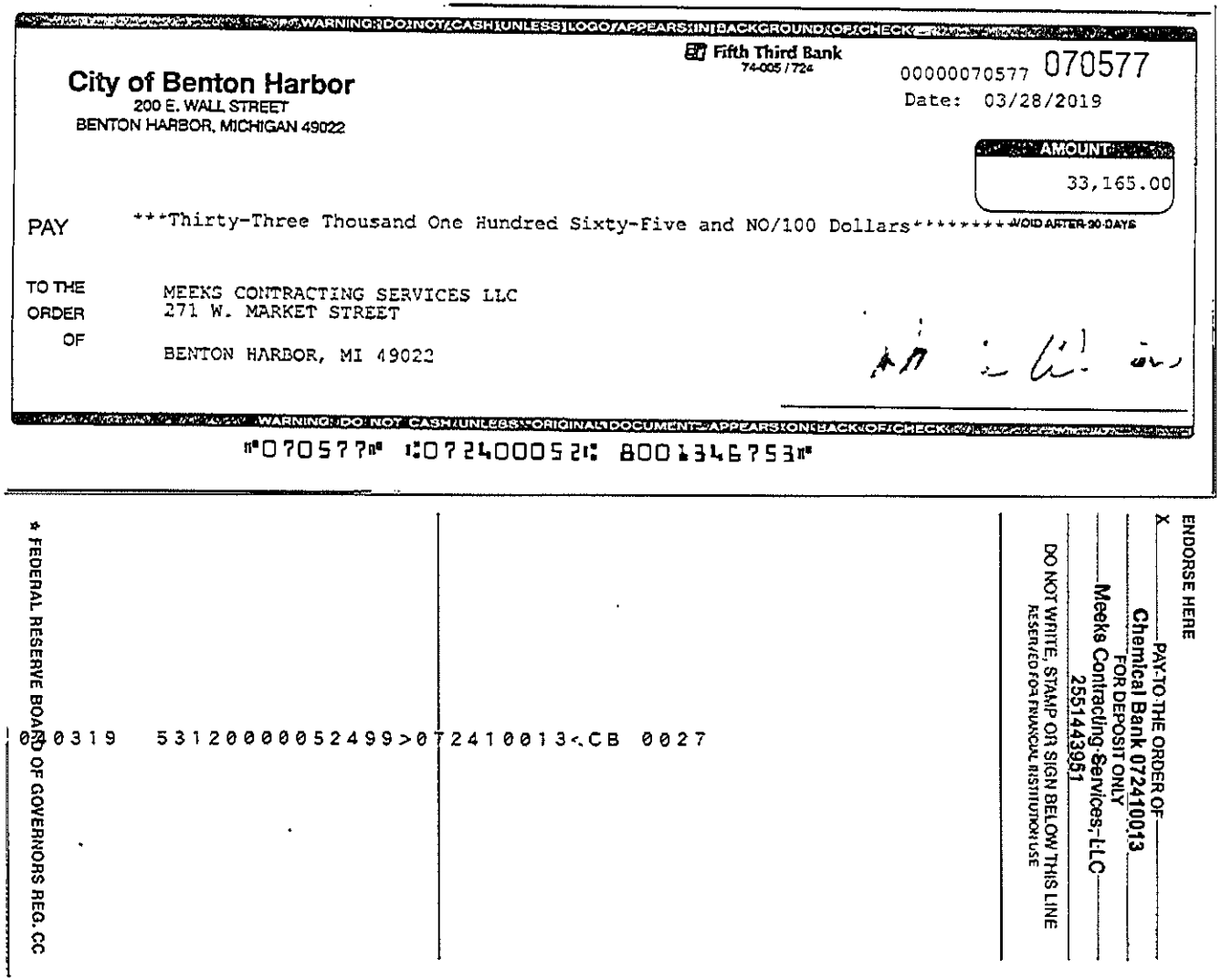
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
2/28/2019	2139

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Line Replacement from curb stop to meter 805 McGuigan	3,600.00	3,600.00
1	Line replacement from Main to Meter 468 Colfax	5,000.00	5,000.00
		Total	$8,60



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005/724

00000070577 070577
Date: 03/28/2019

AMOUNT
33,165.00

PAY ***Thirty-Three Thousand One Hundred Sixty-Five and NO/100 Dollars******** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070577⑈ ⑆072400052⑆ 800134675 3⑈

ENDORSE HERE
X
PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
255143951

DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE

⑆072410013⑆ CB 0027

⑈ FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

Transaction Type: Check	Customer Reference #: 70577
Transaction Date: 2019-04-04	Bank Reference #: 600472385211
Amount: 33165.00	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

April 01, 2019

PAYMENT REQUEST NO. 4
For Work Completed Through 03/31/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00	
Change Orders (#1 & #2)	$	94,950.00	
Current Contract Amount	$	101,450.00	
Work Completed	$	63,111.00	10,000.10
Retainage (10%)	$	6,311.10	(1000.00) retain
Amount Earned	$	56,800.00	
Less Previous Payments (PR#1, #2 & #3)	$	47,799.90	9,000.10
Amount Due Contractor This Payment	$	9,000.10	

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — 3-27-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 4/8/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 4/9/19 Date

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

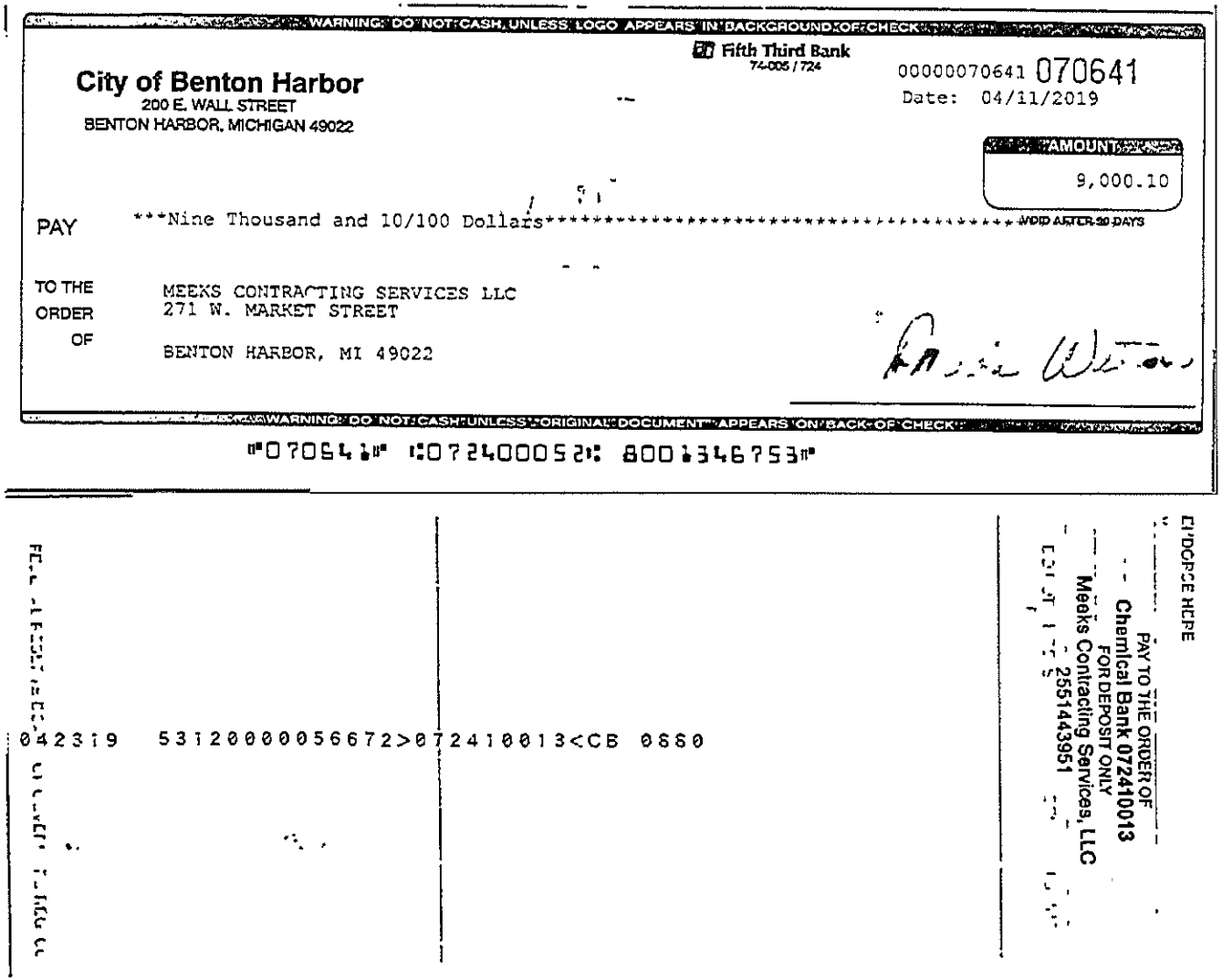
Invoice

Date	Invoice #
3/25/2019	2143

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Line replacement from Main to Meter 791 LaVette	5,000.00	5,000.00
1	Line replacement from Main to Meter 1190 McAlister	5,000.00	5,000.00
	Total		$10,000.00



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070641 070641
Date: 04/11/2019

AMOUNT
9,000.10

PAY ***Nine Thousand and 10/100 Dollars*** VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070641⑈ ⑆072400052⑆ 800134675 3⑈

042319 5312000056672>072410013<CB 0880

PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
255144395 1

ENDORSE HERE

Transaction Type: Check	Customer Reference #: 70641
Transaction Date: 2019-04-23	Bank Reference #: 600474349898
Amount: 9000.10	
Description:	

ABONMARCHE

Engineering • Architecture • Land Surveying

May 20, 2019

PAYMENT REQUEST NO. 5
For Work Completed Through 05/09/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	6,500.00
Change Orders (#1 - #3)	$	69,462.20
Current Contract Amount	$	75,962.20
Work Completed	$	75,962.20
Retainage	$	3,000.00
Amount Earned	$	72,962.20
Less Previous Payments (PR#1 - #4)	$	56,799.10
Amount Due Contractor This Payment	$	16,163.10

off -.90 16,162.20 due

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC)

5-20-19
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/21/19
Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor)

5/21/19
Date

CITY OF BENTON HARBOR
LEAD PILOT GRANT PAY REQUEST 5
MEEKS CONSTRUCTION

	PAY REQUEST 4	CHANGES	PAY REQUEST 5
ORIGINAL CONTRACT	6,500.00		6,500.00
CHANGE ORDERS	94,950.00	(25,487.80)	69,462.20
CURRENT TOTAL CONTRACT AMOUNT	101,450.00	(25,487.80)	75,962.20
WORK COMPLETED	63,111.00	12,851.20	75,962.20
RETAINAGE	6,311.00	(3,311.00)	3,000.00
DUE LESS RETAINAGE	56,800.00		72,962.20
LESS PRIOR PAYMENTS	47,799.90		56,800.00
TOTAL PAYMENT	9,000.10		16,162.20

PAYING:	INVOICE 2150	591-571-977.000	5,200.00
	INVOICE 2151	591-571-977.000	7,651.20
	RELEASE RETAINAGE	591-000-212.000	3,311.00
	TOTAL DUE		**16,162.20**

TOTAL INVOICE	RETAINAGE	PAID
5,850.00	(585.00)	5,265.00
10,411.00	(1,041.10)	9,369.90
36,850.00	(3,685.00)	33,165.00
10,000.10	(1,000.00)	9,000.10
63,111.10	(6,311.10)	56,800.00

ABONMARCHE

Engineering • Architecture • Land Surveying

MAY 20, 2019

CHANGE ORDER NO. 3
LEAD WATER SERVICE VERIFICATION PROJECT
ACI JOB#: 18-0942

OWNER
City of Benton Harbor
200 E. Wall Street
Benton Harbor, MI 49022

CONTRACTOR
Meeks Contracting Services, LLC
271 West Market Street
Benton Harbor, MI 49022

RE: Final balancing and extras.

Original Contract Amount (20 verifications @ $325/EA)	$	6,500.00
Previous Change Orders (#1 & #2)	$	+94,950.00
Previous Contract Amount	$	101,450.00
Net Changes:		
1) Reduce - 5 Replacements @ $5,000/EA	$	-25,000.00
2) Reduce - 23 Verifications @ $325/EA	$	-7,475.00
3) Reduce - 1 Replacement @ $1,400 (805 McGuigan)	$	-1,400.00
4) Reduce - City Materials used	$	-239.00
5) Add – Labor, 13 hrs @ $75/HR	$	+975.00
6) Add - HMA Patching	$	+7,651.20
Current Contract Amount	$	75,962.20

RECOMMENDED BY: CONTRACTOR

Donnie Meeks (Meeks Contracting Services, LLC)

5-20-19
Date

RECOMMENDED BY: ENGINEER

Jason Marquardt, PE (Abonmarche)

5/21/19
Date

APPROVED BY: OWNER

Darwin Watson (Benton Harbor)

5/21/19
Date

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
5/9/2019	2151

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Invoice for Extra Asphalt road repairs		
16	Dump truck hours to haul asphalt	100.00	1,600.00
48	Labor Hours 3 Labors 12hrs each	60.00	2,880.00
20.16	Tons of asphalt	70.00	1,411.20
16	Asphalt roller	35.00	560.00
16	Skidsteer	75.00	1,200.00
		Total	$7,651.20

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

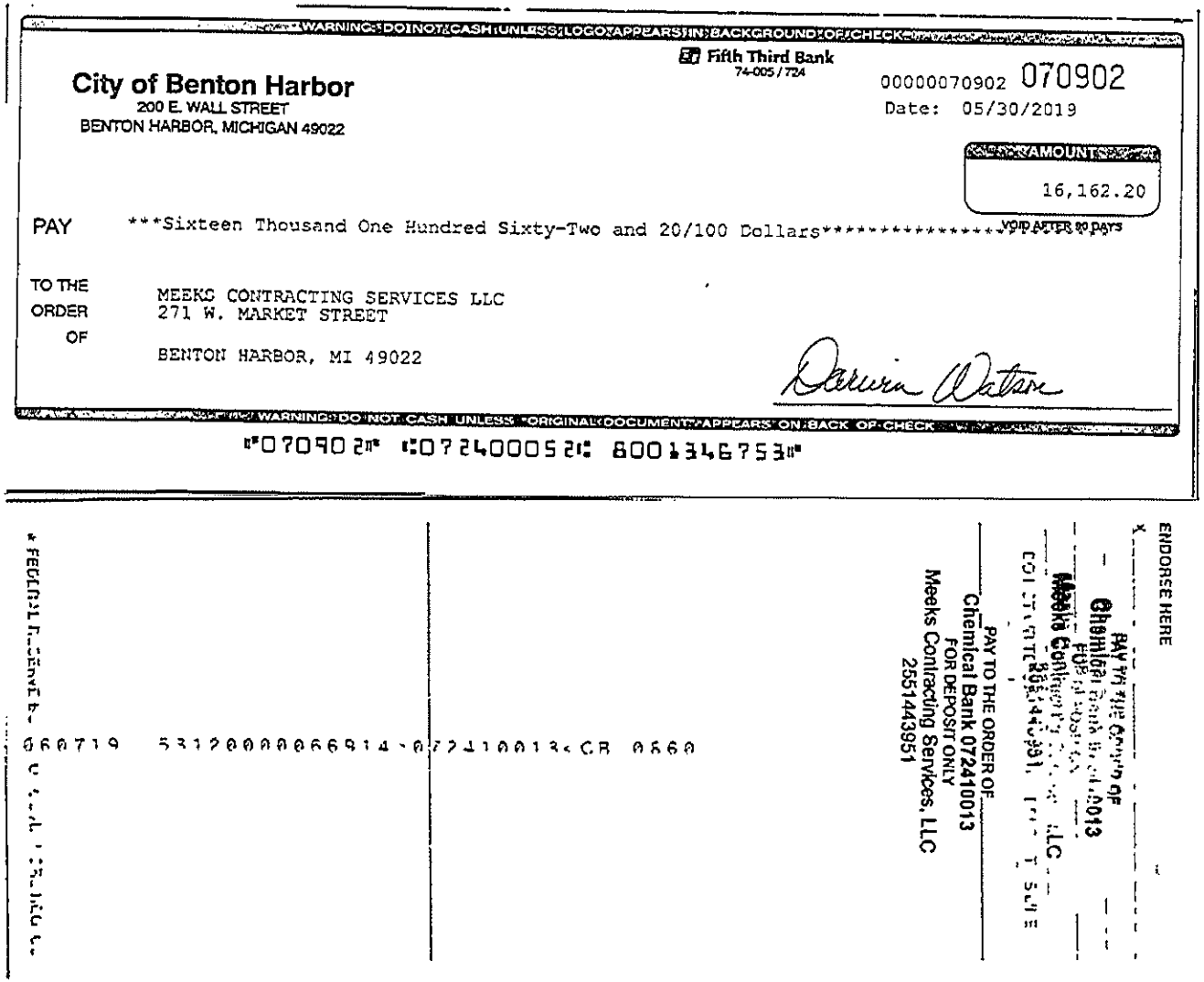
Invoice

Date	Invoice #
5/9/2019	2150

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Lead Verifications shut off		
1	696 Columbus	325.00	325.00
1	696 Columbus Additional Labor	75.00	75.00
1	831 E Britain	325.00	325.00
1	831 E Britain Additional Labor	75.00	75.00
1	652 E Empire	325.00	325.00
1	652 E Empire Additional Labor	75.00	75.00
1	487 E Britain	325.00	325.00
1	487 E Britain Additional Labor	75.00	75.00
1	463 Foster	325.00	325.00
1	463 Foster Additional Labor	75.00	75.00
1	836 Highland	325.00	325.00
1	836 Highland Additional Labor	75.00	75.00
1	742 LaSalle	325.00	325.00
1	742 LaSalle Additional Labor	75.00	75.00
1	366 Lincoln	325.00	325.00
1	366 Lincoln Additional Labor	75.00	75.00
1	235 Oden	325.00	325.00
1	235 Oden Additional Labor	75.00	75.00
1	1210 Ogden	325.00	325.00
1	1210 Ogden Additional Labor	75.00	75.00
1	275 Pipestone	325.00	325.00
1	275 Pipestone Additional Labor	75.00	75.00
1	1251 Superior	325.00	325.00
1	1251 Superior Additional Labor	75.00	75.00
1	817 Nate Wells	325.00	325.00
1	817 Nate Wells Additional Labor	75.00	75.00
		Total	$5,200.00



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005/724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070902 070902
Date: 05/30/2019

AMOUNT
16,162.20

PAY ***Sixteen Thousand One Hundred Sixty-Two and 20/100 Dollars**********

VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070902⑈ ⑆072400052⑆ 800134675 3⑈

ENDORSE HERE

PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
2551443951

Transaction Type: Check	Customer Reference #: 70902
Transaction Date: 2019-06-10	Bank Reference #: 600478195710
Amount: 16162.20	
Description:	

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
4/26/2019	190442

Bill To

City of Benton Harbor
Attn: Mike O'Malley
200 E. Wall St.
Benton Harbor, MI 49022

Phone	Fax

Job Name / Location
2" Tap Water Plant

P.O. No.	Project	Terms	Due Date
		Net 10	5/6/2019

Date	Item	Description	Quan.	Units	Rate	Amount
4/18/2019	Work Complete	2" tap at water plant	9	hrs	65.00	585.00

You may have this in drawer
Okay to pay
$585.00
Charge to
MDEQ Pilot Grant
5/14/19
BB

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases.

Total	$585.00
Payments/Credits	$0.00
Balance Due	**$585.00**

Phone #
269-925-6999

Fax #
269-925-0578

Vendor: 068[redacted] B & Z COMPANY Check #: 00000070881 05/28/2019

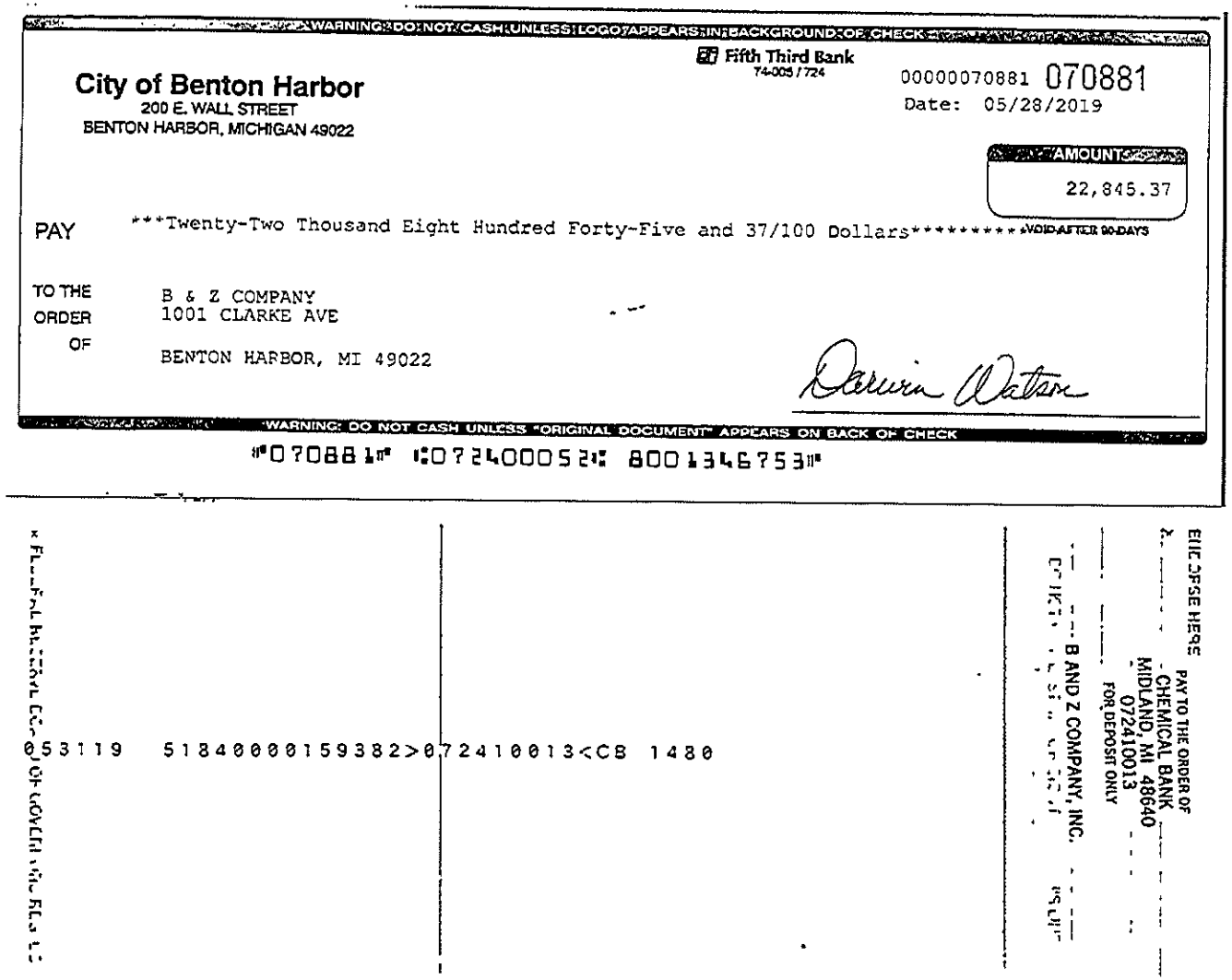
Date	Invoice	Description/Detail	Amount
04/18/19	190424	ROAD REPAIR - WAUCONDA-CONCRETE AT SAN S	9,830.59
04/19/19	190430	ROAD REPAIR-CONCRETE, MILTON-WM BREAK	1,505.50
04/26/19	190442	2" TAP AT WATER PLANT	585.00
05/06/19	190462	REPLACE WATER LINE AT BRITAIN & COLUMBUS	10,924.28

Total: 22,845.37

04/18/2019	190424	591-572-930.000	REPAIRS & MAINT	9,830.59

Entered By Mo. Day Yr.

Finance Approval Mo. Day Yr.



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank
74-005 / 724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

00000070881 070881
Date: 05/28/2019

AMOUNT
22,845.37

PAY ***Twenty-Two Thousand Eight Hundred Forty-Five and 37/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
B & Z COMPANY
1001 CLARKE AVE
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070881⑈ ⑆072400052⑆ 800134675 3⑈

PAY TO THE ORDER OF
- CHEMICAL BANK
MIDLAND, MI 48640
072410013
FOR DEPOSIT ONLY

B AND Z COMPANY, INC.

053119 5184000015938 2>072410013<CB 1480

Transaction Type: Check	Customer Reference #: 70881
Transaction Date: 2019-06-03	Bank Reference #: 600479064452
Amount: 22845.37	
Description:	

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
5/9/2019	2155

Bill To
City of Benton Harbor Public Works 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Placing tap inside of water plant	275.00	275.00

Req S332832
5/9/19
#275.00

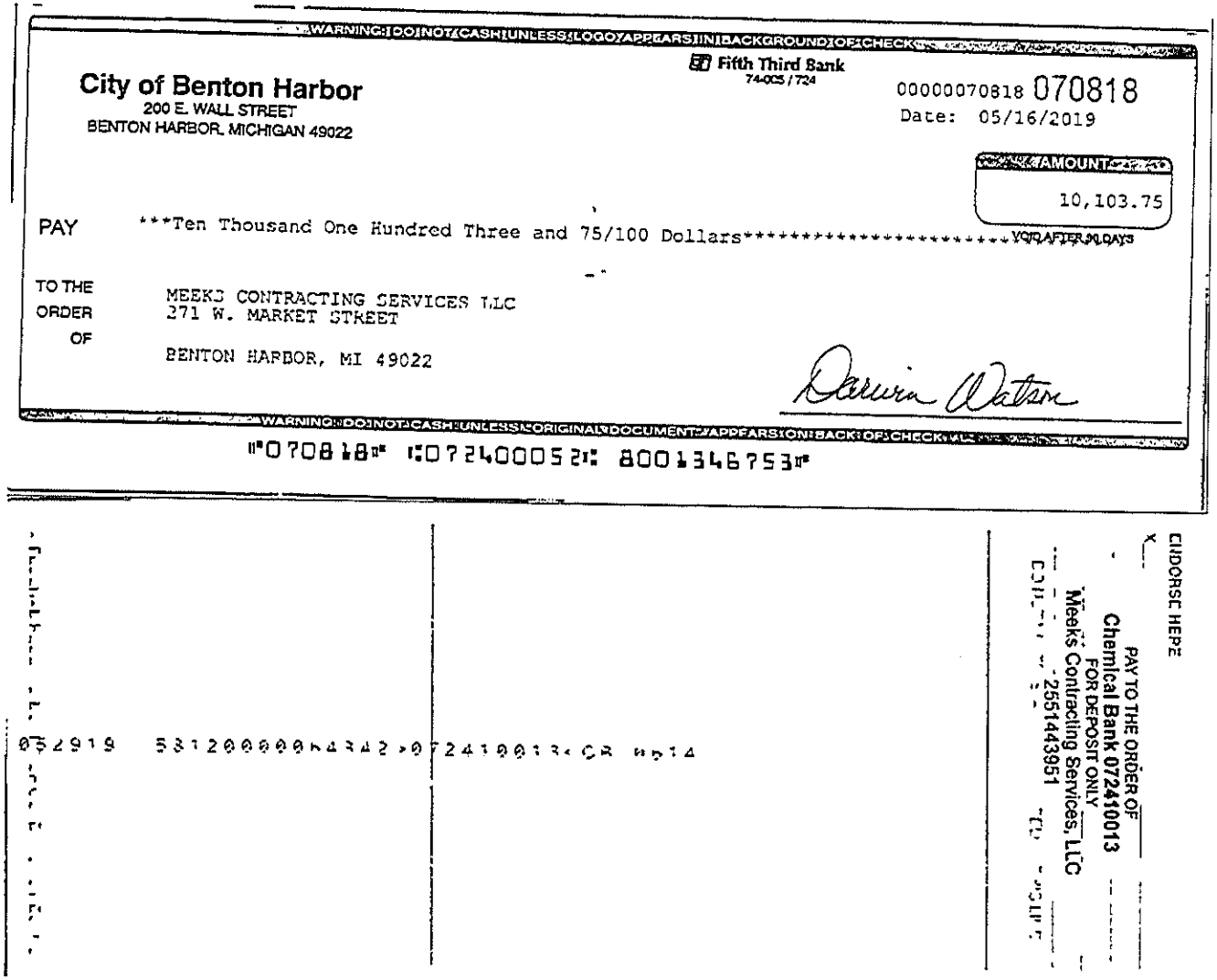
Tap on 30" suction line for Ortho Poly Phosphate ~~March~~ in time work done in for 3/26/19 start-up

	Total	$275.00

Vendor: 0798 MEEKS CONTRACTING SERVICES LLC Check #: 00000070818 05/16/2019

Date	Invoice	Description/Detail	Amount
05/09/19	2152	EMERGENCY SEWER REPAIR, DUMP TRUCK, LABO	3,903.75
05/09/19	2155	PLACING TAP INSIDE OF WATER PLANT	275.00
05/09/19	2154	WATERMAIN REPAIR ON HINKLEY NEAR WATER S	3,175.00
05/09/19	2153	WATER BOX EXCAVATION & SHUT OFF-808 BUSS	600.00
05/09/19	2156	REPLACING LEAD SERVICE LINE-1174 BROADWA	2,150.00

Total: 10,103.75



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005 / 724

00000070818 070818
Date: 05/16/2019

AMOUNT
10,103.75

PAY ***Ten Thousand One Hundred Three and 75/100 Dollars**********VOID AFTER 90 DAYS

TO THE ORDER OF
MEEKS CONTRACTING SERVICES LLC
271 W. MARKET STREET
BENTON HARBOR, MI 49022

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070818⑈ ⑆072400052⑆ 800134675 3⑈

ENDORSE HERE

PAY TO THE ORDER OF
Chemical Bank 072410013
FOR DEPOSIT ONLY
Meeks Contracting Services, LLC
2551443951

Transaction Type: Check	Customer Reference #: 70818
Transaction Date: 2019-05-30	Bank Reference #: 600475794356
Amount: 10103.75	
Description:	

CORE & MAIN™

INVOICE

1830 Craig Park Court
St. Louis, MO 63146

Invoice #	J439198
Invoice Date	9/13/18
Account #	600720
Sales Rep	DAVID SYSON
Phone #	616-222-9500
Branch #259	Kentwood, MI
Total Amount Due	$11,646.00

Remit To:
CORE & MAIN LP
PO BOX 28330
ST LOUIS, MO 63146

CITY OF BENTON HARBOR
200 E WALL ST
BENTON HARBOR MI 49022 4430

000/0000
00000

Shipped To:
601 N RIDGEWAY
BENTON HARBOR, MI

3 lot

Thank you for the opportunity to serve you! We appreciate your prompt payment.

Date Ordered	Date Shipped	Customer PO #	Job Name	Job #	Bill of Lading	Shipped Via	Invoice#
8/31/18	9/12/18	S332475	S332475			CORE & MAIN LP	J439198

Product Code	Description	Quantity Ordered	Quantity Shipped	Quantity B/O	Price	UM	Extended Price
/20015429457	74776S-22 3/4 90 FEM FLR X -22 BID SEQ# 10	25	25		28.72000	EA	718.00
/20015429458	74701L 3/4 CC X FLR CORP BID SEQ# 20	25	25		25.92000	EA	648.00
0807S100K	3/4 SOFT K COPPER TUBE 100' BID SEQ# 30	2000	2000		2.83000	FT	5,660.00
59I95E	95E (I) CURB BOX CAST IRON BID SEQ# 40	60	60		55.92000	EA	3,355.20
37077610022	76100-22 3/4 CURB STOP COMP X COMP NO LEAD BID SEQ# 50	20	20		63.24000	EA	1,264.80

Freight	Delivery	Handling	Restock	Misc

Terms: NET 30

Subtotal:	11,646.00
Other:	.00
Tax:	.00
Invoice Total:	$11,646.00

This transaction is governed by and subject to Core & Main's standard terms and conditions, which are incorporated by reference and accepted.
To review these terms and conditions, please visit: http://tandc.coreandmain.com/

FIFTH THIRD BANK
(WESTERN MICHIGAN)
P.O. BOX 630900 CINCINNATI OH 45263-0900

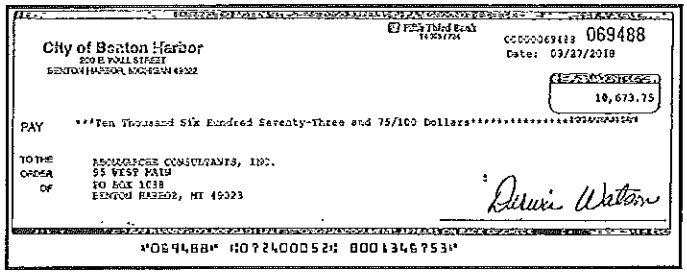
CITY OF BENTON HARBOR
GENERAL ACCT
ATTN FINANCE DIRECTOR
PO BOX 648
BENTON HARBOR MI 49023-0648

0

1560

Statement Period Date: 10/1/2018 - 10/31/2018
Account Type: COMM'L 53 ANALYZED
Account Number: 8001346753

Banking Center: St Joseph South
Banking Center Phone: 269-983-0983
Commercial Client Services: 866-475-0729


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

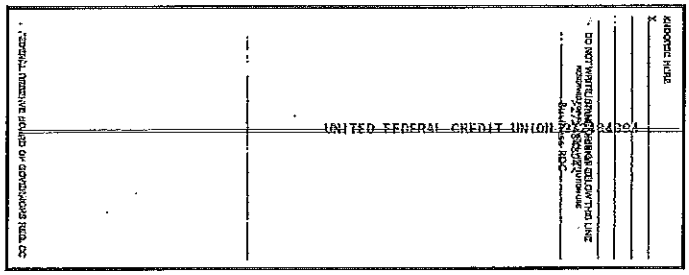
069488
Date: 09/27/2018

AMOUNT
10,673.75

PAY ***Ten Thousand Six Hundred Seventy-Three and 75/100 Dollars**********

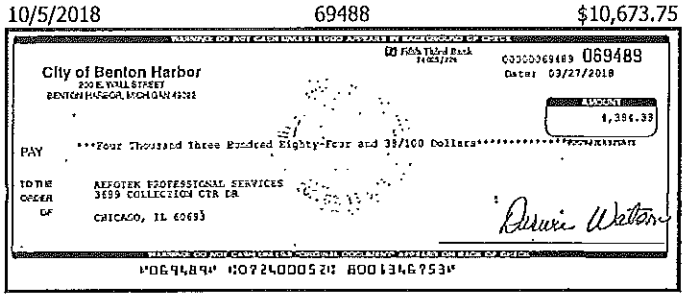
TO THE ORDER OF
ABSOLUTE CONSULTANTS, INC.
55 WEST MAIN
PO BOX 1038
BENTON HARBOR, MI 49023

⑈069488⑈ ⑆072400052⑆ 8001346753⑈


UNITED FEDERAL CREDIT UNION

10/5/2018 69488 $10,673.75

10/5/2018 69488 $10,673.75


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

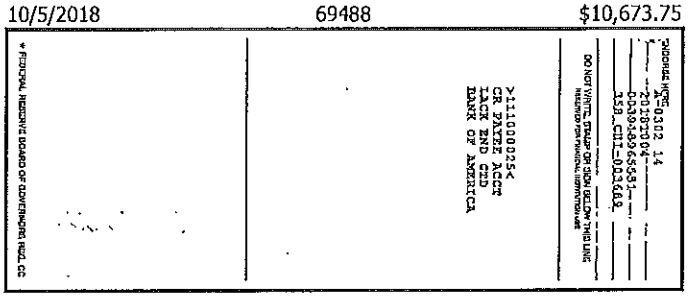
069489
Date: 09/27/2018

AMOUNT
4,384.38

PAY ***Four Thousand Three Hundred Eighty-Four and 38/100 Dollars**********

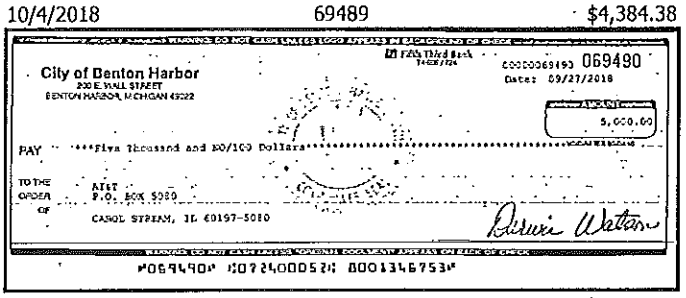
TO THE ORDER OF
AEROTEK PROFESSIONAL SERVICES
3699 COLLECTION CTR DR
CHICAGO, IL 60693

⑈069489⑈ ⑆072400052⑆ 8001346753⑈


>111000025<
CR PAYEE ACCT
BACK END GRD
BANK OF AMERICA

10/4/2018 69489 $4,384.38

10/4/2018 69489 $4,384.38


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

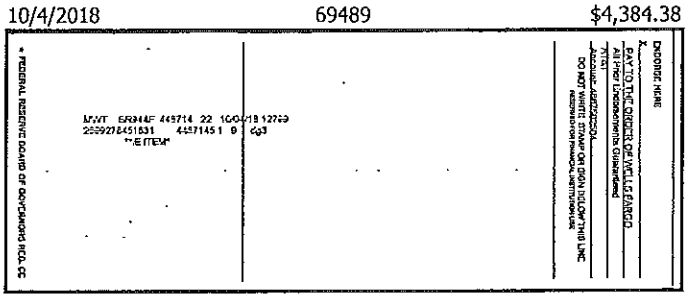
069490
Date: 09/27/2018

AMOUNT
5,000.00

PAY ***Five Thousand and 00/100 Dollars**********

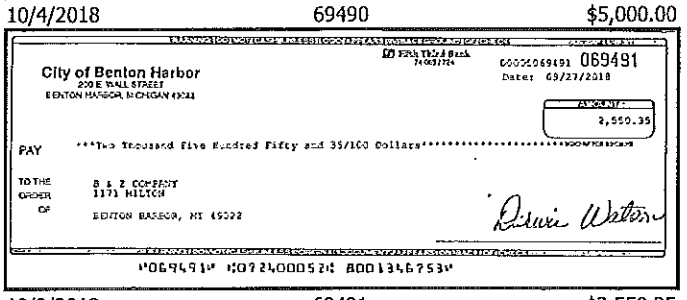
TO THE ORDER OF
AT&T
P.O. BOX 5080
CAROL STREAM, IL 60197-5080

⑈069490⑈ ⑆072400052⑆ 8001346753⑈


DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/4/2018 69490 $5,000.00

10/4/2018 69490 $5,000.00


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

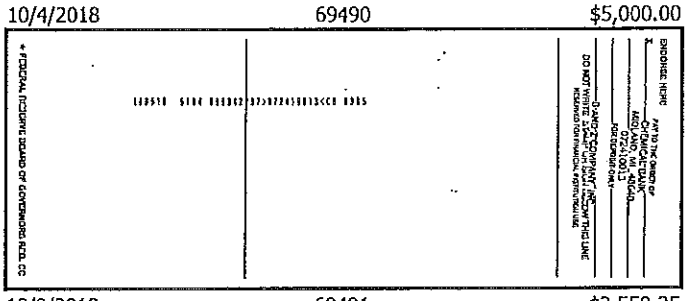
069491
Date: 09/27/2018

AMOUNT
2,550.35

PAY ***Two Thousand Five Hundred Fifty and 35/100 Dollars**********

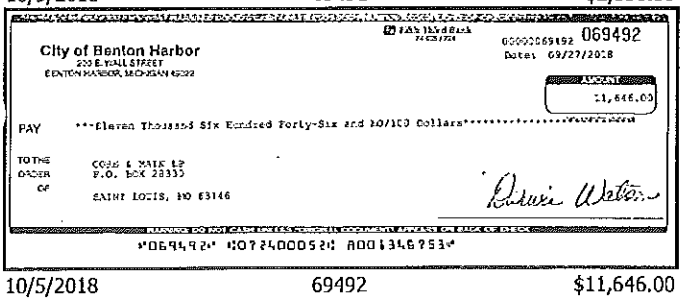
TO THE ORDER OF
B & Z COMFORT
1171 MILTON
BENTON HARBOR, MI 49022

⑈069491⑈ ⑆072400052⑆ 8001346753⑈


DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE

10/9/2018 69491 $2,550.35

10/9/2018 69491 $2,550.35


City of Benton Harbor
200 E WALL STREET
BENTON HARBOR, MICHIGAN 49022

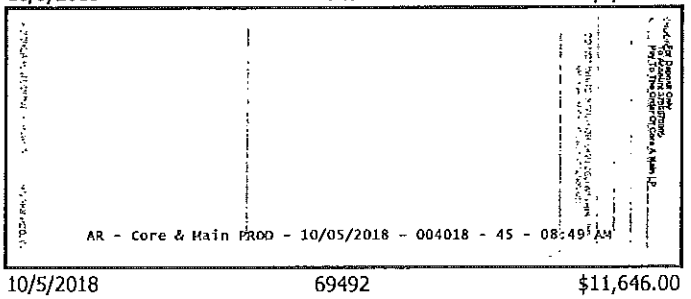
069492
Date: 09/27/2018

AMOUNT
11,646.00

PAY ***Eleven Thousand Six Hundred Forty-Six and 00/100 Dollars**********

TO THE ORDER OF
CORE & MAIN LP
P.O. BOX 28335
SAINT LOUIS, MO 63146

⑈069492⑈ ⑆072400052⑆ 8001346753⑈


AR - Core & Main PROD - 10/05/2018 - 004018 - 45 - 08:49:14 AM

10/5/2018 69492 $11,646.00

10/5/2018 69492 $11,646.00

INVOICE

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
2/18/19	277320	277320
PURCHASE ORDER NUMBER		DUE DATE
97179		3/20/19
TERMS		
NET 30 DAYS		3/20/19

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

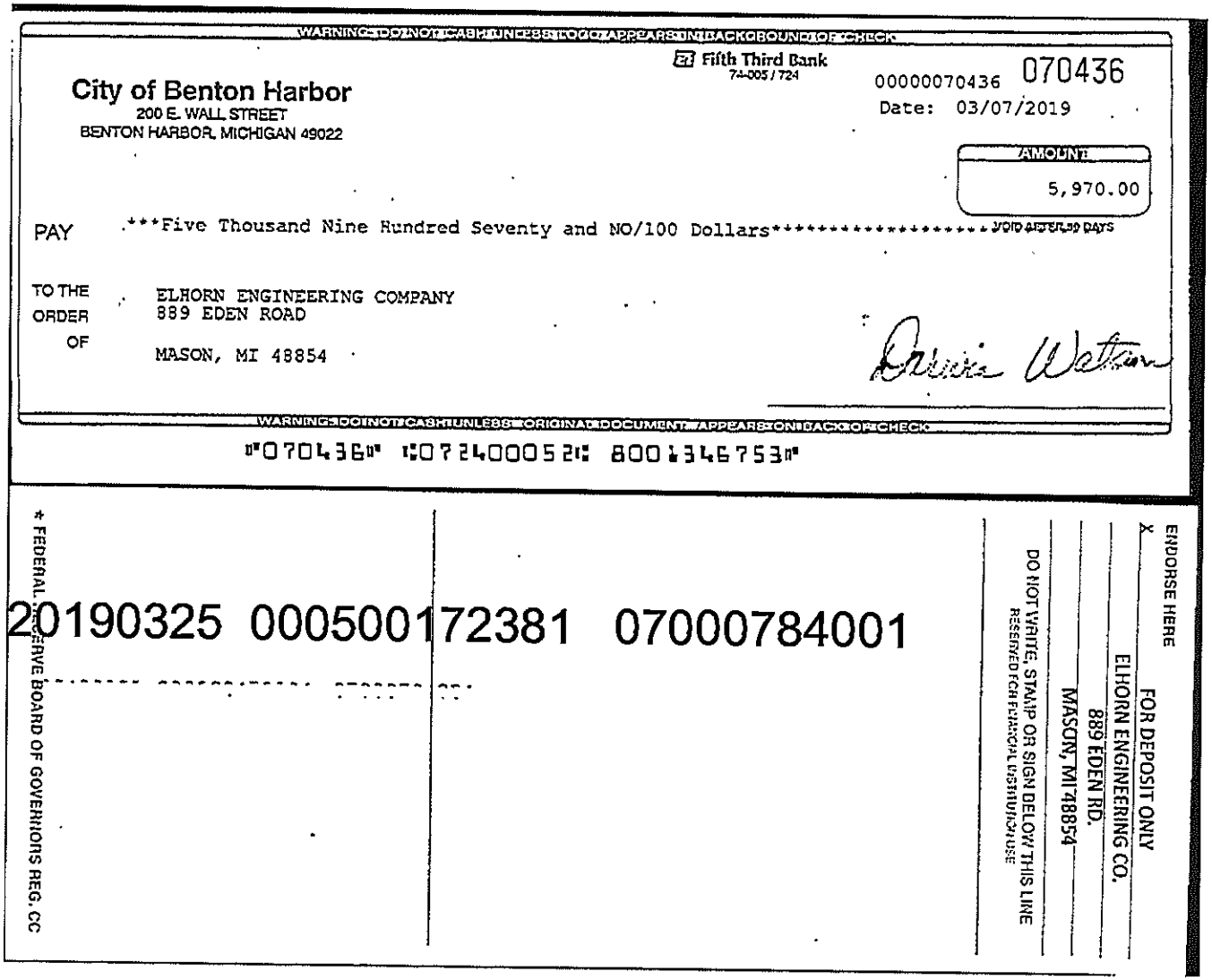
SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
1	XT600	FORCE FLOW CARBOY SCALE	2150.00	EA	$2,150.00
1	S3007	STENNER PUMP	980.00	EA	980.00
1	49287	3/4" NPT CORPORATION	290.00	EA	290.00
1	LABOR	INSTALL EQUIPMENT, TESTING	2550.00	EA	2,550.00
		TOTAL AMOUNT DUE.....			$5,970.00

Reg S 332721
3/4/19
Equipment needed for Start-up for new water treatment System @ water plant for Lead & Copper Control
Change to MDEQ Pilot Grant
$5,970

COMMENT
PLEASE INCLUDE INVOICE NUMBER WITH YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$5,970.00



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005 / 724

00000070436 070436
Date: 03/07/2019

AMOUNT
5,970.00

PAY ***Five Thousand Nine Hundred Seventy and NO/100 Dollars********** VOID AFTER 90 DAYS

TO THE ORDER OF
ELHORN ENGINEERING COMPANY
889 EDEN ROAD
MASON, MI 48854

Darwin Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070436⑈ ⑆072400052⑆ 8001346753⑈

20190325 000500172381 07000784001

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

ENDORSE HERE
X FOR DEPOSIT ONLY
ELHORN ENGINEERING CO.
889 EDEN RD.
MASON, MI 48854

DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE

Transaction Type: Check	Customer Reference #: 70436
Transaction Date: 2019-03-25	Bank Reference #: 600471700241
Amount: 5970.00	
Description:	

INVOICE

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
3/12/19	277556	277556
PURCHASE ORDER NUMBER		DUE DATE
96065		4/11/19
TERMS		
NET 30 DAYS		4/11/19

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
		PO#S332722			
4	8600-55	CARUS 8600 LIQUID 55GAL	522.50	EA	2,090.00
1	EL1110	DELIVERY CHARGE	20.00	EA	20.00
		TOTAL AMOUNT DUE.....			$2,110.00

Ref S 332722

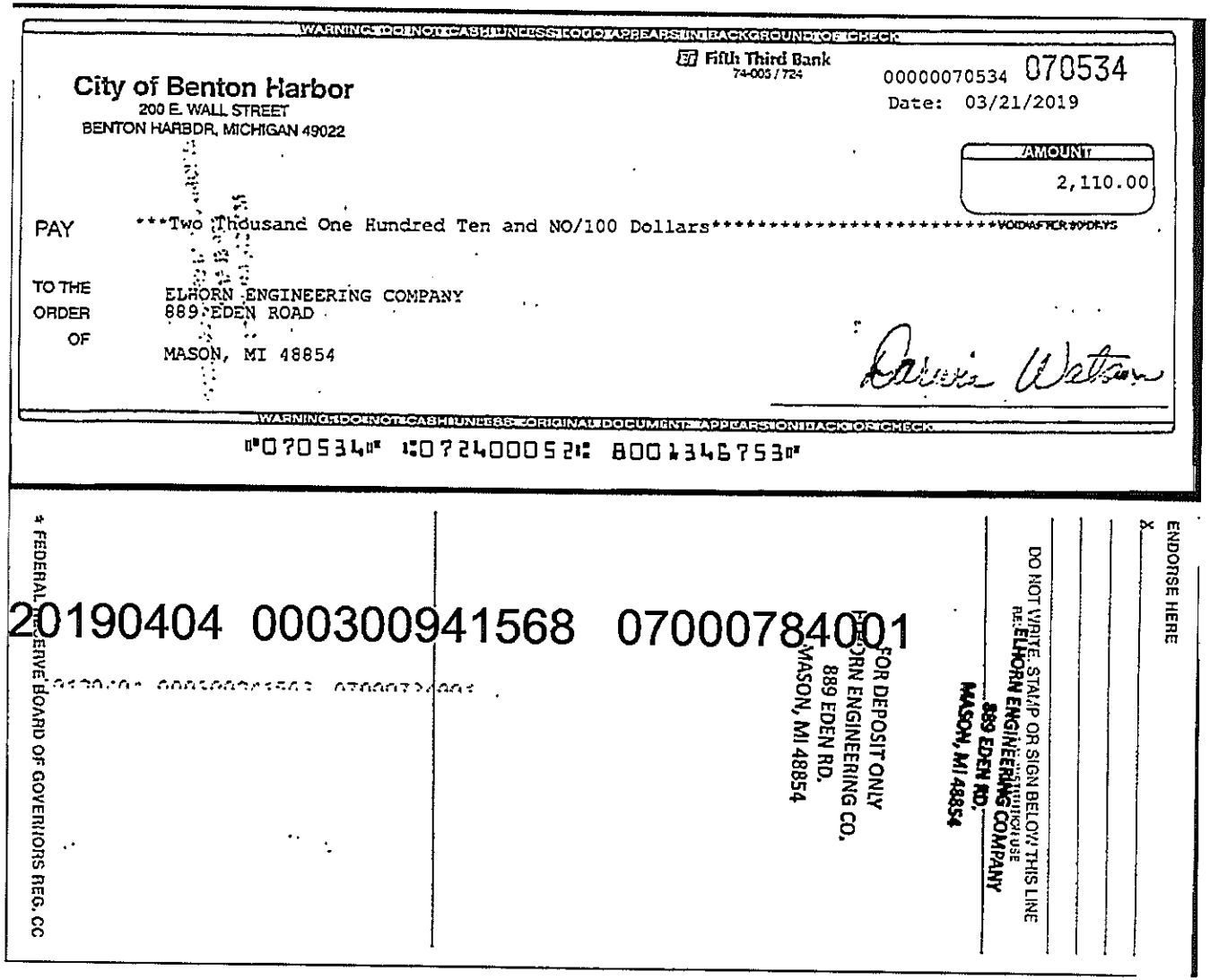
3/26/19

COMMENT

PLEASE INCLUDE INVOICE NUMBER WITH
YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$2,110.00

V 10534



WARNING: DO NOT CASH UNLESS SECURITY APPEARS ON BACKGROUND OF CHECK

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

Fifth Third Bank
74-005/724

00000070534 070534
Date: 03/21/2019

AMOUNT
2,110.00

PAY ***Two Thousand One Hundred Ten and NO/100 Dollars**********VOID AFTER 90 DAYS

TO THE ORDER OF
ELHORN ENGINEERING COMPANY
889 EDEN ROAD
MASON, MI 48854

Patricia Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070534⑈ ⑆072400052⑆ 800134675 3⑈

* FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

20190404 000300941568 0700078401

FOR DEPOSIT ONLY
ELHORN ENGINEERING CO.
889 EDEN RD.
MASON, MI 48854

DO NOT WRITE, STAMP OR SIGN BELOW THIS LINE
RESERVED FOR FINANCIAL INSTITUTION USE
RE: ELHORN ENGINEERING COMPANY
889 EDEN RD.
MASON, MI 48854

ENDORSE HERE
X

Transaction Type: Check	Customer Reference #: 70534
Transaction Date: 2019-04-04	Bank Reference #: 600472890917
Amount: 2110.00	
Description:	

INVOICE

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
5/14/19	278419	278419
PURCHASE ORDER NUMBER		DUE DATE
96823		6/13/19
TERMS		
NET 30 DAYS		6/13/19

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
1	DR300P	POCKET COLORIMETER/PO4	490.00	EA	$490.00
2	2106069	PHOSVER 3 REAGENT 10ML SAMPLE	46.00	100	92.00
		TOTAL AMOUNT DUE.....			$582.00

Reg $332847
5/22/19
#582.00
Reimburse through MDEQ Pilot Grant

COMMENT

PLEASE INCLUDE INVOICE NUMBER WITH
YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$582.00

Vendor: 805362416 ELHORN ENGINEERING COMPANY Check #: 00000070896 05/30/2019

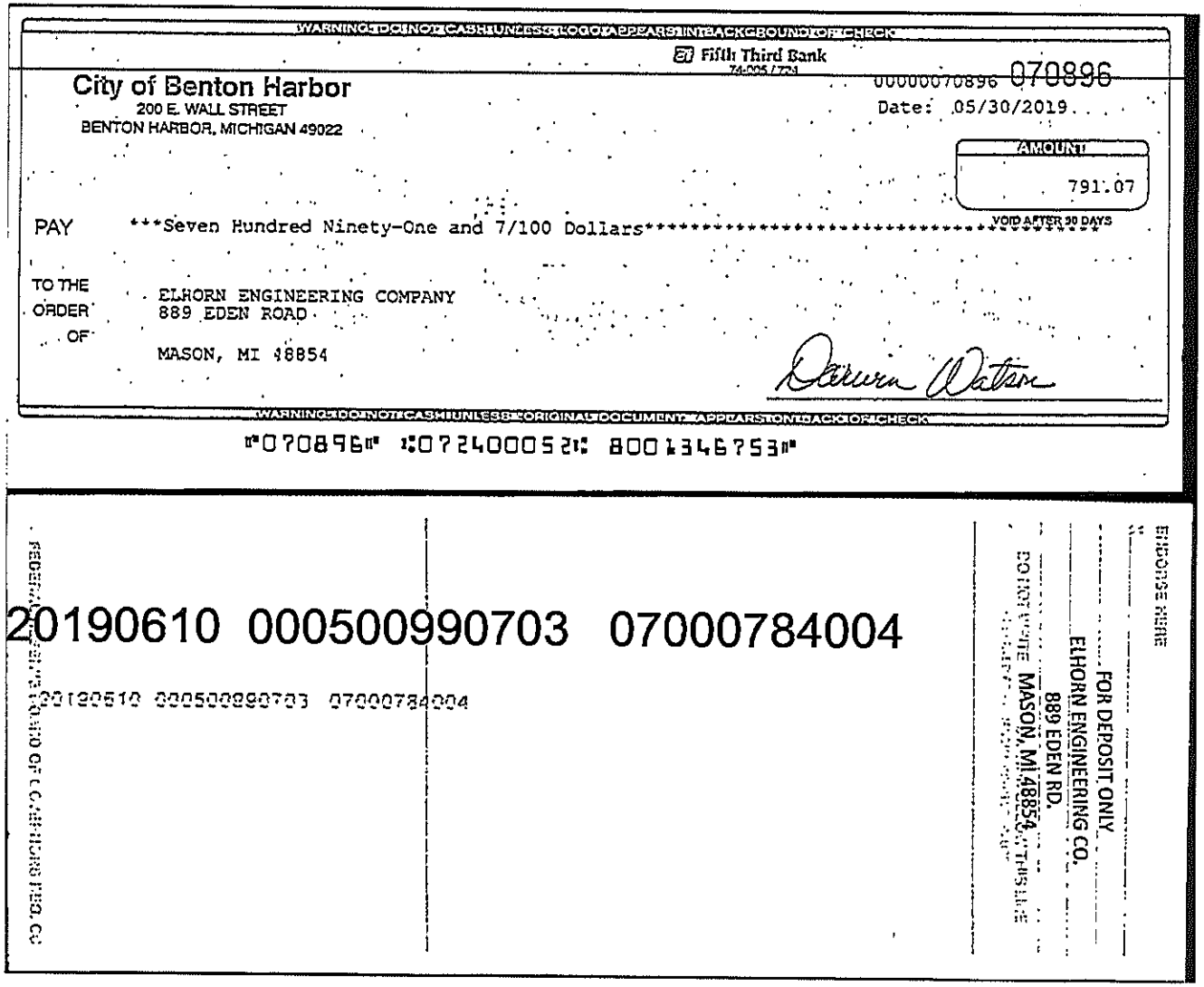
Date	Invoice	Description/Detail	Amount
05/14/19	278419	POCKET COLORIMETER, PHOSVER	582.00
05/17/19	278476	BAND SADDLE & FREIGHT	209.07

Total: 791.07

05/14/2019	278419	591-570-740.000	OPERATING SUPPLIES	582.00

Entered By Mo. Day Yr.

Finance Approval Mo. Day Yr.



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Fifth Third Bank
74-005/724

City of Benton Harbor
200 E. WALL STREET
BENTON HARBOR, MICHIGAN 49022

0000070896 070896

Date: 05/30/2019

AMOUNT
791.07

VOID AFTER 90 DAYS

PAY ***Seven Hundred Ninety-One and 7/100 Dollars**********

TO THE ORDER OF
ELHORN ENGINEERING COMPANY
889 EDEN ROAD
MASON, MI 48854

Dawn Watson

WARNING: DO NOT CASH UNLESS ORIGINAL DOCUMENT APPEARS ON BACK OF CHECK

⑈070896⑈ ⑆072400052⑆ 800134675 3⑈

20190610 000500990703 07000784004

20190610 000500990703 07000784004

ENDORSE HERE

FOR DEPOSIT ONLY
ELHORN ENGINEERING CO.
889 EDEN RD.
MASON, MI 48854

Transaction Type: Check	Customer Reference #: 70896
Transaction Date: 2019-06-10	Bank Reference #: 600479236871
Amount: 791.07	
Description:	

Mead & White Electric, Inc.
and
Colip Electric, Inc.
Serving Indiana and Michigan

INVOICE #
B8044-4

SOLD TO
BENTON HARBOR WATER WORKS
200 E. WALL ST
ATTN: A/P WATER
BENTON HARBOR, MI 49022

JOB INFO
BH WATER WORKS - REMOTE PANEL
FOR NEW ALUM PUMP, CHECK SIZE
AND LOCATION

M&W ACCT NO	PO NUMBER			TERMS	INVOICE DATE	PAGE
BHWW10	MIKE O'MALLEY			Net 30	3/31/2019	1

Final invoice for work completed (3/1/19 - 3/31/19)

	QUANTITY	DESCRIPTION	TRADE UNIT	EXTENDED
	18.50	ELECTRICIAN LABOR HOURS	95.00	1,757.50*
	1	MATERIALS	516.92	516.92

* means item is non-taxable

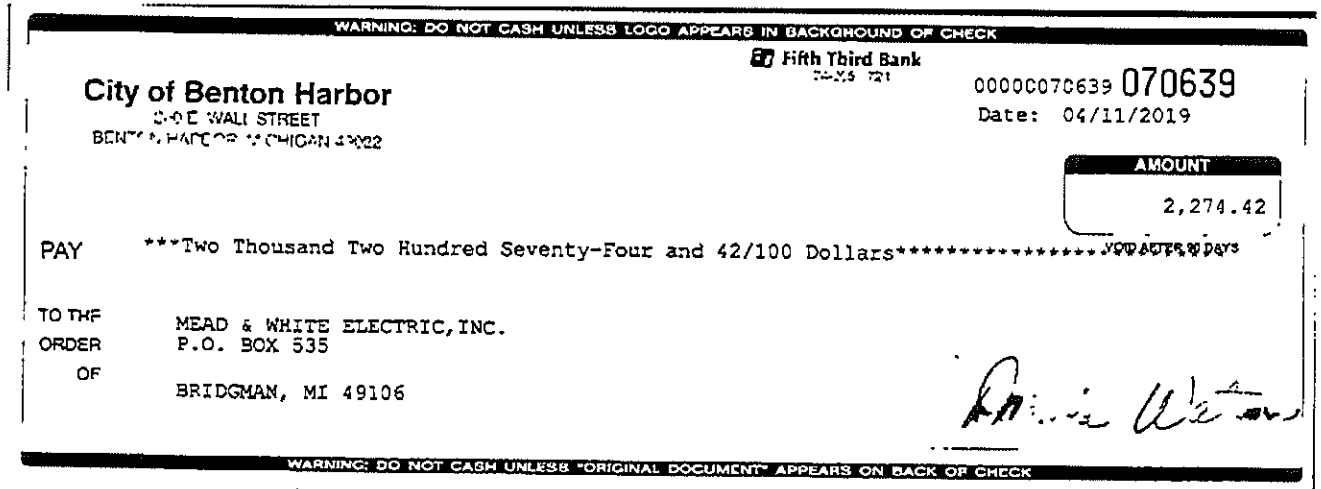
TOTAL AMOUNT **2,274.42**

Reg. 53327444
04.09.2019

Please Remit to: **Mead & White/Colip Electric, Inc.** ¤ **P.O. Box 535** ¤ **Bridgman, MI 49106**

Material furnished on this job is owned by Mead & White Electric until all payment for work performed has been paid in full; property is subject to contractors lien for nonpayment.

VISA DISCOVER MasterCard **Call (269) 465-6922 or (574) 288-4708 to pay by Credit Card**



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank

City of Benton Harbor
200 E WALL STREET
BENTON HARBOR MICHIGAN 49022

00000070639 070639
Date: 04/11/2019

AMOUNT
2,274.42

PAY ***Two Thousand Two Hundred Seventy-Four and 42/100 Dollars**********

TO THE ORDER OF
MEAD & WHITE ELECTRIC,INC.
P.O. BOX 535

BRIDGMAN, MI 49106

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070639⑈ ⑆072400052⑆ 800134675 3⑈

For Deposit Only - JPMC

for deposit only

Transaction Type: Check	Customer Reference #: 70639
Transaction Date: 2019-04-22	Bank Reference #: 600431472775
Amount: 2274.42	
Description:	

Mead & White Electric, Inc.
and
Colip Electric, Inc.
Serving Indiana and Michigan

INVOICE #
B8539

SOLD TO
BENTON HARBOR WATER WORKS
200 E. WALL ST
ATTN: A/P WATER
BENTON HARBOR, MI 49022

JOB INFO
BH WATER WORKS-LEAD PHOSPHATE
PUMP POWER INSTALLATION

M&W ACCT NO	PO NUMBER			TERMS	INVOICE DATE	PAGE
BHWW10	MIKE O'MALLEY			Net 30	3/14/2019	1

	QUANTITY	DESCRIPTION	TRADE UNIT	EXTENDED
	19.00	ELECTRICIAN LABOR HOURS	95.00	1,805.00*
	1	MATERIALS	307.92	307.92

* means item is non-taxable

TOTAL AMOUNT **2,112.92**

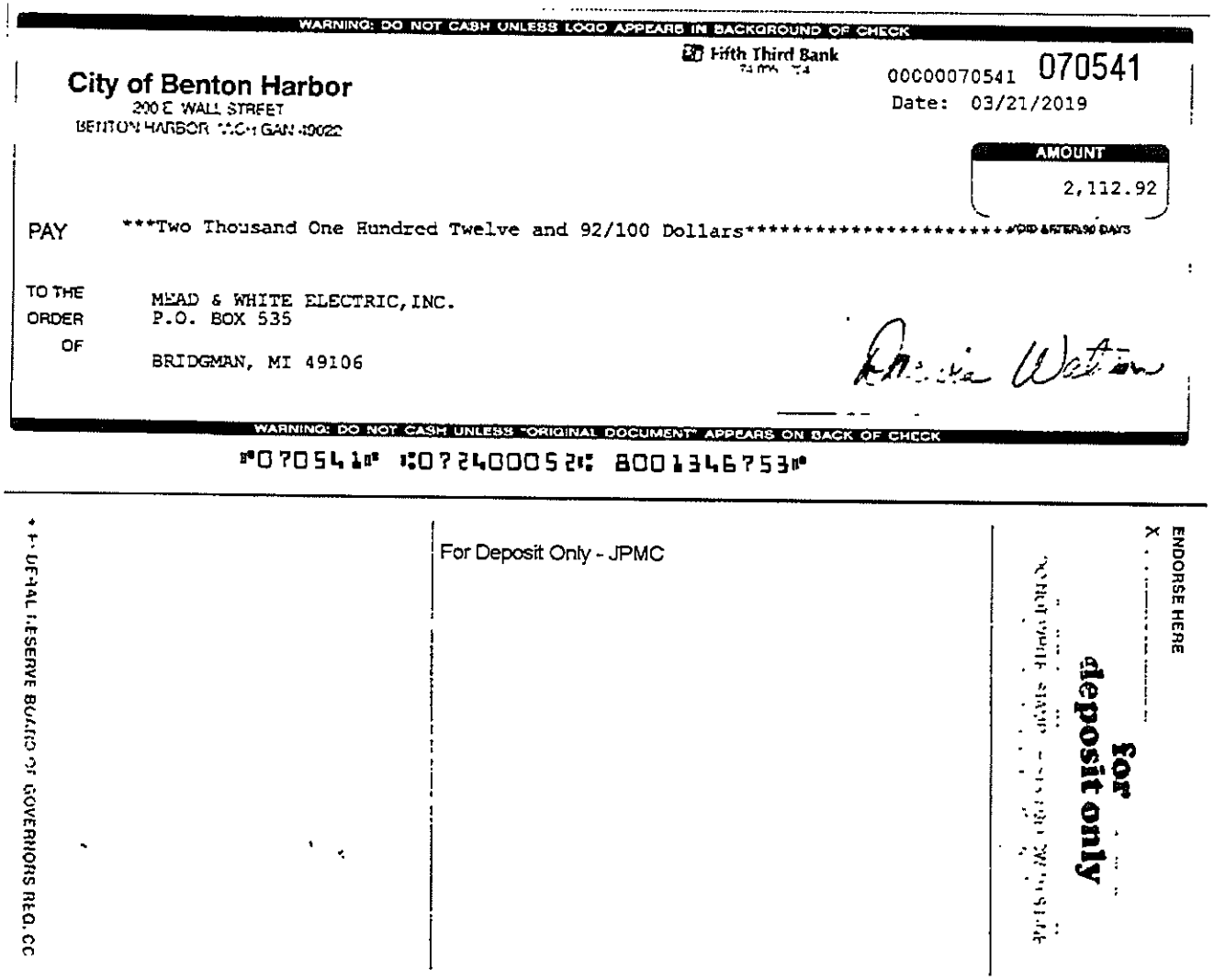
Ref # 332682
3/20/19 #2,112.92

Please Remit to: **Mead & White/Colip Electric, Inc.** ¤ **P.O. Box 535** ¤ **Bridgman, MI 49106**

Material furnished on this job is owned by Mead & White Electric until all payment for work performed has been paid in full; property is subject to contractors lien for nonpayment.

VISA DISCOVER

Call (269) 465-6922 or (574) 288-4708 to pay by Credit Card



WARNING: DO NOT CASH UNLESS LOGO APPEARS IN BACKGROUND OF CHECK

Fifth Third Bank

City of Benton Harbor
200 E WALL STREET
BENTON HARBOR MICHIGAN 49022

00000070541 070541
Date: 03/21/2019

AMOUNT
2,112.92

PAY ***Two Thousand One Hundred Twelve and 92/100 Dollars**********VOID AFTER 90 DAYS

TO THE ORDER OF
MEAD & WHITE ELECTRIC,INC.
P.O. BOX 535

BRIDGMAN, MI 49106

WARNING: DO NOT CASH UNLESS "ORIGINAL DOCUMENT" APPEARS ON BACK OF CHECK

⑈070541⑈ ⑆072400052⑆ 800134675 3⑈

THE FEDERAL RESERVE BOARD OF GOVERNORS REG. CC

For Deposit Only - JPMC

ENDORSE HERE
X

for deposit only

Transaction Type: Check	Customer Reference #: 70541
Transaction Date: 2019-04-08	Bank Reference #: 600476711145
Amount: 2112.92	
Description:	

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION
REVOLVING LOAN SECTION

PILOT DRINKING WATER COMMUNITY WATER SUPPLY GRANT PROGRAM
REQUEST FOR DISBURSEMENT OF FUNDS

THIS INFORMATION IS REQUIRED UNDER AUTHORITY OF PA 201 of 2017.

DOCUMENTATION TO SUPPORT THE INCURRED COSTS MUST BE INCLUDED WITH EACH REQUEST
PLEASE SEE OTHER SIDE FOR INSTRUCTIONS TO COMPLETE REQUEST

A. Project #	B. Request #	C. Period Covered by Request	D. Request Type	E. Grantee's EIN	F. Grant Amount
1901-01 1	2	6-14-2019 (M/D/Y) to 12-31-2019 (M/D/Y)	☐ partial ☒ final	38-6004537	$284,000

G. Grantee Name: City of Benton Harbor	Phone #: 269-927-8457
Address: 200 E. Wall Street , Benton Harbor, MI 49022	Email: emitchell@cityofbentonharbormi.gov
H. Grantee's Bank Name: Fifth Third	Phone #
Address: 1295 East Napier, Benton Harbor, MI 49022	
Account Name: City of Benton Harbor - Utility Services	ABA #: 072400052 / Account #: 7161395665
Special Instructions:	

I. Budget Items (Include Eligible Costs Only Using Dollars and Cents)	Requested Incurred Costs This Period	Cumulative Costs Incurred To Date
1. PLANNING COSTS – DISTRIBUTION SYSTEM MATERIAL INVENTORY	$ 0	$ 35,260
2. DRINKING WATER ASSET MANAGEMENT PLAN COSTS	$ 0	$ 30,000
3. LEAD AND GALVANIZED SERVICE LINE CONSTRUCTION COSTS	$ 55,029	$ 218,740
4. TOTAL CUMULATIVE AMOUNT FOR PERIOD COVERED BY THIS REQUEST (add totals in 1st column)	$ 55,029	
5. TOTAL CUMULATIVE ELIGIBLE COSTS INCURRED TO DATE (add totals in 2nd column)		$ 284,000
6. LESS AMOUNT PREVIOUSLY DISBURSED		($ 228,971)
7. AMOUNT REQUESTED FOR DISBURSEMENT		$ 55,029

J. For each request, describe the scope of work completed to date. Attach separate sheet if more space is needed. Discuss the progress made on the services not yet complete and a schedule for their completion by the grant period end date. The incurred grant expense cannot exceed one (1) year from your grant agreement date.

Request is for reimbursement for retainage released to B&Z and Meeks for construction contracts for service verifications. Also included replacement of 6 additional lead service replacements and purchase of equipment from McCrometer.

I certify that I am an authorized representative of the grantee and am authorized to make the following certifications on behalf of the grantee: (i) there is no pending litigation or event which will materially and adversely affect the project or the prospects for its completion; (ii) the representations, warranties and covenants contained in the grant agreement for the obligations pursuant to which this request for disbursement is submitted continue to be true and accurate in all material respects as of the date hereof; (iii) to the best of my knowledge and belief, the costs above were incurred in accordance with the terms of the grant agreement and the application for assistance for this project; and (iv) the amount requested for disbursement has not previously been requested.

Authorized Representative Name (Print or Type): Ellis Mitchell **Title:** City Manager

Authorized Representative Signature (Original): Ellis E. Mitchell **Date:** 5-4-2020

EMAIL THIS COMPLETED REQUEST TO YOUR DEQ PROJECT MANAGER OR MAIL TO THE ADDRESS SHOWN ON THE REVERSE SIDE

(3/2018)

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01 - DRAW 2 REQUEST
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOIC DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
DRAW 1										
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	35,260.46	30,000.00	10,000.00		75,260.46
										-
B&Z-CONTRACT	HRU 12/31/18	2/14/19	70292	181239	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			9,000.00		9,000.00
	THRU 1/31/19	2/14/19	70292	190149/50/51	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			19,237.50		19,237.50
	THRU 2/28/19	3/14/19	70478	190256/57/58/59	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			21,060.00		21,060.00
	THRU 4/26/2019	5/23/19	70855	190437	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			5,895.00		5,895.00
					TOTAL B&Z CONTRACT	-	-	55,192.50	-	55,192.50
MEEKS-CONTRACT	HRU 12/31/18	2/13/19	70285	2116	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1			5,265.00		5,265.00
	THRU 1/31/19	2/13/19	70285	2128	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2			9,369.90		9,369.90
	THRU 2/28/19	3/28/19	70577	2131/2137/2138/2139	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3			33,165.00		33,165.00
	THRU 3/31/19	4/11/19	70641	2143	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4			9,000.10		9,000.10
	THRU 5/9/19	5/30/19	70902	2150/2151/PART RETAIN	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5			16,162.20		16,162.20
					TOTAL MEEKS CONTRACT	-	-	72,962.20	-	72,962.20
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	11,646.00	13,909.34	25,555.34
TOTAL DRAW 1						35,260.46	30,000.00	149,800.70	13,909.34	228,970.50
DRAW 2										
B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	LEAD SERVICE LINE CONSTRUCTION			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	INSTALL & TEST INSERTION MAGNETIC FLOW METER			1,550.00		1,550.00
MCCROMETER	6/20/2019	10/10/2019	71721	526233RI	FULL PRO INSPECTION MAG			13,919.54		13,919.54
MEEKS	8/19/2019	8/22/2019	71457	2173	LEAD SERVICE LINE REPLACEMENT-179 GARFIELD			5,750.00		5,750.00
MEEKS	9/11/2019	9/26/2019	71604	2176	LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP			2,600.00		2,600.00
MEEKS	9/11/2019	9/26/2019	71604	2176	LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP			2,600.00		2,600.00
MEEKS	10/25/2019	11/14/2019	71970	2186	LEAD SERVICE LINE REPLACEMENT- 1110 MILTON TO CURB STOP			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER			3,740.00		3,740.00
MEEKS	12/9/2019	1/3/2020	72215	2196	LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA			2,470.82		2,470.82
										-
					LESS AMOUNT IN EXCESS OF GRANT			(451.96)		(451.96)
TOTAL DRAW 2						-	-	55,029.50	-	55,029.50
TOTAL SPENDING THROUGH 12-31-2019						35,260.46	30,000.00	204,830.20	13,909.34	284,000.00
AMOUNT PER GRANT						35,000.00	30,000.00	199,000.00	20,000.00	284,000.00
REMAINING GRANT FUNDS						(260.46)	-	(5,830.20)	6,090.66	-

ABONMARCHE

Engineering • Architecture • Land Surveying

May 2, 2019

PAYMENT REQUEST NO. 5 - FINAL
For Retainage

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	B & Z Company Inc. 1171 Milton St. Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$	10,000.00
Change Orders	$	51,325.00
Current Contract Amount	$	61,325.00
Work Completed	$	61,325.00
Retainage (10%)	$	0.00
Amount Earned	$	55,192.50
Less Previous Payments	$	55,192.50
Amount Due Contractor This Payment	$	6,132.50

541-000-212.000

RECOMMENDED BY: Contractor

Bruce Bingee

Bruce Binger (B & Z)

5-8-2019
Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche)

5/8/19
Date

ACCEPTED BY: Owner

Darwin Watson

Darwin Watson (Benton Harbor)

5/14/19
Date

ABONMARCHE

Engineering • Architecture • Land Surveying

May 20, 2019

PAYMENT REQUEST NO. 6 & FINAL
For Work Completed Through 05/28/2019

OWNER	CONTRACTOR
City of Benton Harbor 200 E. Wall Street Benton Harbor, MI 49022	Meeks Contracting Services, LLC 271 West Market Street Benton Harbor, MI 49022

RE: City of Benton Harbor
Lead Pilot Grant – Service Verifications
ACI Project No.: 18-0942

Original Contract Amount	$ 6,500.00
Change Orders (#1 - #3)	$ 69,462.20
Current Contract Amount	$ 75,962.20
Work Completed	$ 75,962.20
Retainage	$ -
Amount Earned	$ 75,962.20
Less Previous Payments (PR#1 - #5)	$ 72,962.20
Amount Due Contractor This Payment	$ 3,000.00

RECOMMENDED BY: Contractor

Donnie Meeks (Meeks Contracting Services, LLC) — 5-20-19 Date

RECOMMENDED BY: Engineer

Jason Marquardt, PE (Abonmarche) — 5/21/19 Date

ACCEPTED BY: Owner

Darwin Watson (Benton Harbor) — 5/21/19 Date

ABONMARCHE

Engineering • Architecture • Land Surveying

CITY OF BENTON HARBOR
Attn: Accounts Payable Department/Darwin Watson
P.O. Box 648
Benton Harbor, MI 49023

INVOICE

No. 127669
09/10/2019

18-0942 **Pilot Drinking Water Grant**

Project Manager: Jason W. Marquardt (JWM)

Professional services through 8/31/19, including construction administration, and obtaining contractor quotes for remaining lead service work.

	Contract Amount	Previously Invoiced	Current Invoice	Remaining Contract
101 Update Distribution System Inventory	$35,260.46	$35,260.46	$0.00	$0.00
102 Update/Improve Asset Management Program	$30,000.00	$30,000.00	$0.00	$0.00
103 Lead Service Line Construction	$15,258.60	$10,000.00	$5,258.60	$0.00
Totals:	$80,519.06	$75,260.46	$5,258.60	$0.00

Invoice Amount **$5,258.60**

All invoices are due upon receipt. After 30 days, interest of 1.5% per month will be added to any unpaid balance.

If, upon receipt of an invoice from Abonmarche, the client has any questions, or if there are any discrepancies in the invoice, the Client shall identify the issue in writing within ten (10) days of its receipt. If no written objection is made within the ten (10) day period, any such objection shall be deemed waived.

Please remit to **Abonmarche Consultants, Inc.**
PO Box 1088
Benton Harbor, MI 49023

OUDBIER INSTRUMENT CO.
4136 Ranchero Dr
Dorr MI 49323
(269) 792-4404

Invoice

DATE	INVOICE #
7/15/2019	9204

BILL TO
Benton Harbor Water Billing 200 East Wall St. Benton Harbor MI 49022

P.O. NO.	TERMS	PROJECT
5331419	Net 30	

QUANTITY	DESCRIPTION	RATE	AMOUNT
1.5	Install, wire and test operation of the new insertion magnetic flow meter.	900.00	1,350.00
1	General Hardware, Nuts, Bolts, Conduit fittings and Wire	200.00	200.00
		Total	$1,550.00

McCROMETER

3255 West Stetson Avenue • Hemet, CA 92545-7763 USA
Tel: 951 652-6811 • Fax: 951 652-3078 • payments@mccrometer.com

Page Number -	1
Date -	06/20/19
Customer -	46261
Brn/Plt -	MCI000
Related Ord -	760725
Order Nbr -	326136 SO
Invoice -	626233 RI

SALES INVOICE

571-977-800 (or Equip)
591.~~570.930~~
Charge to MDEQ
Pilot Grant

Sold To: CITY OF BENTON HARBOR
200 E WALL STREET
BENTON HARBOR MI 49022

Ship To: BENTON HARBOR WATER PLANT
601 RIDGEWAY
ATTN: MIKE O'MALLEY - SUPERINTENDENT
CELL 269-363-0575
ST JOSEPH MI 49085

Metering required as part of the MDEQ Corrosion Control system design

Tax ID: 386004537
Tax Cert: MI

002 / 077 / 273

REP: 21763 MIDWEST MUNICIPAL INSTRUMENTAT
RSN:

Request Date	Customer P.O.		Ship : FEDEX FRT/PPC
06/18/19	S332693	EXW Seller's Premises	Inst : 06/19/19

Ln/Rq Dt	Description	Item Number	UM	Ship/Back/Cance	Price	Extended Price	Tax
	Please Note, -All McCrometer facilities will be closed on Thursday July 4th, 2019 in observance of Independence Day. Normal business hours will resume on Friday July 5th, 2019. SN/MARIAV						
1.000	FULL PRO INSERTION (FPI) MAG 395LC MI19-0280 & E19-02960		EA S	1	13,694.4467 Per EA	13,694.45	Y
	Total Sensor Length in Inches: 44 Total Cable Length in Feet: 40 Pipe ID: 28.75 Pipe OD: - Totalizer Unit: 1000 GAL Indicator Unit: 2800 GPM MIN Flow: 0 /AVG Flow: 2000 GPM /MAX Flow: 2800 GPM MAX Pressure PSI: 8 4-20ma=: 2800 GPM Cable Connection Type: Quick-Connect Electrode Type: 316 Stainless Steel Ball Valve Type: Stainless Steel Conductivity: Standard Conductivity Converter: M-Series,AC,CSA Hardware Size Requirement: 2"NPT, 1.25, Heavy, 3/8 TAG: HS SUNCTION LINE						
2.000	Shipping & Handling/NonTaxable 4195148366		EA		225.0900	225.09	N

took a very long time to get this invoice?

Item recieved & installed Earlier this year, June 2019

Okay to pay 10/4/19

$13,919.54

Item 13694.45
ship 225.09
Inv $ ~~[illegible]~~ 13,919.54

Terms	Net 30 Days from Invoice	Net Due Date 07/20/19	Tax Rt	Sales Tax	~~Total Order~~ 13,919.54

This is funny, just recieved Inv

MCCROMETER'S TERMS AND CONDITIONS APPLY UNLESS OTHERWISE STATED IN WRITING BETWEEN THE PARTIES; MCCROMETER'S TERMS AND CONDITIONS CAN BE VIEWED AT THE FOLLOWING URL: WWW.MCCROMETER.COM/TERMS_AND_CONDITIONS.PDF
REMIT TO: McCrometer, Inc. • 96894 Collections Center Drive • Chicago, IL 60693-0329 USA
INTERNATIONAL WIRE TRANSFERS: Bank of America • 231 South LaSalle Street • Chicago, IL 60697 USA
A.B.A. No. 026009593 Swift: BOFAUS3N Acct# 87655-61569

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
8/19/2019	2173

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	Full lead service line replacement from the main to the meter		
1	179 Garfield	5,000.00	5,000.00
15	Site restoration pouring road patch topsoil placement. labor hours	50.00	750.00
		Total	$5,750.00

Req ∫332926
8/20/19
#5,750.00

A good price considering the road had to be open cut & restored w/ concrete surface

FYI LSLR cost around #5,000 to 9,000 each house

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
9/11/2019	2176

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	Stop service leak and the replacement of Service Line from Main to curb stop at 1063 Superior.	2,600.00	2,600.00
1	Stop Service leak and the replacement of Service line from Main the Curb stop at 711 Buss	2,600.00	2,600.00
1	Repair of Hydrant located on the corner of McAlister and Harrison	450.00	450.00
1	Repair and investigation of service leak located at 1283 Ogden	450.00	450.00
1	Repair of Manhole in the intersection of Lake and Ohio Include concrete patch	975.00	975.00

Leg $ [illegible]
9/11/19
Lead service leak
Partial copper replacement
#2,600.00

	Total	$7,075.00

Meeks Contracting Services LLC

271 West Market Street
Benton Harbor, MI 49022

Invoice

Date	Invoice #
10/25/2019	2186

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

P.O. No.	Terms	Project
S04675	Due on receipt	

Quantity	Description	Rate	Amount
1	Total Line replacement 1110 Milton Ave	5,000.00	5,000.00
-1	3/4" K Copper Credit	280.00	-280.00

591-571-977.300
MDEQ

Total $4,720.00

ks Contracting Services LLC
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
12/11/2019	2197

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	This Invoice is for 1063 Superior Water line from curb stop to meter Waterline installation	3,740.00	3,740.00

1063 Superior
Lead Service Line Replacement
City supply Copper, curb stop box & valve box
Req. 504252
$3,740.00
Okay to Pay

Total $3,740.00

Invoice

...s Contracting Services LLC
...271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
12/9/2019	2196

Bill To
City of Benton Harbor Water dept. 200 E Wall St. Benton Harbor, MI 49022

HAS Not Been Paid.

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
1	This Invoice is for 711 Buss Water line from curb stop to meter Waterline installation	3,740.00	3,740.00

LSL Replacement
full
711 Buss

Eligible for Grant

Req. 504300
12.30.19

MEEQ

Total	$3,740.00

Invoice

Meeks Contracting Services LLC
271 West Market Street
Benton Harbor, MI 49022

Date	Invoice #
11/25/2019	2193

Bill To

City of Benton Harbor Water dept.
200 E Wall St.
Benton Harbor, MI 49022

P.O. No.	Terms	Project
	Due on receipt	

Quantity	Description	Rate	Amount
	This invoice is for the repair of a leaking service line located at 876 Wauceda.		
	Replaced old shut off and replace 2' of customers line	125.00	875.00
	extra labor cost billed for stopping leak to repair line	50.00	1,400.00
7	Mini Excavator	98.00	98.00
28	4 Labors	97.82	97.82
1	Pump rental		
1	Parts		

Total $2,470.82

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

EGLE

LIESL EICHLER CLARK
DIRECTOR

September 11, 2019

Mr. Ellis Mitchell, City Manager
City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mr. Ellis Mitchell:

SUBJECT: Pilot Drinking Water Community Water Supply (PDW) Grant Program
City of Benton Harbor
Asset Management Plan/Update Inventory, Lead Service Line Replacement, and Corrosion Control Project
Grant Project Number 1901-01

This letter is notification that you can receive an extension to your PDW Grant end date, which would revise the grant budget period from September 30, 2019 to March 31, 2020.

Enclosed is a copy of the grant amendment form, which needs to be signed by the authorized representative and mailed to our office at the address below within two weeks. Upon receipt, the Department of Environment, Great Lakes, and Energy (EGLE) will sign and send you a fully-executed copy of the amendment, and it will become effective.

Reminder that your PDW Grant requires the following "deliverable" be provided to EGLE within 30 days from the end date of the grant agreement:

- Certificate of Project Completeness

Should you have any questions, please contact me at the phone number listed below, e-mail at Jonesc13@michigan.gov, or by mail at EGLE, P.O. Box 30457, Lansing, Michigan 48909-7957.

Sincerely,

Clarence Jones, Project Manager
Water Infrastructure Financing Section
Finance Division
517-284-5410

EGLE - WIFS
SEP 13 2019
REVIEWED AND APPROVED

Enclosures

cc: Mr. Chris Cook, Abonmarche Group, Benton Harbor
Ms. Heather Bishop, EGLE-DWEHD, Kalamazoo District Office
cc/enc: Mr. Jonathan Doyle, EGLE-FD

Department of Environmental Quality
Pilot Drinking Water Community Water Supply (CWS) Grant
Certification of Project Completeness

(complete as applicable to grant scope)

Completion Due Date April 30, 2020
(30 days from the executed grant end date)

CWS Grant No. 1901-01

The City of Benton Harbor *(legal name of grantee)* certifies that:

1) the distribution system material inventory project has been conducted.
2) the drinking water asset management plan (DWAMP) activities have been completed and the DWAMP, prepared with the assistance of CWS Grant funding, is being maintained.
3) the Notice to Proceed has been issued for lead/galvanized steel service line replacement.

Attached to this certification is an executive summary of the DWAMP. Copies of the DWAMP and/or other materials prepared through CWS Grant funding will be made available to the Department of Environmental Quality or the public upon request by contacting:

Ellis E. Mitchell at 269.927-8457 emitchell@cityofbentonharbormi.gov

Name | Phone Number | Email

Ellis E. Mitchell 3/30/2020

Signature of Authorized Representative (Original Signature Required) | Date

Ellis E. Mitchell, City Manager

Print Name and Title of Authorized Representative

Jones, Clarence (DEQ)

From: Sarkipato, Ernest (DEQ)
Sent: Wednesday, April 17, 2019 8:51 AM
To: Mike O'Malley; Jones, Clarence (DEQ)
Cc: Jason Marquardt; Timothy R. Drews; Darwin Watson; Chris J Cook; Onan, Brandon (DEQ)
Subject: RE: FW: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant

We determined the use of pilot grant funds is warranted as this is unequivocally the best way to mitigate lead exposure throughout town. Addition of a corrosion inhibitor will help reduce lead exposure in every home and business in BH, which is quite a lot of public health protection for #30k as compared to removing lead service lines.

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Wednesday, March 27, 2019 9:55 AM
To: Jones, Clarence (DEQ) <JONESC13@michigan.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov>; Timothy R. Drews <tdrews@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Onan, Brandon (DEQ) <OnanB@michigan.gov>; Oswald, Eric (DEQ) <OswaldE1@michigan.gov>
Subject: Re: FW: MDEQ Pilot Grant Phase 2 verification and State Corrosion Control Treatment at Plant

Clarence, as I promised you the other day on the phone,

This should help. The original proposal between Ernie Sarikipato with Brandon Onan is in typical ink, as are my initial table of expenditures. These were also shared with The Abonmarche Group that is handling most all of Benton Harbor's MDEQ Pilot Grant project funding.
Edits and additions from Mike O'Malley are in RED

The MDEQ Ernie and Brandon were very busy designing a Corrosion Control treatment with help from Elhorn Engineering a Chemical Specialties contractor, using an Orthopolyphosphate 70/30 blend in the high lift service lines.

And the idea of using MDEQ Pilot Grant Funding to minimize Lead in the City Water delivery system.

They suggested and are working hard to use a portion of the MDEQ Pilot Grant funds to also pay for this new treatment. They believe that we can use grant money to pay instead of out of pocket money.

I would guess closer estimates at this date March 27, 2019

Contractor: $ 5,000 $5,900 Elhorn Engineering

Pump: included in Contractor Scale: $ 3,000 included in contract

Flow meter and Pump Control: $4,000 Original insertion meter did not meet MDEQ choice. New Price $ 14,000

Miscellaneous fittings: $500

Miscellaneous:

INVOICE

ELHORN ENGINEERING COMPANY
889 EDEN RD
MASON MI 48854
PHONE: 517-676-3786

INVOICE DATE	INVOICE NUMBER	ORDER NUMBER
2/18/19	277320	277320
PURCHASE ORDER NUMBER		DUE DATE
97179		3/20/19
TERMS		
NET 30 DAYS		3/20/19

BILL TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIP TO:
CITY OF BENTON HARBOR
200 E. WALL STREET
ATTN: ACCOUNTS PAYABLE-WATER
BENTON HARBOR, MI. 49022

SHIPPED	ITEM NO.	DESCRIPTION	PRICE	U/M	AMOUNT
1	XT600	FORCE FLOW CARBOY SCALE	2150.00	EA	$2,150.00
1	S3007	STENNER PUMP	980.00	EA	980.00
1	49287	3/4" NPT CORPORATION	290.00	EA	290.00
1	LABOR	INSTALL EQUIPMENT, TESTING	2550.00	EA	2,550.00
		TOTAL AMOUNT DUE.....			$5,970.00

Reg S 332721
3/4/19
Equipment needed 4
Start-up for new water treatment
System @ water Plant
for Lead & Copper Control
Charge to MDEQ Pilot Grant
$5,970

COMMENT

PLEASE INCLUDE INVOICE NUMBER WITH
YOUR PAYMENT!
THANK YOU FOR YOUR BUSINESS!

$5,970.00

Invoice

B and Z Company
1001 Clarke Ave
Benton Harbor, MI 49022

Date	Invoice #
4/26/2019	190442

Bill To

City of Benton Harbor
Attn: Mike O'Malley
200 E. Wall St.
Benton Harbor, MI 49022

Phone	Fax

Job Name / Location
2" Tap Water Plant

P.O. No.	Project	Terms	Due Date
		Net 10	5/6/2019

Date	Item	Description	Quan.	Units	Rate	Amount
4/18/2019	Work Complete	2" tap at water plant	9	hrs	65.00	585.00

You may have this in drawer
Okay to pay
#585.00
Charge to
MDEQ Pilot Grant
5/14/19
BG

An unpaid balance after the due date may be subject to a late payment charge of 1.5% per month.
(Annual percentage rate 18%)
Any applicable sales taxes have been paid on all purchases.

Total	$585.00
Payments/Credits	$0.00
Balance Due	**$585.00**

Phone #
269-925-6999

Fax #
269-925-0578

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	**-**	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00
MCCROMETER	6/20/2019			526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
MEEKS	8/19/2019			2173	**LEAD SERVICE LINE REPLACEMENT-179 GARFIELD**			5,750.00		5,750.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	10/25/2019			2186	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	12/9/2019			2196	**LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	**LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA**			2,470.82		2,470.82
										-
									less overage	(451.96)
TOTAL TO DRAW THROUGH 12-31-2019						**-**	**-**	**55,481.46**	**-**	**55,029.50**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**205,282.16**	**13,909.34**	**284,000.00**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**(6,282.16)**	**6,090.66**	**-**

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH JUNE 13, 2019
REQUEST FOR DISBURSEMENT OF FUNDS - #1

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS	Vendor Invoice #	Invoice	10% Retainage not paid	Amount City Paid
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25				
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75				
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60				
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96				
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50				
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50				
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60				
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76				
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54				
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**				
										-				
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**	**181239**	**10,000.00**	**(1,000.00)**	**9,000.00**
											190149	10,000.00	(1,000.00)	9,000.00
											190150	6,400.00	(640.00)	5,760.00
											19051	4,975.00	(497.50)	4,477.50
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**		**21,375.00**	**(2,137.50)**	**19,237.50**
											190256	4,800.00	(480.00)	4,320.00
											190257	6,575.00	(657.50)	5,917.50
											190258	6,925.00	(692.50)	6,232.50
											190259	7,150.00	(715.00)	6,435.00
											adjustmt	(2,050.00)	205.00	(1,845.00)
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**		**23,400.00**	**(2,340.00)**	**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**	**190437**	**6,550.00**	**(655.00)**	**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**		**61,325.00**	**(6,132.50)**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**	**2116**	**5,850.00**	**(585.00)**	**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**	**2128**	**10,411.00**	**(1,041.10)**	**9,369.90**
											2131	5,325.00	(532.50)	4,792.50
											2137	20,000.00	(2,000.00)	18,000.00
											2138	2,925.00	(292.50)	2,632.50
											2139	8,600.00	(860.00)	7,740.00
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**		**36,850.00**	**(3,685.00)**	**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**	**2143**	**10,000.00**	**(999.90)**	9,000.10
											2150	5,200.00	(520.00)	4,680.00
											2151	7,651.20	(765.12)	6,886.08
											retainage		4,596.12	4,596.12
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**		**12,851.20**	**3,311.00**	**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**		**75,962.20**	**(3,000.00)**	**72,962.20**
OTHER MISCELLANEOUS														
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00				
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00				
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00				
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00				
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00				
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00				
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42				
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92				
						-	-	**11,646.00**	**13,909.34**	**25,555.34**				
TOTAL SPENT THROUGH 6/13/2019						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**				
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**				
REMAINING GRANT FUNDS						**(260.46)**	**-**	**49,199.30**	**6,090.66**	**55,029.50**				

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH SEPTEMBER 30, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS	
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25	-
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75	-
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60	-
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96	-
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50	-
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50	-
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60	-
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76	-
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54	-
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**	-
										-	-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**	-
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**	-
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**	-
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**	-
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**	
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**	-
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**	-
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**	-
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**	-
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**	-
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**	
OTHER MISCELLANEOUS											
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00	-
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00	-
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00	-
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00	-
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00	-
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00	-
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42	-
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92	-
						-	-	**11,646.00**	**13,909.34**	**25,555.34**	
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**	-

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50	
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00	
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60	
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00	
MEAD & WHITE	2/28/2019	8/1/2019	71283	B8044-3	**REMOTE PANEL FOR NEW ALUM PUM**				1,709.36	1,709.36	
MEAD & WHITE	2/13/2019	8/1/2019	71283	B8044-2	**REMOTE PANEL FOR NEW ALUM PUM**				6,495.41	6,495.41	
MCCROMETER	6/20/2019 not pd just rec'd inv			526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54	
TOTAL TO DRAW THROUGH 9-30-2019						-	-	**29,860.64**	**8,204.77**	**38,065.41**	
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**179,661.34**	**22,114.11**	**267,035.91**	
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**	
REMAINING GRANT FUNDS						**(260.46)**	**-**	**19,338.66**	**(2,114.11)**	**16,964.09**	

Benton Harbor Water Quality: **Update for Residents**

In 2018, it was discovered that there was a problem with high lead levels in tap water in Benton Harbor. The City performed routine monitoring for lead and copper by sampling at homes connected to the Benton Harbor Water Supply and found that more than 10% of these samples exceeded the Action Level for lead. The samples collected in previous rounds did not have the same elevated results.

Can I have my tap water tested for lead? If so, how?

To determine if your home qualifies to be included in City testing (homes with lead service lines), call Mike O'Malley at 269-363-0575. If your home isn't eligible for the compliance program, there are other options for testing. The City may be able to connect you to a certified lab, or you can directly contact a certified lab. A list of certified labs is available at *Michigan.gov/EGLElab*.

What can I do as a resident to ensure my tap water is safe?

1. **Get your water moving.** Flushing water pipes can reduce the amount of lead in your water. If you have not used your water for several hours, flush your pipes following your public water supply's recommended amount of time by doing any of the following:

For more information on what to do after plumbing changes inside or outside the home, go to: *bit.ly/391ycD0*.

2. **Use a point-of-use water filter.** A certified lead-reducing filter can reduce lead in drinking water. Filters are made to reduce lead, but do not guarantee that all lead will be removed from drinking water. For more information on choosing a POU water filter, go to *bit.ly/2vaHLkO*.

3. **Clean your faucet aerators.** Clean the mesh screen, or aerator, on the end of your faucet at least every six months. If construction is being done to the water system or pipes near your home—including water meter replacement in your home—check and clean your drinking water faucet aerator every month until the work is done. Go to *bit.ly/2JgIQvE* for more information.

4. **Consider replacing older plumbing, pipes, and faucets that may add lead to water.** Older faucets, fittings, and valves sold before 2014 may contain up to 8 percent lead, even if marked "lead-free." Look for replacement faucets made in 2014 or later and make sure they are NSF 61 certified or marked to contain 0.25 percent lead or less. Check your plumbing or hire a plumber to know what parts should be replaced to reduce lead in your drinking water.

What actions have been taken since the city learned of the lead issue in tap water?

Many efforts are underway to measure and minimize corrosion. **The first action that was taken was to tell the residents of the city of Benton Harbor that there were elevated levels of lead in the drinking water** and how to protect themselves by running their water, and/or, by obtaining a lead reducing water filter.

The Berrien County Health Department (BCHD) began providing filters in 2019. The Michigan Department of Health and Human Services provides the funding for the filter and BCHD provides staffing and locations to distribute the filters. For help with securing a water filter, go to *berriencounty.org/1599/City-of-Benton-Harbor*.

The City has begun replacing lead service lines. This is an important step because the best way to reduce lead levels is by removing the sources of lead in the system. Because removal of all lead service lines is going to take quite some time, the city has also installed corrosion control treatment to help reduce the amount of corrosivity of the water, which will reduce lead levels.

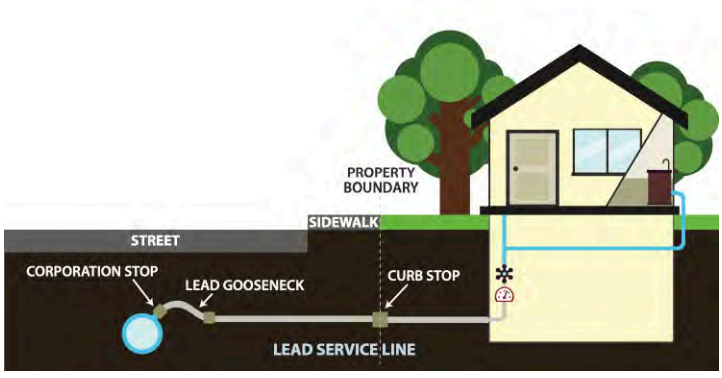
The City has increased the monitoring of lead and copper. The City is now sampling twice as many homes as they were previously, and they are sampling those homes more often (every 6 months instead of every 3 years). *This sampling is done so that everyone knows the levels of lead and copper in the system, and to show when the corrosion control treatment has become effective in lowering the levels of lead.

What remains to be done in order to reduce lead in tap water below the Action Level?

The Lead and Copper Rule requires collecting samples from a number of homes, reporting the results to the residents of those homes, and reporting the results to the state. Benton Harbor will have resolved the Action Level exceedance when the corrosion control treatment has reduced lead levels in homes, and two back-to-back six-month rounds of sampling confirm this. Both six-month sets of sampling must have a 90th percentile that is less than 15 parts per billion. The City is also required to conduct a study of the corrosion control treatment to identify the most effective treatment to reduce lead. Currently, the City is seeking a qualified expert to propose a detailed plan for the study.

Since there is no lead in the water that comes from Lake Michigan or in the water as it leaves the water treatment plant, how does lead get into the water?

Drinking water is free of lead until it is in contact with lead containing materials, such as lead service lines. Then as it sits in contact with lead containing materials the lead begins to be dissolved into the water. The longer that water sits motionless and in contact with lead containing materials the more lead it can "pick up". Most of the lead containing materials that can be in contact with drinking water are found in the service line (the water line coming from the water main in the street into your home) or within your home in the form of pipes, solder, or brass.



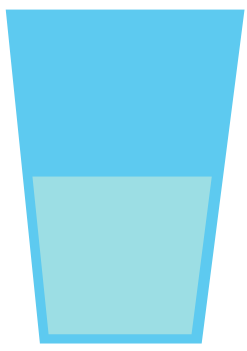
See page one for more information on reducing the amount of lead in your drinking water.

You can learn more about the dangers of lead to health at this link:

https://www.berriencounty.org/1568/Lead-Drinking-Water

CITY OF BENTON HARBOR

DRINKING WATER & LEAD



OCT. 2018

During **routine** lead testing, required of every municipal water provider, City of Benton Harbor had 8 of 30 homes with lead levels greater than 15 part per billion.

This elevated result from testing triggered an **Action Level Exceedance (ALE).**

Notification & information was distributed to residents, including recommendations for flushing times.

NOV. 2018 - JAN. 2019

Additional investigation into the **source of lead in the drinking** water was completed.

335 homes participated in voluntary water testing (46 were elevated). MDHHS conducted sequential water sampling to further ensure good recommendations were being made for residents

JAN. - FEB, 2019

Following investigation period, it was determined that **lead service lines and aging infrastructure** were of concern.

Residents were recommended to use 5 minute flushing times or use a water filter that is NSF 53 certified for lead.

FEB. - MARCH, 2019

Berrien County Health Department, with support from the Michigan Department of Health & Human Services (MDHHS) **began to distribute water filters to all City residents**.

Michigan Department of Environment, Great Lakes, & Energy (EGLE) continues to work with City Water Plant; **corrosion prevention treatment** implemented by City of Benton Harbor - Water Treatment Plant on March 25th.

MAR. 2019 - PRESENT

Berrien County Health Department continues to provide water filters to residents & monitor blood lead levels in children throughout the City (and county). No increase in the trend of elevated blood lead levels has been seen.

City of Benton Harbor continues to replace lead service lines.

EGLE & MDHHS continue to support work and resident communication.

Updated April, 2020

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: Darwin Watson, City Manager 200 East Wall Street Benton Harbor, MI 49022 **WSSN**: 600	Permit Stamp Area (DEQ use only)	
2. **Owner's Contact Person** (provide name for questions): Contact: Mike O'Malley Title: Water Plant Superintendent Phone: 269-927-8470		
3. **Project Name** (Provide phase number if project is segmented): Phosphate Corrosion Inhibitor Installation	4. **Project Location** (City, Village, Township): City of Benton Harbor	5. **County** (location of project): Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc:

Issued by: _____

Reviewed by: _____

☐ **If this box is marked see attached special conditions.**

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

6. **Facilities Description** – In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW. Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
- -No day tank needed per estimated chemical use
- -Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
- -Insertion meter to interface with chemical dosing pump
- -isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
- -chemical scale with digital readout (Forceflow XT-600)
- -LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:

Chemical Supplier:
Mike Enlow, Elhorn Engineering Co.
517-204-2845
mike@michonline.net

8. Indicate who will provide project construction inspection:
☒Organization listed in Box 1.
☐Engineering firm listed in Box 7.
☐Other - name, address, and phone number listed below.

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, Mike O'Malley (print) (name), acting as the Benton Harbor Water Superintendent (print) (title/position) for City of Benton Harbor, MI. (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature* _____ Date 1/24/19 Phone (269) 363-0575

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)

_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

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Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

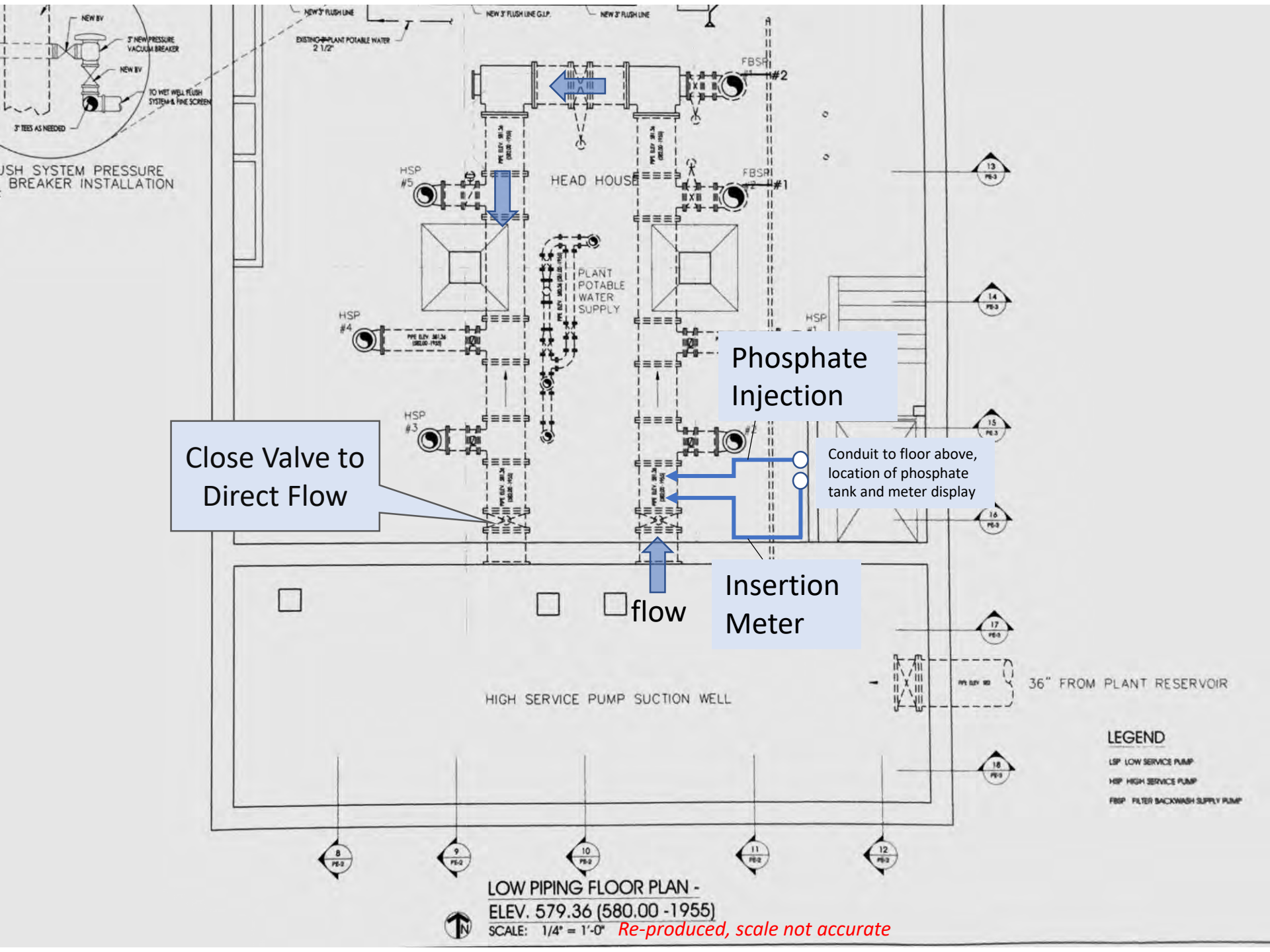
Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4 lbs/gal
Strength	33%	total P			

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	6.33	9.50	15.84	25.34
	2 mg/L as PO4	12.67	19.00	31.67	50.67
	3 mg/L as PO4	19.00	28.50	47.51	76.01

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

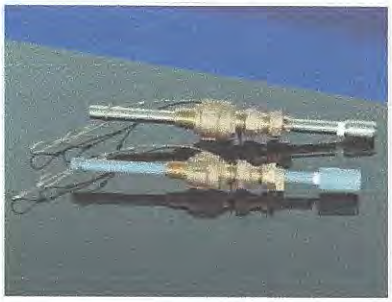
Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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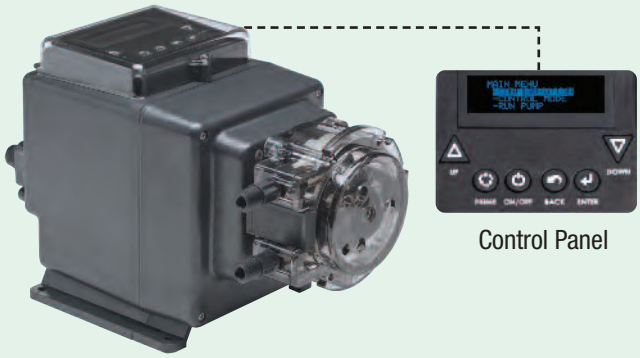
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

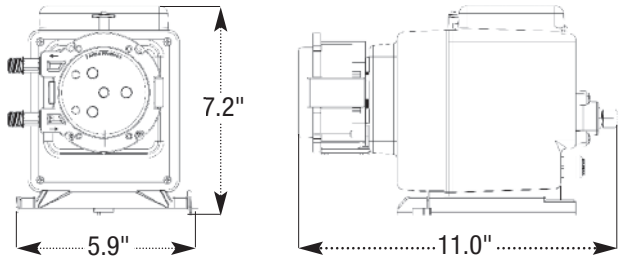
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

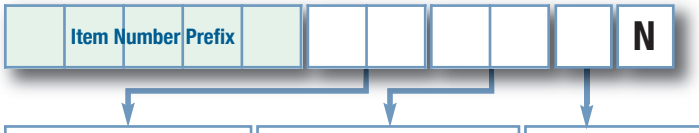
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

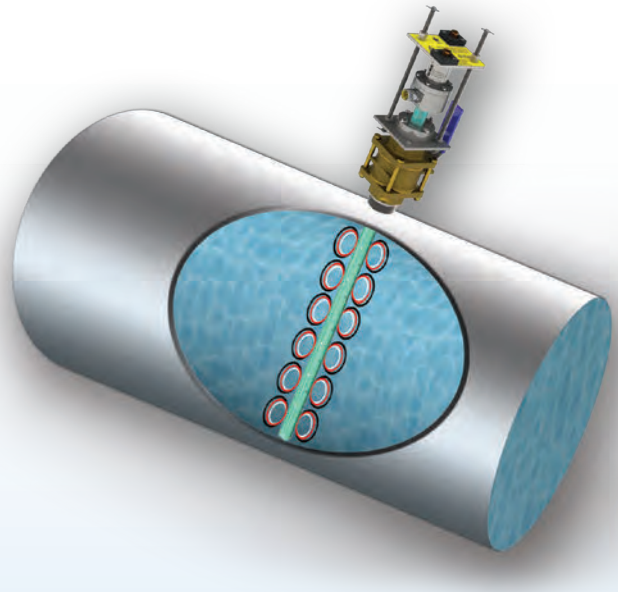
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

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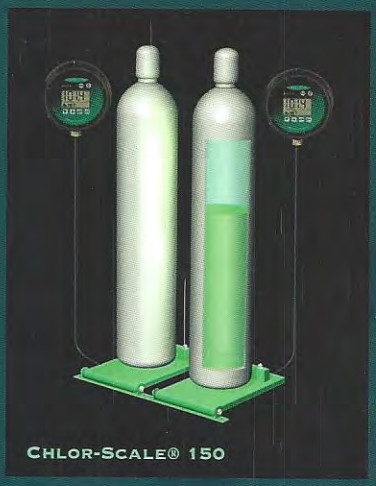
Represented by:

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

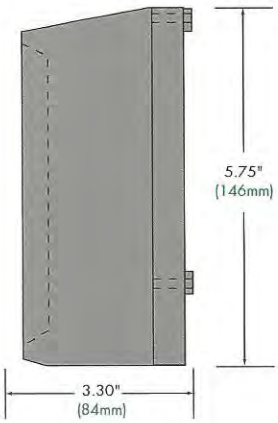
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

1150-D BURNETT AVE., CONCORD, CA 94520 USA, 925.686.6700 FAX 925.686.6713, E-MAIL: INFO@FORCEFLOW.COM
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Working Together to Reduce Lead Exposure from Drinking Water in Benton Harbor

You may have been informed that recent testing led to the discovery of high lead levels in drinking water in Benton Harbor. State and local partners are working together to make sure that you have the information needed to protect your family. Visit Michigan.gov/CleanWater for additional information or assistance in protecting your family from lead in drinking water. This fall, a wide range of stakeholders are working together to host a three-part series in the Benton Spirit Community Newspaper. The series will provide residents with an overview of when lead was discovered in water in Benton Harbor, what we're doing to support community residents, what's being done to address the issue, and our plan to remove lead service lines in Benton Harbor. The Benton Harbor Community Water Council, the City of Benton Harbor, Berrien County Health Department, Andrews University, Freshwater Future, and the Benton Spirit Community Newspaper; Michigan Department of Environment, Great Lakes, and Energy; and the Michigan Department of Health and Human Services are joining forces to ensure that Benton Harbor residents have access to information and free resources to reduce lead in water. This effort is being led by the Office of the Clean Water Public Advocate. The Office of the Clean Water Public Advocate was created through Governor Whitmer's Executive Order 2019-06 to improve access to information and resources around water quality in Michigan.

What actions have been taken since the City learned of the lead issue in tap water?

Though the water treatment plant is relatively new, Benton Harbor's water distribution system is about 100 years old with much of the original infrastructure still in use, including water mains and service lines. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that may pose a health risk to residents.

Elevated lead levels were first discovered during routine testing in 2018. The first action that was taken was to tell Benton Harbor residents that there were elevated levels of lead in the drinking water and how to protect themselves by running their water, and/or, by obtaining a lead-reducing water filter.

To get a water filter or replacement cartridge, visit:

berriencounty.org/1599/City-of-Benton-Harbor.

The City has since installed corrosion control treatment to help reduce the amount of corrosivity of the water, which will reduce lead levels, and has begun the process of replacing lead service lines (estimated to be 3,011 lines). This is an important step because the best way to reduce lead levels is by removing the sources of lead in the system.

The City has also increased the monitoring of lead and copper. The City is now required to sample twice as many homes, and they are required to sample those homes more often (every six months instead of every three years). This increase in sampling helps us study the levels of lead and copper in the system, and will show when the corrosion control treatment has become effective in lowering the levels of lead.

CITY OF BENTON HARBOR

Water System History

Construction of water tower at Britain Street, helping to keep pressure on the system and provide water for fire fighting

Upgrades to water treatment plant to update equipment, including pumping and chemical treatment

Loss of Township customers results in reduced sales of water

2020

City Commission approves water rate increases based on a study of water system finances and needed improvements

Last updated August 2020

1914 and previous

Construction of original pipe network for well water. (Exists today as the distribution system.)

Construction of original water treatment plant and Lake Michigan water intake.

Upgrades to water treatment plant to replace outdated treatment process and upgrade computer controls

Upgrades to the Distribution System to replace aging water pipe and lead service lines, and repaint the water tower

Photo credit: Ernie Sarkipato, EGLE

Can I get my water tested for lead? If so, how?

To determine if your home qualifies to be included in City testing (homes with lead service lines), call Mike O'Malley at 269-363-0575. If your home isn't eligible for the compliance program, there are other options for testing. The City may be able to connect you to a certified lab, or you can directly contact a certified lab. A list of certified labs is available at Michigan.gov/EGLElab. If you have questions about testing your water, you can also contact MDHHS at 844-934-1315.

If you would like to join state and local partners to help spread the word about lead efforts in Benton Harbor, email EGLE-CleanWater@michigan.gov.

What actions are being taken by the City to address the lead Action Level Exceedance (ALE) in Benton Harbor?

Since the City learned of the lead issue, there has been a comprehensive and collaborative response to address it. Many efforts are underway to measure and minimize corrosion:

The first action that was taken was to tell the residents of the city of Benton Harbor that there were elevated levels of lead in the drinking water and **how to protect themselves** by running their water, and/or, by obtaining a lead reducing water filter.

The Berrien County Health Department (BCHD) began **providing filters** in 2019. The Michigan Department of Health and Human Services provides the funding for the filter and BCHD provides staffing and locations to distribute the filters.

For help with getting a free water filter, go to:
berriencounty.org/1599/City-of-Benton-Harbor

The City has begun **replacing lead service lines**. This is an important step because the best way to reduce lead levels is by removing the sources of lead in the system. Because removal of all lead service lines is going to take quite some time, the city has also installed **corrosion control treatment** to help reduce the amount of corrosivity of the water, which will reduce lead levels.

The City has **increased the monitoring of lead and copper**. The City is now sampling twice as many homes as they were previously, and they are sampling those homes more often (every 6 months instead of every 3 years).

Do you want to help support clean water initiatives in Benton Harbor? Sign up to be a Clean Water Ambassador!

Clean Water Ambassadors play a vital role in ensuring that drinking water programs and resources are accessible and effective. Ambassadors provide their feedback and input by participating in webinars and in-person meetings as well as completing online surveys. For more information, visit Michigan.gov/CleanWater.

If you would like to join state and local partners to help spread the word about lead efforts in Benton Harbor, email EGLE-CleanWater@michigan.gov.

What Actions Can You Take to Reduce Lead Exposure?

5 steps you can take to reduce lead in drinking water

1) Get your water moving. Flushing water pipes can reduce the amount of lead in your water. If you have not used your water for several hours, flush your pipes following your public water supply's recommended amount of time by doing any of the following:

- Running faucets
- Taking a shower
- Running a load of laundry
- Washing dishes

In addition, always run your water until it's cold before using it for drinking, cooking, rinsing foods or brushing your teeth. This flushes out any water that had been sitting in that sink's pipes and faucet.

For more information on what to do after plumbing changes outside or inside the home, go to https://bit.ly/391ycD0

2) Use a point-of-use (POU) water filter. A POU water filter reduces contaminants at the point water is being used, such as a faucet. A certified lead-reducing filter can reduce lead in drinking water. Filters are made to reduce lead, but do not guarantee that all lead will be removed from drinking water.

Look for these certifications on the filter package: NSF/ANSI Standard 53 for lead reduction and NSF/ANSI Standard 42 for particulate reduction (Class I). It is important to follow the manufacturer's directions.

For help with getting a ***free water filter***, go to:

https://www.berriencounty.org/1599/City-of-Benton-Harbor

3) Clean your faucet aerators. Clean the mesh screen, or aerator, on the end of your faucet at least every six months. If construction is being done to the water system or pipes near your home—including water meter replacement in your home—check and clean your drinking water faucet aerator every month until the work is done. Go to https://bit.ly/2JgIQvE for more information.

5) Consider replacing older plumbing, pipes, and faucets that may add lead to water. Older faucets, fittings, and valves sold before 2014 may contain up to 8 percent lead, even if marked "lead-free." Look for replacement faucets made in 2014 or later and make sure they are NSF 61 certified or marked to contain 0.25 percent lead or less. Check your plumbing or hire a plumber to know what parts should be replaced to reduce lead in your drinking water.

Things you should NOT do to reduce lead exposure

Do not use hot water for drinking or cooking. Lead dissolves more easily into hot water.

Do not try to remove lead by boiling the water. Lead is not removed by boiling. Water evaporates during boiling, so the amount of lead in the water may end up higher than before boiling.

Statewide Lead Service Programs

Lead Safe Home Program (LSHP)
This program helps families identify and remove lead-hazards from homes.
Contact the Lead and Healthy Homes Section: 866-691-LEAD or visit Michigan.gov/Lead

Childhood Lead Poisoning Prevention Program (CLPPP)
This program's mission is to prevent childhood lead poisoning across the state through surveillance, outreach and health services.
Contact CLPPP: 517-335-8885 or visit Michgan.gov/Lead

Can I get my water tested for lead? If so, how?

To see if your home qualifies to be included in City testing (homes with lead service lines), call Mike O'Malley at 269-363-0575. If your home isn't eligible, there are other options for testing. The City may be able to connect you to a certified lab, or you can directly contact a certified lab. A list of certified labs is available at Michigan.gov/EGLElab. If you have questions about testing your water, you can also contact MDHHS at 844-934-1315.

If you would like to join state and local partners to help spread the word about lead efforts in Benton Harbor, email EGLE-CleanWater@michigan.gov.

Benton Harbor Water Quality: 2021 Update for Residents

On January XX, 2021, Benton Harbor found that more than 10% of these samples exceeded the Action Level for lead, resulting in Benton Harbor's fourth Action Level Exceedance (ALE). There are many homes in Benton Harbor that have lead service lines, the pipes that deliver water to your home; as a result, the ALE will continue until lead service lines are replaced.

LOOKING TO THE FUTURE AND KEY NEXT STEPS

The **Benton Harbor Water Outreach Task Force** will provide regular updates about lead outreach efforts and lead service lines. Members of the Task Force will include a representative from the Benton Harbor Community Water Council, the City of Benton Harbor, Berrien County Health Department, Andrews University, Freshwater Future, and the Benton Spirit Community Newspaper, along with the Office of the Clean Water Public Advocate, Michigan Department of Environment, Great Lakes, and Energy, and the Michigan Department of Health and Human Services. Additional community partners will be added to help support the work of the Task Force.

For regular updates and to help support getting messages out to the community, sign up here.:

[link to list serv]

In October 2020, the U.S. Environmental Protection Agency (EPA) awarded the City of Benton Harbor a **$5.6 million grant.** This funding along with additional state grants and loans will help remove lead service lines and support a study to improve the city's lead corrosion control treatment to protect public health in Benton Harbor. Residents will see this work take place throughout the City in 2021.

Looking for more information? Visit https://bhcity.us/water/ for an overview of the history of the City of Benton Harbor's water system and current efforts to reduce lead in drinking water. These articles were published in the Benton Spirit Community Newspaper and also summarized below:

THE PROBLEM: Benton Harbor's water distribution system, which are the pipes that help deliver water to your home, is about 100 years old. It is known that a high number of lead service lines were installed in the first half of the 20th century and many homes built before the 1960s are likely to have lead service lines or pipes that pose a health risk to residents.

HOW TO PROTECT YOUR FAMILY: Obtain a lead reducing filter. Berrien County Health (BCHD) offer free water filters to City of Benton Harbor residents. For help with getting a free water filter, go to:

berriencounty.org/1599/City-of-Benton-Harbor

FIXING THE PROBLEM: The City has begun replacing lead service lines. Because removal of all lead service lines is going to take quite some time, the city has also installed corrosion control treatment to help reduce the amount of corrosivity of the water, which will reduce lead levels.

If you are interested in helping to support the Task Force, contact EGLE-CleanWater@Michigan.gov.
For more information about resources and upcoming events, visit https://bhcity.us/water/.

Benton Harbor Water Update

Ernie Sarkipato, Engineering Unit

Michigan Department of Environment, Great Lakes, and Energy

Water System Public Information

- Water customers need to be informed
- Regulations require information be sent to the public
- Rebuild trust in water system

What is lead?

- Naturally Occurring Metal (“Pb”)
- Exposures:

Gasoline (outlawed)

Paint (common in older homes)

Plumbing

Corrosion is a two-way street

All water is corrosive

- Depends on chemistry

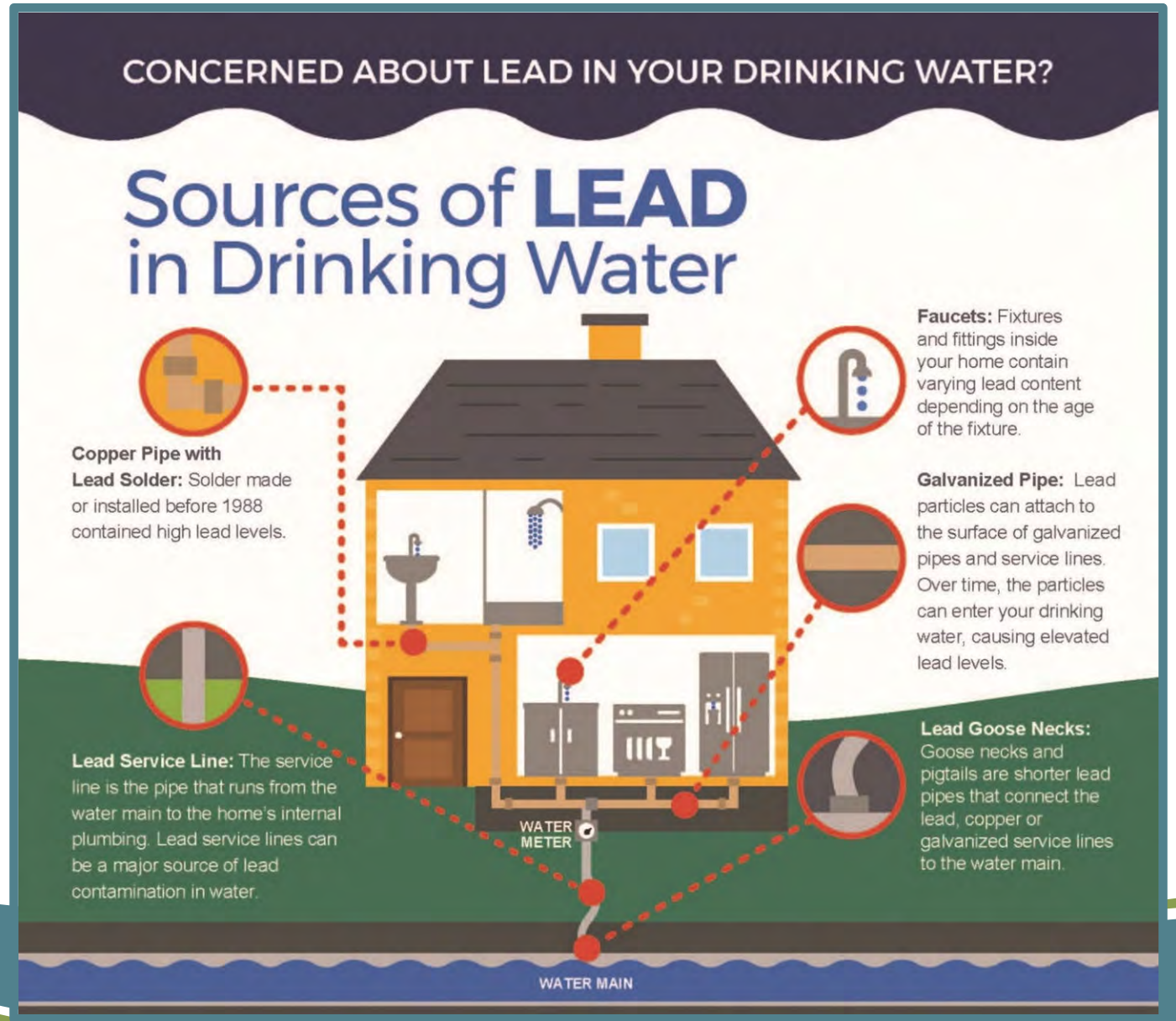
Plumbing materials

Flowing or Sitting?

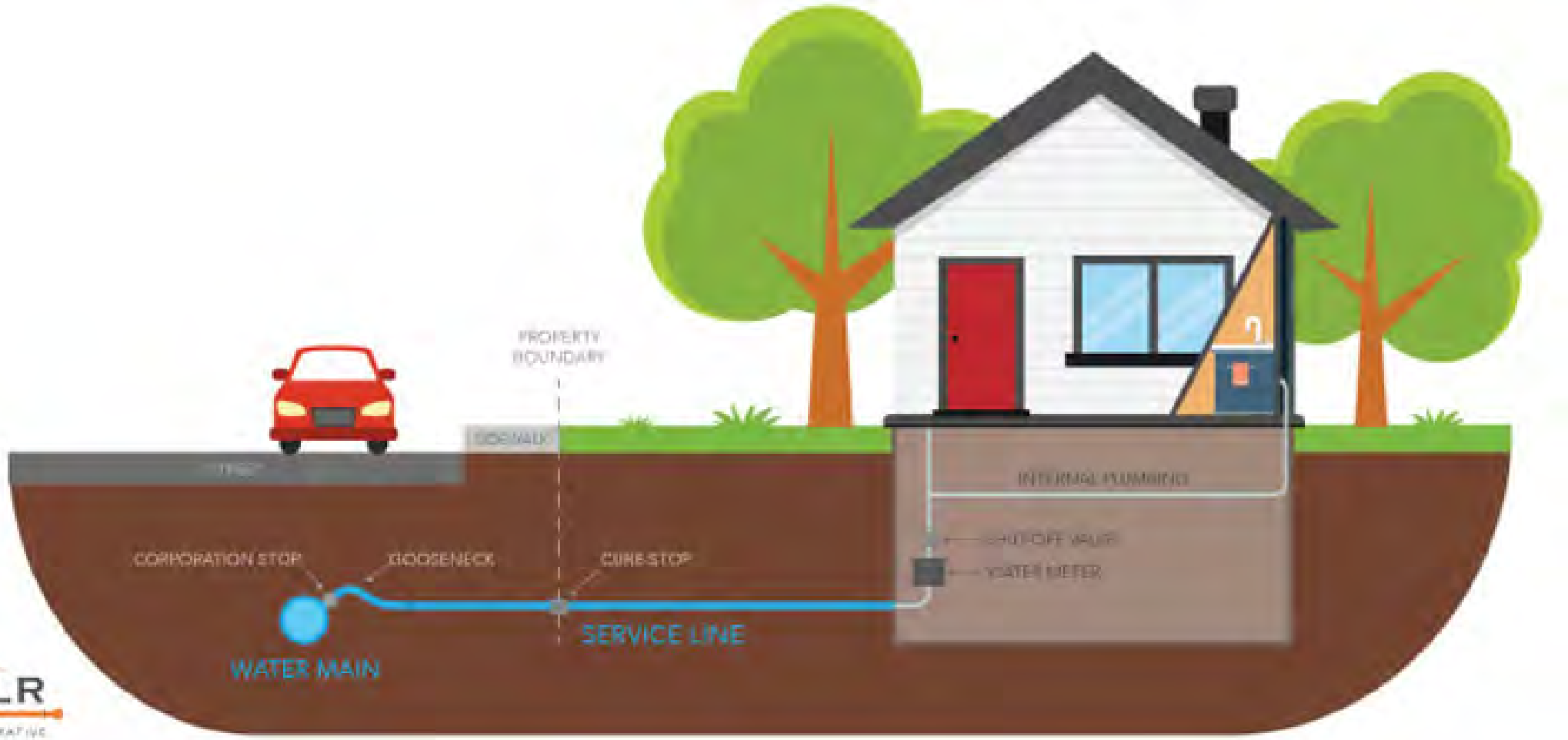
Disturbances?

EGLE

Sources of Lead in Drinking Water



Service Line Diagram



Compliance Sampling Procedures

Lead Service Lines

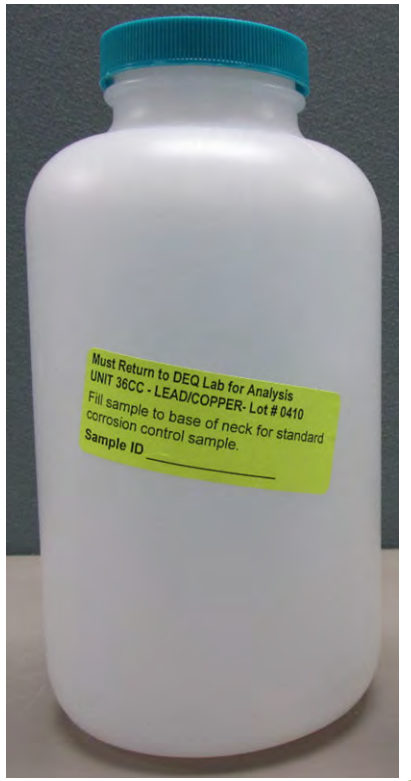
Five 1-liter bottles

- Tier 1, Single-family residence
- Tier 2, Business or other building

No Lead Service Lines

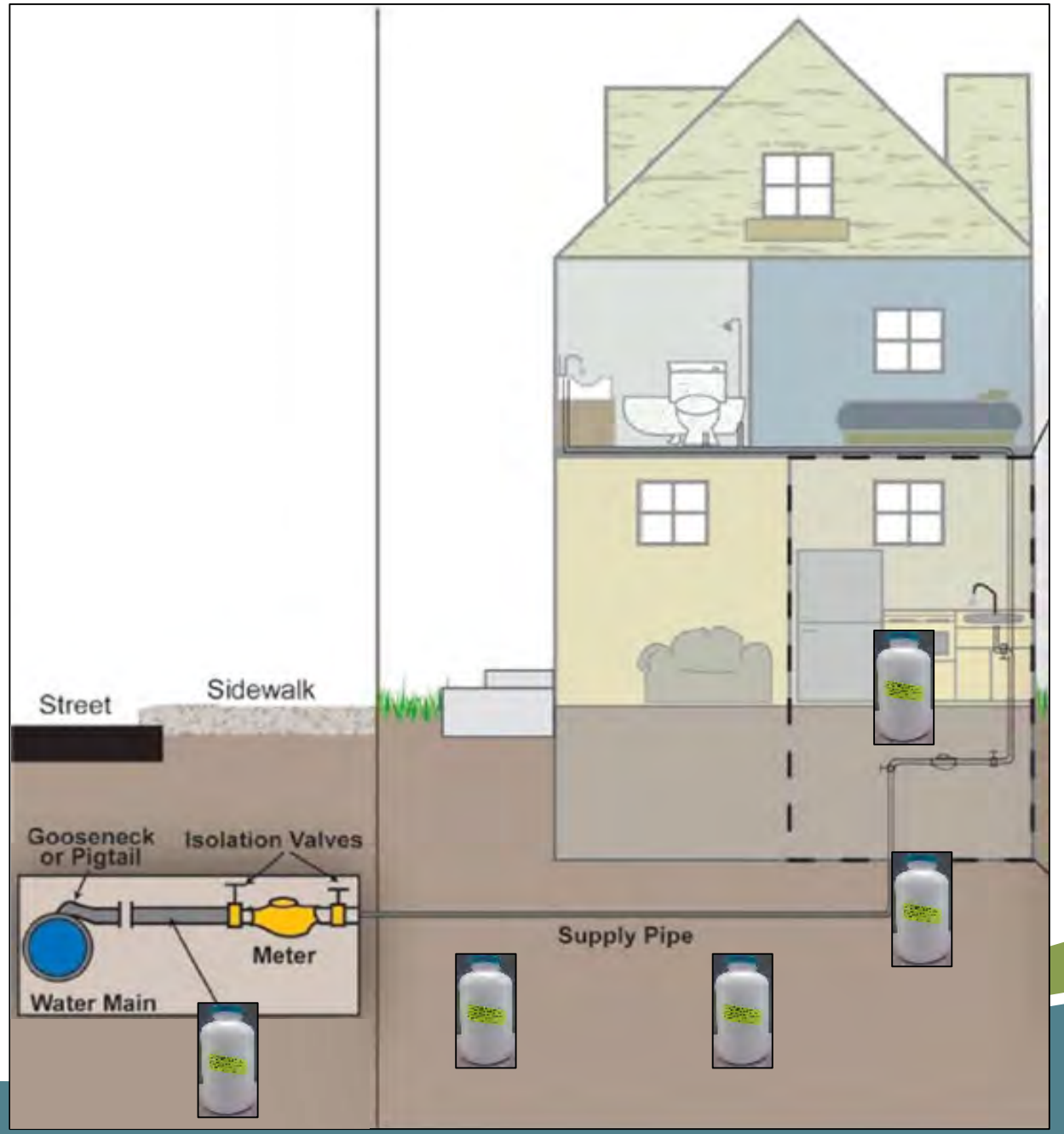
One 1-liter bottle

- All other sites



Why the 5th liter?

- Why collect a second sample?
  - The first draw sample does not always represent the highest risk to public health for a site with an LSL
- Why the fifth liter?
  - Chosen based on the average home configuration.



Sampling for Lead

1-10ppb
2-
3-
4-
5-12ppb

12ppb

1-5ppb
2-
3-
4-
5-7ppb

7ppb

1-2ppb
2-
3-
4-
5-5ppb

5ppb

1-0ppb
2-
3-
4-
5-25ppb

25ppb

1-6ppb
2-
3-
4-
5-2ppb

6ppb

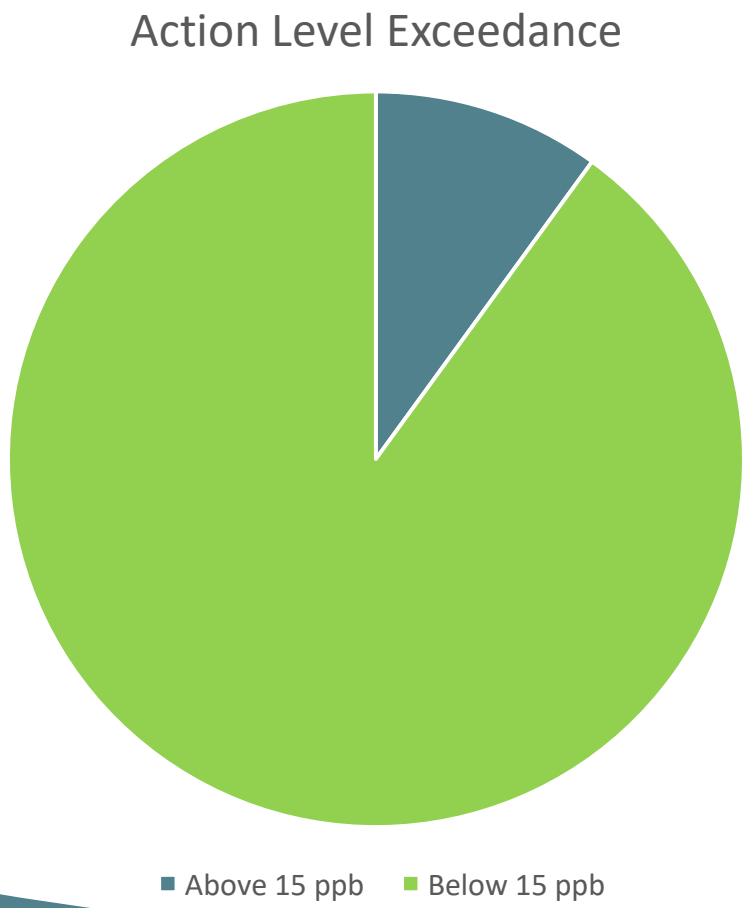
1-2ppb
2-
3-
4-
5-0ppb

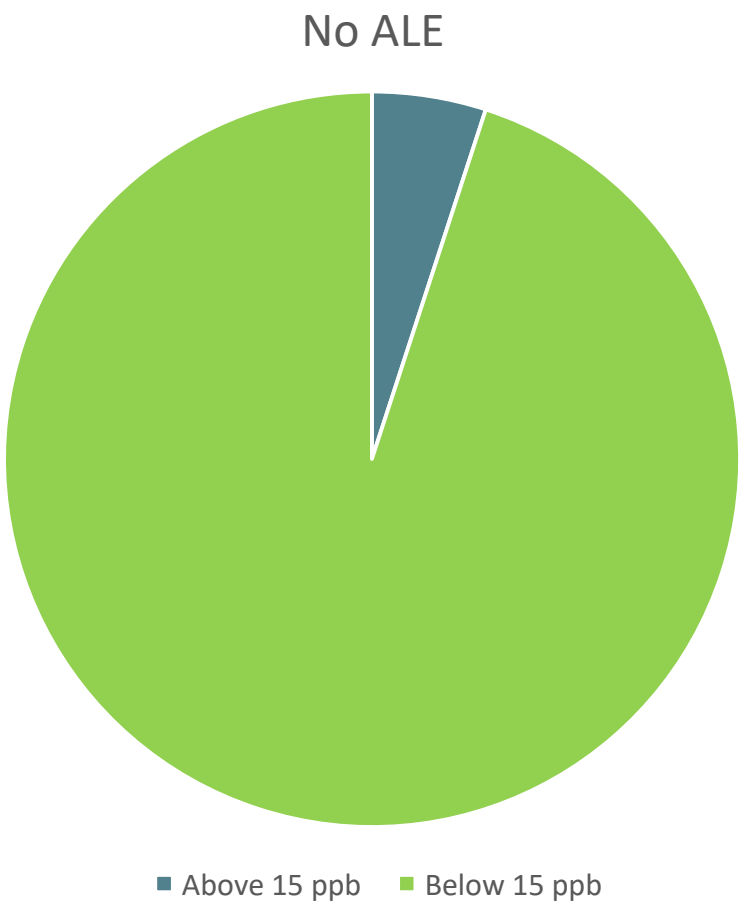
2ppb

1-0ppb
2-
3-
4-
5-3ppb

3ppb

Action Level: 90% below 15 ppb





Timeline

Treatment Installed March 2019

Treatment Increased March 2020

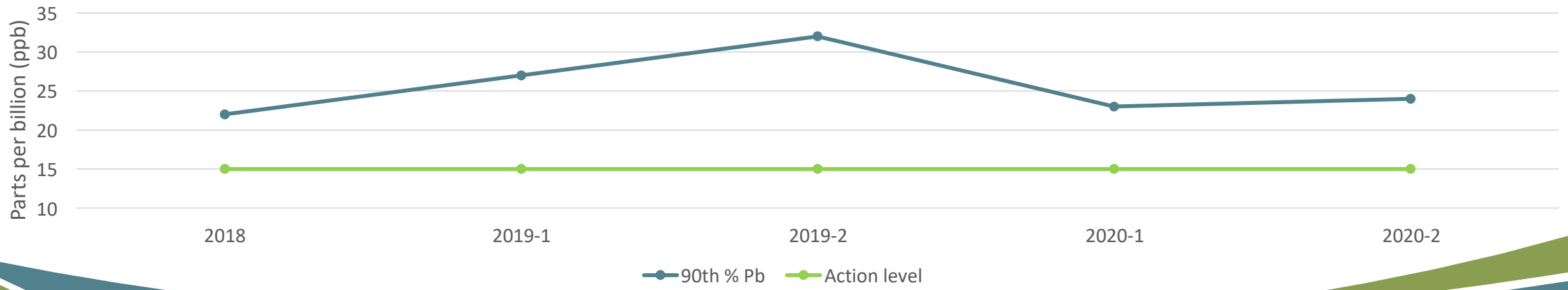
Oct 2018
30
samples

July 2019
46
samples

Dec 2019
39
samples

July 2020
63
samples

Dec 2020
67
samples

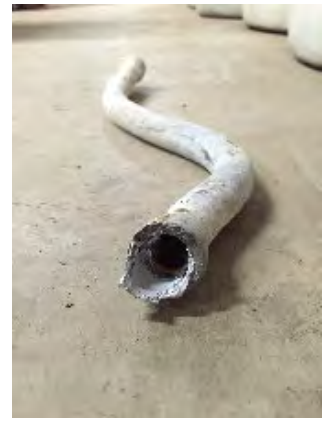


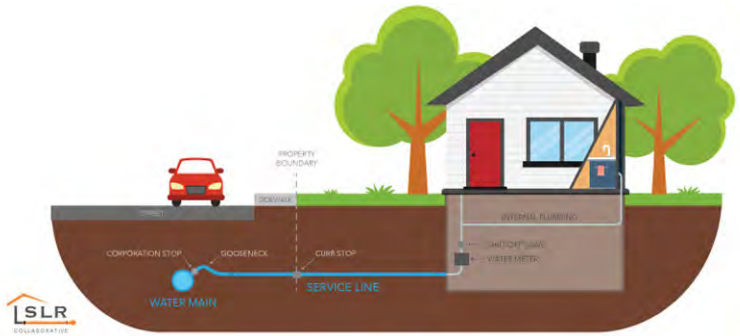
What's Been Done?

- **Work closely with partners to communicate to public**
- Big increase in sampling
- Installed treatment to help corrosion
- Increased treatment to help corrosion
- Started identifying lead service lines
- Started replacing lead service lines

What's coming up

- Continued Sampling – **need volunteers!**
- Engineering study of corrosion study
- Identification of LSL's
- Removal of LSL's
- Updates to Public





Ernie Sarkipato, Engineering Unit

Michigan Department of Environment, Great Lakes, and Energy

616-307-0261

sarkipatoe@michigan.gov

CARUS™ 8600 Water Treatment Chemical

DATA SHEET

CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF CARUS™ 8600

•Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

•Decreases iron tuberculation, to extend the life of the distribution system

•Inhibits lead and copper leaching, resulting in lower lead and copper levels in the delivered potable water

•Minimizes the occurrence of microbial-influenced corrosion providing longer life system

•Controls iron and manganese minimizing rusty and dirty water in the system

•Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

•Diminshes calcium scale depostis typically seen in hot water lines and heaters

•Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks and failures.

PROPERTIES AND CERTIFICATIONS

Description: Clear homogenous liquid
Freezing Point: Do not Freeze
Specific Gravity: 1.34-1.40
pH (1% w:w): 5.0 ± 0.5
NSF Maximum Feed Rate: 23 mg/L
NSF/ANSI Standard 60, Kosher Appproved

Certified
Kosher Pareve

HANDLING AND STORAGE

CARUS™ 8600 water treatment chemical should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations Consult the MSDS for additional safety information.

SHIPPING

CARUS™ 8600 water treatment chemical is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

CARUS™ 8600 water treatment chemical can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, glass lined /epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead. brass, bronze, tin, and other base metals.

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
Fax + 1 815 224 6697

Carus Europe
Asturias, Spain
Tel + 34 985 78 55 13
Fax + 34 985 78 55 10

Certified Company

Web: www.caruscorporation.com
E-Mail: salesmkt@caruscorporation.com

Responsible Care® Good Chemistry at Work

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
(UN Specification: UN3H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg). **The net weight is 57 lb (25.85 kg).**

15-gallon (171-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg). **The net weight is 171 lb (77.6 kg).**

30-gallon (342-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg). **The net weight is 342 lb (155.1 kg).**

55-gallon (627-lb) Drum
(UN Specification: UN1H1/Y1.8/100) Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg). **The net weight is 627 lb (284.4 kg).**

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
(UN Specification: UN31HA1/Y1.9/100) Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk Quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 90-year history Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change; and the conditions of handling, use or misuse of the product are beyond our control. Carus Corporation makes no warranty, either expressed or implied, including any warranties of merchantability and fitness for a particular purpose. Carus also disclaims all liability for reliance on the completeness or confirming accuracy of any information included herein. Users should satisfy themselves that they are aware of all current data relevant to their particular use(s).

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500

Carus Europe
Asturias, Spain

Responsible Care® Good Chemistry at Work

CARUS™ is a trademark of Carus Corporation. Carus and Design is a registered service mark of Carus Corporation. Responsible Care is a Copyright 2009

SAFETY DATA SHEET

1. Identification

Product identifier	**CARUS™ 8600 Water Treatment Chemical**
Other means of identification	
SDS number	-
Recommended use	CARUS™ 8600 water treatment chemical is an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Company name	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixtures	
Composition comments	The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling	Avoid inhalation and contact with skin and eyes. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate.
Individual protection measures, such as personal protective equipment	
Eye/face protection	If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.

Form	Liquid.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	5.8±0.5
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1.37±0.03 at 25°C
Solubility(ies)	
Solubility (water)	Completely soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization will not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	May cause discomfort if swallowed.
Inhalation	In high concentrations, vapors may be irritating to the respiratory system.
Skin contact	Prolonged or repeated skin contact may cause irritation.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	May cause discomfort if swallowed.
Skin corrosion/irritation	Prolonged contact may cause dryness of the skin.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization No data available.

Skin sensitization Not a skin sensitizer.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity No data available.

Specific target organ toxicity - single exposure No data available.

Specific target organ toxicity - repeated exposure No data available.

Aspiration hazard Not classified.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability The product is not expected to be readily biodegradable.

Bioaccumulative potential No data available for this product.

Mobility in soil Not available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This substance/mixture is not intended to be transported in bulk.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 24-July-2014

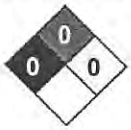
Revision date -

Version # 01

HMIS® ratings

Health: 0
Flammability: 0
Physical hazard: 0

NFPA ratings



References

HSDB® - Hazardous Substances Data Bank

Disclaimer

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CORPORATION DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CORPORATION MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTIABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Corporation, and shall be the sole responsibility of the holder or user of the product.

Carus Corporation
1500 8th Street
LaSalle, IL 61301

Benton Harbor, MI

Date Received:	11/8/2018
Date Analyzed:	11/12/2018
Lab Number:	1108-07744
Product:	N/A
PWS No.:	N/A
Number of Samples:	2
Tests per Sample:	14

cc: Mike Enlow
Elhorn Engineering Co.
889 Eden Road
Mason, MI 48854

SAMPLE INFORMATION

	Sample Site	Date	Time	Sampler
A	Raw	10/31/2018		ME
B	Finished	10/31/2018		ME
C				
D				
E				
F				
G				

RESULTS

Parameter	A	B	C	D	E	F	G	Units
Hardness	149.8	151.2						mg/L as $CaCO_3$
Orthophosphate	0.05	0.04						mg/L as PO_4
Iron	0.08	<0.02						mg/L
Manganese	<0.01	<0.01						mg/L
Copper								mg/L
Lead								mg/L
Initial pH								
Final Temp.	21.9	22.0						Celsius
Final pH	7.8	7.7						
Alkalinity	53.0	58.3						mg/L as $CaCO_3$
Calcium	38.7	39.2						mg/L
Langelier	-0.21	-0.29						mg/L
Conductivity	153	180						umhos/cm
Chloride								mg/L
TDS	102	120						mg/L
Sulfate	23	32						mg/L
Poly Phosphate	0.08	0.01						mg/L as PO_4
Total Phosphate	0.13	0.05						mg/L as PO_4

Comments:

Note: These results are for monitoring purposes only. They cannot be used for compliance reporting.
Tina Garcia, Senior TS Lab Specialist
Tel: (815) 224-6880

INVOICE

Account Address:

Reference:

Lab Number: 1108-07744
Date: 11/8/2018

Description of Service	Number of Samples	Tests Per Sample	Price Per Test	Net Extension
Carus Corporation Laboratory Services	2	14	$25.00	$700.00
Customer Appreciation Credit				($700.00)
			Total USD	$0.00

By teaming with Elhorn Engineering and Carus, you just saved $700.00 in outside laboratory fees!

Thank you for giving us the opportunity to serve you.

We appreciate your business and the confidence you have placed in us.
Please contact Tina Garcia at (815) 224-6880 for further assistance.

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

March 8, 2019

CERTIFIED MAIL

The Honorable Marcus Muhammad
Mayor of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Dear Mayor Muhammad:

SUBJECT: Administrative Consent Order (ACO); City of Benton Harbor; WSSN: 00600

Enclosed please find a fully executed ACO between the City of Benton Harbor and the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), regarding the water supply at the City of Benton Harbor. The compliance schedule in this ACO is meant to bring the water supply into compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. The effective date of the ACO is March 5, 2019.

If you have any questions regarding the ACO, please contact me at 616-490-9590; lachancea1@michigan.gov; or DEQ, P.O. Box 30817, Lansing, Michigan 48909-8311.

Sincerely,

Amy Lachance
Assistant Division Director
Drinking Water and Municipal Assistance Division

Enclosure
cc: Mr. Darwin Watson, City of Benton Harbor
Mr. Eric J. Oswald, DEQ
Mr. Brian Thurston, DEQ
Mr. Mike Bolf, DEQ
Mr. Ernie Sarkipato, DEQ
Mr. Dave Willard, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER AND MUNICIPAL ASSISTANCE DIVISION

ADMINISTRATIVE CONSENT ORDER

In the matter of: DWMAD Order No. ACO-399-07-2019

SECTION I

FACILITY OWNER/OPERATOR

NAME	OWNER☒	OPERATOR☐
City of Benton Harbor		
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS BUSINESS IDENTIFICATION NUMBER		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
CONTACT NAME/TITLE: Darwin Watson, City Manager	PHONE #: 269-927-8408	

FACILITY NAME AND LOCATION

FACILITY NAME: Benton Harbor Public Water Supply		WATER SUPPLY SERIAL NUMBER: 00600
FACILITY OWNER IF NOT IDENTIFIED ABOVE: City of Benton Harbor		
ADDRESS: 200 East Wall Street		
CITY: Benton Harbor	STATE: Michigan	ZIP CODE: 49022
COUNTY: Berrien		
CONTACT NAME: Darwin Watson	PHONE #: 269-927-8408	

1.1 This document results from allegations by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ alleges that the City of Benton Harbor, owner/operator of the city's public water supply, is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder.

1.2 Specific violations are referenced in the DEQ Significant Deficiency Violation Notice (SDVN) attached to this Administrative Consent Order (Consent Order) as Exhibit A. The Owner/Operator and the DEQ agree to resolve the violations set forth therein through entry of this Consent Order. The Owner/Operator agrees to resolve all compliance issues set forth in Exhibit A in accordance with the requirements contained in this Consent Order. This Consent Order, in its entirety, shall consist of Section I, the attached Sections II, III, and IV, Exhibit A, and any other referenced attachments, exhibits, or appendices. This Consent Order shall be considered null and void if it does not include, at a minimum, Sections I, II, III, and IV and Exhibit A. The Owner/Operator further agrees that this Consent Order shall become effective on the date it is signed by the DWMAD Director, designee of the DEQ Director.

1.3 The Owner/Operator agrees to pay a civil fine of $500 per day for failure to complete corrective actions as specified in Section II, Compliance Schedule, unless an extension has been approved under Section 4.14. Failure to make a timely payment constitutes a violation of this Consent Order.

1.4 The Owner/Operator agrees to make payment of all funds due pursuant to this agreement by certified check made payable to the "State of Michigan" and mailed to the Accounting Services Division, Cashier's Office for the DEQ, P.O. Box 30657, Lansing, Michigan 48909-8157. To ensure proper credit, all payments made pursuant to this Consent Order must include "Payment Identification Number RMD90044" on the check. The Owner/Operator agrees not to contest the legality of the civil fine.

Signatories

DEPARTMENT OF ENVIRONMENTAL QUALITY

Eric Oswald, Director
Drinking Water and Municipal Assistance Division

5-Mar-19
Date

I undersigned CERTIFY that I am fully authorized by the party identified above to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it. I further attest that all information provided herein is accurate and true.

CITY OF BENTON HARBOR

Marcus Muhammad, Mayor

2/25/2019
Date

SECTION II - COMPLIANCE SCHEDULE

IT IS THEREFORE AGREED AND ORDERED THAT the Owner/Operator shall take the following actions to prevent further violations of Act 399 and the administrative rules promulgated thereunder and/or to correct the significant deficiencies identified in the SDVN attached to this Consent Order as Exhibit A.

2.1 Submit to the DWMAD a completed rate study from a qualified professional consultant, along with a plan to implement rate increases as recommended by the study, no later than April 1, 2019.

2.2 Upgrade the water plant supervisory and data acquisition (SCADA) system to allow for storage and easy access to required regulatory data including turbidity and chlorine, alarming for regulatory minimum levels, and potentially automation of some water plant operations, no later than April 1, 2019.

2.3 Install metering capabilities on the finished water no later than April 1, 2019.

2.4 Make necessary improvements to the water treatment facility in order to have a functioning and reliable continuous chlorine analyzer on the finished water tap no later than April 1, 2019.

2.5 Obtain an adequately licensed operator in charge, solely dedicated to the water distribution system, no later than April 1, 2019.

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD no later than April 31, 2019.

2.7 Submit to the DWMAD an implementation plan for a consistent and equitable rate collection program to minimize the number of unpaid bills and streamline the collections process, no later than May 1, 2019.

2.8 Submit an updated cross connection program for DWMAD approval, incorporating the City's plan for implementing control of residential accounts, and for obtaining adequate personnel to implement the City's cross connection control program, no later than June 1, 2019.

2.9 Install necessary modifications at the water treatment plant to inject coagulant chemical at a DWMAD-approved rapid mix location, and develop a standard operating procedure for feeding coagulant, no later than June 1, 2019.

2.10 Submit a plan to the DWMAD for inventorying and ongoing maintenance of distribution valves and hydrants, no later than June 1, 2019.

2.11 Conduct professional inspection of the elevated tank interior and exterior no later than June 30, 2019.

2.12 Install working mussel control system at the intake no later than June 30, 2019.

2.13 Repair filter to waste valves no later than January 1, 2020.

Sections III and IV of this Consent Order shall not be altered in any way, including adding or eliminating any language, striking terms or parts of terms, retyping in whole or in part, or using a different format. Any changes to this document without written approval from the DEQ renders the Consent Order null and void.

SECTION III - STIPULATIONS

The Owner/Operator and the DEQ stipulate as follows:

3.1 The DEQ is authorized to enter this Consent Order requiring the Owner/Operator to comply with state law under Section 15 of Act 399.

3.2 The Owner/Operator consents to the issuance and entry of this Consent Order and stipulates that the entry of this Consent Order constitutes a final order of the DEQ and is enforceable as such under the appropriate provisions of state law identified in this Consent Order. The Owner/Operator agrees not to contest the issuance of this Consent Order and that the resolution of this matter by the entry of this Consent Order is appropriate and acceptable.

3.3 The Owner/Operator and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Owner/Operator that the law has been violated.

3.4 The Signatory to this Consent Order on behalf of the Owner/Operator agrees and attests that he/she is fully authorized to ensure that the Owner/Operator will comply with all requirements under this Consent Order.

3.5 The Owner/Operator shall achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section II of this Consent Order.

SECTION IV - GENERAL PROVISIONS

The Owner/Operator and the DEQ further stipulate as follows:

4.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Owner/Operator to comply with the requirements of Act 399 and the administrative rules promulgated thereunder.

4.2 The DEQ and the Owner/Operator consent to enforcement of this Consent Order in the same manner and by the same procedures for all final orders entered pursuant to the provisions of Act 399.

4.3 This Consent Order in no way affects the Owner/Operator's responsibility to comply with any other applicable local, state, or federal laws or regulations.

4.4 The DEQ reserves its right to pursue appropriate action, including injunctive relief to enforce the provisions of this Consent Order, and applicable statutory fines for any violation of this Consent Order.

4.5 Nothing in this Consent Order is or shall be considered to affect any liability the Owner/Operator may have for natural resource damages caused by the

Owner/Operator's acts or omissions at the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

4.6 In the event the Owner/Operator sells or transfers the facility, he/she shall advise any purchaser or transferee of the existence of this Consent Order in connection with such sale or transfer. Within 30 calendar days, the Owner/Operator shall also notify the DWMAD Engineering Unit, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Consent Order has been given to the purchaser and/or transferee. The purchaser and/or transferee of this Consent Order must agree, in writing, to assume all of the obligations of this Consent Order. A copy of that agreement shall be submitted to the DWMAD Engineering Unit within 30 days of assuming the obligations of this Consent Order.

4.7 The provisions of this Consent Order shall apply to and be binding upon the parties to this action and their successors and assigns.

4.8 This Consent Order constitutes a civil settlement and satisfaction as to the resolution of the violations specifically addressed herein; however, it does not resolve any criminal action that may result from these same violations.

Reporting

4.9 The Owner/Operator shall make all submittals and written notifications required by this Consent Order, to the DWMAD Engineering Unit, DEQ, Grand Rapids District Office, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49503. The cover letter with each submittal or notification shall identify the specific paragraph and requirement of this Consent Order that the submittal or notification is intended to satisfy.

4.10 The Owner/Operator shall verbally report any violation(s) of the terms and conditions of this Consent Order to the DWMAD Engineering Unit Supervisor at 231-590-3430 by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with submittal of a written report within five business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The Owner/Operator shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

Retention of Records

4.11 Upon request by an authorized representative of the DEQ, the Owner/Operator shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order or pursuant to applicable laws or rules. All such documents shall be retained by the Owner/Operator for at least a period of three years from the date of generation of the record unless a longer period of record retention is required by the applicable law or its rules.

Right of Entry

4.12 The Owner/Operator shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all

reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to Act 399 and the administrative rules promulgated thereunder or any other applicable statutory provision.

DEQ Approval of Submittals

4.13 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Owner/Operator, the following process and terms of approval shall apply:

a. All work plans, proposals, and other documents required to be submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

b. In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the reasons for such disapproval. The Owner/Operator shall submit, within 30 days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

c. In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the Owner/Operator, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Owner/Operator to submit, prior to implementation and within 30 days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the Owner/Operator, in writing, of this disapproval.

d. Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

e. Failure by the Owner/Operator to submit an approvable work plan, proposal, or other document, within the applicable time periods specified above, constitutes a violation of this Consent Order and shall subject the Owner/Operator to the enforcement provisions of this Consent Order.

f. Any delays caused by the Owner/Operator's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Owner/Operator's responsibility to comply with any other deadline(s) specified in this Consent Order.

g. No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted

by the Owner/Operator will be construed as relieving the Owner/Operator of his/her obligation to obtain written approval, if and when required by this Consent Order.

Extensions

4.14 The Owner/Operator and the DEQ agree that the DEQ may grant the Owner/Operator a reasonable extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a written request to the DWMAD Engineering Unit no later than ten business days prior to the pertinent deadline and shall include:

a. Identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances that will prevent the Owner/Operator from meeting the deadline(s).

c. A description of the measures the Owner/Operator has taken and/or intends to take to meet the required deadline(s).

d. The length of the extension requested and the specific date on which the obligation will be met.

No change or modification to this Consent Order shall be valid unless in writing from the DEQ and, if applicable, signed by both parties.

Termination

4.15 This Consent Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the Owner/Operator shall submit a request consisting of a written certification that the Owner/Operator has fully complied with the requirements of this Consent Order and has made payment of any fines required in this Consent Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section II of this Consent Order, and the date any fines or penalties were paid.

b. A statement that all required information has been reported to the DWMAD Engineering Unit.

c. Confirmation that all records required to be maintained pursuant to this Consent Order are being maintained at the facility.

The DEQ may also request additional relevant information. The DEQ shall not unreasonably withhold issuance of a TN.

Exhibit A
Administrative Consent Order

Enforcement Type	Issue Date
Significant Deficiency Violation Notice	October 3, 2018

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
GRAND RAPIDS DISTRICT OFFICE

C. HEIDI GRETHER
DIRECTOR

October 3, 2018

CERTIFIED MAIL

Mr. Marcus Muhammad, Mayor
Mr. Darwin Watson, City Manager
City of Benton Harbor
200 Wall Street
Benton Harbor, MI 49022

SIGNIFICANT DEFICIENCY VIOLATION NOTICE
WSSN: 00600

Dear Sirs:

SUBJECT: City of Benton Harbor (City) - Water System Sanitary Survey and Significant Deficiency Violation Notice – Financial and Managerial Capacity

This letter will confirm meetings with Benton Harbor staff on multiple dates in 2017 and 2018; representing the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD), and summarize the subsequent review and discussion of the water supply facilities serving the City of Benton Harbor (City). The purpose of these meetings and subsequent review is to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). **Findings from the survey, listed below, have led to the determination the water supply currently lacks the financial and managerial capacity to meet all the requirements of Act 399.** Findings of significant deficiency have been identified as having the potential to introduce contamination to the public water supply and must be addressed within 120 days or be outlined in a corrective action plan and schedule approved by this office.

Since the previous sanitary survey in 2015, staff at the City of Benton Harbor have made significant efforts to maintain and improve the historically neglected water system. The distribution pipe network alone represents $124 million in replacement value, according to the 2017 asset management program by Abonmarche. Along with the City's complex treatment plant, this represents a significant challenge for the City in terms of maintenance costs. Proper care and maintenance of the system is necessary to protect the health of all customers.

The major findings below indicate a number of areas needing immediate attention by the City, many of which have the potential to impact public health by allowing or introducing contamination to the water supply. Of utmost importance, a review of financial information finds the City presently lacks an adequate financial mechanism to conduct necessary improvements or hire necessary staff to properly maintain and operate the water system. **We strongly advise the City to work with a qualified financial consultant to identify the revenue necessary to support operation and maintenance and to implement effective revenue collection methodologies.** Investment from the City's rate payers is essential for resolving the below (significant) deficiencies and for ensuring the long term vitality of the water system assets.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	**Deficiencies Identified**
Treatment	**Significant Deficiencies Identified**
Distribution System	**Significant Deficiencies Identified**
Finished Water Storage	**Deficiencies Identified**
Pumps	Recommendations made
Monitoring & Reporting	**Significant Deficiencies Identified**
Management & Operations	**Significant Deficiencies Identified**
Operator Compliance	Recommendations made
Security	No Deficiencies or Recommendations
Financial	**Significant Deficiencies Identified**
Other	**Significant Deficiencies Identified**

The following significant deficiencies are violations of Act 399 with the potential to allow or introduce contamination to the public water supply, and must either be resolved within 120 days or be included in an approved corrective action plan.

D1. Our review included the City's asset management program, submitted in December 2017, as well as the bill payment and collections process. Current revenues are not sufficient to cover capital improvement costs, and necessary improvements identified in this survey are likely to increase operations and maintenance costs beyond the current revenues. In addition, the current water bill collection process is inadequate and creates a significant drain on staff resources and time, which would be better spent towards resolution of significant deficiencies and performance of routine maintenance activities. **In order to maintain the required financial capacity to operate a public water supply, the City must:**

a. Conduct a rate study with a qualified professional consultant, and implement findings to generate sufficient revenue to cover costs.
b. Implement a consistent and equitable program to minimize the number of unpaid bills, and streamline the collections process.

D2. An increasing trend in the number of violations of Act 399 in the past year indicates the need for increased managerial oversight of the water supply. In addition, maintenance of the water plant and distribution system components is severely lacking. The lack of separate designated distribution and plant managers prevents staff from spending adequate time and energy on managing the water system. **In order to maintain the managerial capacity to operate the public water supply and meet the requirements of Act 399, the City must hire separate certified operators to oversee the distribution system and the water treatment facility.**

D3. R 325.11008 (2) requires a sufficient primary coagulant dose shall be added to create a settleable or filterable floc at all times. Currently the City adds coagulant to an injection point in the raw water influent pipe rather than the engineered rapid mix basins in the new plate settler building. It has become apparent, through a near violation of turbidity standards in February of 2018, as well as an ongoing treatment technique violation of R 325.10610c, this coagulation practice is not acceptable to meet the requirements of Act 399. Lack of proper mixing also impacts the pathogen removal credit awarded to properly operated conventional treatment facilities. **Adequate rapid mix for the primary coagulant must be installed.**

The current raw water pH of Lake Michigan is above the optimum operating range of the City's current coagulant, aluminum sulfate. At these elevated pH ranges, iron based coagulants, such as ferric sulfate or ferrous sulfate may be more suited for creating a settleable or filterable floc. The City should hire a consultant to explore the steps necessary to explore a switch of the primary coagulant.

D4. R 325.10720 (3) requires continuous monitoring for residual disinfectant at an entry point to the distribution system (EPTD) on a continual basis, and requires the minimum to be recorded for each day. The chlorine analyzer at the City's EPTD was reading less than 0.2 mg/L, the minimum required residual under R325.10611a(2)(b). The readings were identified as unreliable by the operator, and are not recorded as required above. Moreover, plant staff were not familiar with the operational setpoints necessary to achieve sufficient disinfection. **Accurate chlorine analyzer must be in place, minimum levels recorded daily and reported to the DEQ, and connected to SCADA with callout alarms in the event of low residual.**

D5. R 325.11404 requires a water supply to develop a comprehensive control program for the elimination and prevention of all cross connections. The program must include education, inspection, preventer testing in all customer sectors including residential. In addition, an annual report summarizing activities must be submitted to the DEQ. The City has insufficient staff to conduct any activities for the last few years, as evidenced by the lack of annual reporting. **The City must dedicate a trained staff person to implement this program or obtain a contract with a qualified professional company to implement the program.**

D6. R325.11108 requires a water supply to have sufficient valves in the distribution system to minimize interruptions in service and minimize sanitary hazards during construction or repairs. In addition, R 325.11111 requires adequate records be maintained on the distribution system components including hydrants and valves. The City has struggled to conduct necessary inventory and maintenance on valves in the system. **A plan for valve inventory and maintenance must be submitted, approved and implemented consistently.**

D7. R 325.11105 requires a water supply distribution system to maintain a minimum pressure of 20psi throughout the system during emergencies such as firefighting, and allows the department to prohibit installation of fire hydrants in areas where fire flow is not sufficient. From our discussion with staff and through the hydrant flow testing activities conducted during the reliability study, a number of hydrants in town have no flow or zero flow. This may be related to closed valves in the system, which significantly impacts public safety should an emergency occur. **A plan for hydrant inventory and maintenance must be submitted,**

approved and implemented consistently.

D8. The water plant's supervisory control and data acquisition (SCADA) system is in need of upgrades to achieve the following requirements:

a. Storage and access to regulatory data such as EPTD chlorine residuals (R 325.10720), plant flow, and individual filter turbidity profiles (R10720a).
b. Alarming capabilities to call out during unstaffed hours for low chlorine residual, low tower level, high turbidity at the filter confluence point and other undesirable conditions.
c. Automation of water plant operations may be enhanced to allow staff to focus on maintenance activities.

The following deficiencies are also violations of Act 399, and must be resolved to return to compliance with Act 399.

D9. Install finished water meters at the water plant to facilitate accurate calculations and reporting of chemical treatment, calculation of non-revenue water, and more accurate calculation of CT.

D10. Significant amounts of unlined cast iron water main are in need of replacement. With funding in place, the City must prioritize replacement of old water main that is unreliable and undersized.

D11. The monthly operating report must accurately reflect the data collected at the water plant. For example, treated water has been estimated using raw water meters, and chlorine at the plant tap should be the minimum recorded for the day from the EPTD continuous analyzer as opposed to bench top analysis.

D12. Conduct a professional inspection on the elevated tank, including necessary maintenance and cleaning. This may be facilitated by installing variable frequency drive(s) on high service pumps, which would allow operating on pressure rather than on tower level.

If you have any information you would like us to consider regarding the significant deficiencies identified in this Significant Deficiency Violation Notice, please provide it in a written response by November 2, 2018.

Representatives from the City and DEQ met on September 14, 2018 to discuss preliminary findings of the sanitary survey, and to begin discussion of a corrective action plan such as an administrative consent order (ACO), to return to compliance. It is understood that a significant amount of time will be required to address many of these issues. Therefore, we recognize that this ACO contains a schedule, which is both systematic and flexible, to bring the City back into compliance with the SDWA and providing a safe and reliable source of drinking water to its residents. Upon hearing from the City of its desire to move forward with an ACO, we will forward a draft ACO for the City's review and comment. At that time, DEQ staff will be available to meet with City officials to discuss the ACO in an attempt to execute it prior to the 120 day deadline.

A reliable supply of quality drinking water is critical to the growth and strength of any community. We are committed to working with the City to improve the water distribution system and treatment plant. With a strong commitment and swift effort from the City, we believe these deficiencies can be resolved and lead to long term water system sustainability.

We anticipate and appreciate your cooperation in resolving this matter. If you have any questions regarding this Significant Deficiency Violation Notice, please contact me by telephone at 616-307-0261; by e-mail at sarkipatoe@michigan.gov; or DEQ-DWMAD, 350 Ottawa Avenue NW, Unit 10, Grand Rapids, Michigan 49506.

Sincerely,

Ernie Sarkipato, P.E.,
Surface Water Treatment Specialist
Drinking Water and Municipal Assistance Division

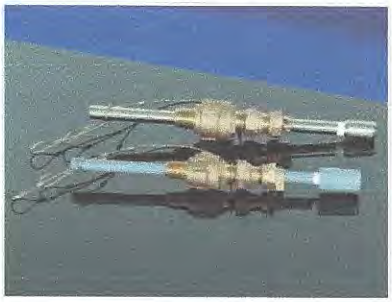
Enclosure

cc: Berrien County Health Department
cc/enc: Mr. Mike O'Malley, Operator in Charge, City of Benton Harbor
Mr. Eric Oswald, Director, DEQ (via email)
Ms. Sue Maul, Enforcement Specialist, DEQ (via email)
Mr. Jon Bloemker, Engineering Unit Supervisor, DEQ (via email)

Corporation Stop & Nozzle Assembly

Corporation Stop & Nozzle Assembly

LMI offers a selection of Corporation Stop & Nozzle Assemblies to meet your chemical injection requirements. Available in four sizes consisting of 1" NPT with PP Nozzle, 1" NPT with Carpenter 20 Nozzle, 1" Mueller with PP Nozzle and 3/4" NPT with CPVC Nozzle. The durable brass components in contact with potable water are designed with a 0.10% maximum lead content which meets certain areas requiring "lead free" or "no lead" fixtures.



High Resolution Image

Request a Quote

Features Tab Information Tab

Brass components in contact with potable water are designed with a 0.10% maximum lead content

Injects Chemical into the center of the water flow

Allows easy nozzle withdrawal for service removal of injection check valve without shutdown of treated line.

Maximum pressure : 150 PSI

Part No.	Description
49290	1" Mueller Bronze Corp Stop Assembly with PP Nozzle Assembly (replaces P/N 27741)
49289	1" NPT Bronze Corp Stop with Carpenter 20 Nozzle Assembly (replaces P/N 26741)
49288	1" NPT Bronze Corp Stop with PP Nozzle Assembly (replaces P/N 10741)
49287	3/4" NPT Bronze Corp Stop Assembly with CPVC Nozzle Assembly (replaces P/N 10998)

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: Darwin Watson, City Manager 200 East Wall Street Benton Harbor, MI 49022 **WSSN**: 600	Permit Stamp Area (DEQ use only)	
2. **Owner's Contact Person** (provide name for questions): Contact: Mike O'Malley Title: Water Plant Superintendent Phone: 269-927-8470		
3. **Project Name** (Provide phase number if project is segmented): Phosphate Corrosion Inhibitor Installation	4. **Project Location** (City, Village, Township): City of Benton Harbor	5. **County** (location of project): Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc:

Issued by: _____

Reviewed by: _____

☐ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

6. **Facilities Description –** In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW**.** Use additional sheets if needed.

Installation of equipment to feed a blended polyphosphate for the purposes of corrosion protection. Consultation with Elhorn Engineering has resulted in a recommended corrosion inhibitor. The following are components of the project:

-Carus 8600, 70% orthophosphate, 30% polyphosphate, chemical strength of 33% as total Phosphate, SG=11.4 lbs/gal
-Necessary equipment to feed at a rato of 1.5 mg/L as phosphate:
- -No day tank needed per estimated chemical use
- -Stenner S series pump capable of 40 gpd dosing with flow-pacing capabilities
- -Insertion meter to interface with chemical dosing pump
- -isolation of the high service pump suction line using existing valves to allow a single dosing pump and flow meter
- -chemical scale with digital readout (Forceflow XT-600)
- -LMI corporation stop and nozzle assembly

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:	8. Indicate who will provide project construction inspection: ☒Organization listed in Box 1. ☐Engineering firm listed in Box 7. ☒Other - name, address, and phone number listed below. Chemical Supplier: Mike Enlow, Elhorn Engineering Co. 517-204-2845 mike@michonline.net

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed. Adequate design information is attached

10. Are sealed and signed engineering plans attached?
☐YES ☒NO

If no, briefly explain why engineering plans are not needed. Project is in coordination with Elhorn and MDEQ

11. Are sealed and signed construction specifications attached?
☐YES ☒NO

If specifications are not attached, they need to be on file at DEQ.

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☐YES ☒NO

If yes, a wetland permit must be obtained.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☐ Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO
If yes, is this activity regulated by the National Pollutant Discharge Elimination System storm water regulations?
☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated:
Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If yes, attach a copy of a plan acceptable to the DEQ for handling contaminated soils and/or groundwater disturbed during construction. Contact the local DEQ district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1) Name and WSSN of source water supply system (seller) _____

2) Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?
☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to DEQ.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, _____ (name), acting as the _____ (title/position) for
(print) (print)

_____ (entity owning proposed facilities) certify that this project has
(print)
been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

_____ _____ _____
Signature* Date Phone

*Original signature only, no photocopies will be accepted.

PROJECT BASIS OF DESIGN – FOR WATER MAIN PROJECTS

PROJECT NAME: _____

For this PROJECT the following information must be provided per Act 399 unless waived by the Department. For projects other than water main installation, or if additional space is needed, attach separate sheet(s) with detailed Basis of Design calculations.

A. A general map of the initial and ultimate service areas
☐Included on engineering plans ☐Attached separately

B. Number of service connections served by this permit application _____

C. Total number of service connections ultimately served by entire project _____

D. Residential Equivalent Units (REUs) served by this permit application _____

E. Total Residential Equivalent Units (REUs) ultimately served by entire project _____

F. Water flow rates for proposed project based on REUs listed in "D' and "E" above

1. Initial design average day flow (mgd) _____
2. Initial design maximum day flow (mgd) _____
3. Total design average day flow (mgd) _____
4. Total design maximum day flow (mgd) _____
5. Required fire flows: (1) _____ gpm for _____ hours

G. Actual flows and pressures of existing system at the connection point(s) (2)
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi
_____ gpm at _____ psi

H. Estimated minimum flows and pressures within the proposed water main system (3) _____ gpm at _____ psi

(1) Every water system must decide what levels of fire fighting flows they wish to provide. Fire flow should be appropriate for the area (residential, commercial, industrial) being served by the project. Typical fire flow rates can be obtained from the water supply, local fire dept., ISO or AWWA. The water system must then be designed to be able to provide the required fire flows while maintaining at least 20 psi in all portions of the distribution system.

(2) Flows and pressures at the connection points must be given to determine if the existing water main(s) are able to deliver water to the new service area. These numbers can be obtained from a properly modeled and calibrated distribution system hydraulic analysis or hydrant flow tests performed in the field. If more than one connection is proposed, list as needed.

(3) List what the estimated minimum flows can be expected in the proposed water mains based on estimated water demands, head losses, elevation changes and other factors that may affect flows, such as dead end mains.

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

Ortho Content	70%	Poly Content	30%	Density:	11.4 lbs/gal
Strength	33%	total P			

Chemical Use Flow Rate Calculation (gallons per day)						
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity	
Plant Flow Rate (mgd):		2	3	4	8	
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	8.87	17.74	13.30
	2 mg/L as PO4	8.87	13.30	17.74	35.47	
	3 mg/L as PO4	13.30	19.95	26.60	53.21	

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

Day Tank Use		
	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

Carus 8600 **City of Benton Harbor** **Corrosion Inhibitor Addition**

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Strength	33%	total P				

Chemical Use Flow Rate Calculation (gallons per day)					
		Min Flow Rate	Ave Flow Rate	Max Flow Rate	State Rated Capacity
Plant Flow Rate (mgd):		2	3	5	8
Chem Dosing Rate:	1 mg/L as PO4	4.43	6.65	11.08	17.74
	2 mg/L as PO4	8.87	13.30	22.17	35.47
	3 mg/L as PO4	13.30	19.95	33.25	53.21

Goal: 1.5 mg/L as PO4

Low End: 9.3 gpd
High end: 37.5 gpd
Proposed Pump: *40 gpd*

Day Tank Use

	realistic day:	max day:
Gal Chem per day	10	40
# days per tank	*5.5*	*1.38*

November 21, 2018

City of Benton Harbor
601 N. Ridgeway Street
St. Joseph, MI. 49035
Attn: Mike O'Malley – Water Superintendent

Mike,

Thank you for your courtesies extended on my recent visit. As discussed, I am providing information on phosphates and why they are applied for your water system.

Phosphates have a long history of successful application in drinking water treatment, providing both primary and secondary benefits. Phosphates are widely used by facilities to help meet regulatory rules and to produce quality drinking water that will meet public expectations. Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, biofilm, reduce lead and copper levels) in the distribution system. Ortho and Polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion and chlorine demand in drinking water systems.

Phosphates are used in water systems to perform three broad functions.

1) Inhibit corrosion of water mains / plumbing (iron, steel, galvanized, asbestos, cement, lead and copper)
2) Sequester nuisance metals in water supply (iron, manganese, calcium, magnesium).
3) Improvement of the water in the distribution system by removing scale deposits and tuberculation, discourage microbial film formation, regrowth and stabilizing free chlorine disinfectant residuals.

Presently you are not using any phosphate treatment. We are recommending a blended ortho/poly phosphate (Carus 8600). This product is a 70/30 ortho/poly blend, which is a blend with a emphasis on corrosion control. The starting recommended applied dosage rate is 1.0 as PO4. The American Water Works Associate Research Foundation (AWWARF) and the EPA have reported corrosion control (phosphate included) provides numerous health and consumer benefits at a rate of return much greater than the original cost of the additive. Lastly, we would like to install corrosion couple racks to monitor and verify performance results are optimal.

I hope this information is helpful in your dealings with the general public and regulatory agencies.

Sincerely,

Mike Enlow
Elhorn Engineering Company

600

Sarkipato, Ernest (DEQ)

From: mike@michonline.net
Sent: Tuesday, November 20, 2018 6:47 PM
To: Onan, Brandon (DEQ)
Subject: Benton Harbor informaion
Attachments: RWU Lead and Copper Compliance-Carus Webinar final.pdf; Carus 8600 Data Sheet.pdf; Carus 8600 SDS.pdf; Benton Harbor MI Oct30.pdf; benton harbor 11-18.doc

Hi Brandon, As discussed on the phone, I wanted to provide recommendations for a corrosion control program for the City of Benton Harbor. The product is Carus 8600 which is a 70/30 ortho/poly blend. The product weights 11.4 lbs and 33% total phosphate. The starting recommended dosage is 1.0 ppm as PO4. Attached is a case study, product literature and SDS sheets , water quality results, and a recommendation letter to the City of Benton Harbor. Please review and I look forward to having a phone conversation on Wednesday afternoon to discuss. Thanks much, Mike Enlow, Elhorn Eng. Co.

Mike E: ortho 0.7
poly 0.3

Jones, Clarence (EGLE)

From: Jones, Clarence (EGLE)
Sent: Monday, June 14, 2021 10:45 PM
To: Patton, Karol (EGLE)
Subject: FW: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019
Attachments: Benton Harbor Pilot Drinking Water Grant No. 1901-01 Extension Letter.pdf

BH emails

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes, and Energy
(EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Friday, May 17, 2019 3:24 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Cc: Patton, Karol (EGLE) <PATTONK@michigan.gov>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Darwin-

I have attached a copy of the signed City of Benton Harbor Pilot Drinking Water Grant No. 1901 Grant Period Extension letter for your records.

Please contact me if you have questions.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst

Michigan Department of Environment, Great Lakes, and Energy
(EGLE)
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

From: Darwin Watson <dwatson@cityofbentonharbormi.gov>
Sent: Wednesday, May 15, 2019 1:39 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Jason Marquardt <jmarquardt@abonmarche.com>
Subject: Re: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Clarence,

The original hard copy was signed and mailed last week. The document should be in your possession or should soon be in your possession.

Thanks

On Wed, May 15, 2019 at 8:56 AM Jones, Clarence (EGLE) <JONESC13@michigan.gov> wrote:

> All-
>
> We are still waiting for the hard copy of the Benton Harbor Amendment to Pilot DW CS Grant Extension to September 30 2019 which we have been requesting since March. A PDF copy will not due since we must sign the hard copy and return it to the city in order for it to become effective. If you do not return the extension form and have our signature, on May 31, 2019, the project deliverables will be due, and the Benton Harbor Pilot Grant period will end.
>
> Thank you,
>
> Clarence Jones
>
> Project Manager/Environmental Quality Analyst
>
> Michigan Department of Environment, Great Lakes, and Energy
>
> Phone: 517-284-8410
>
> Email: JonesC13@Michigan.gov
>
> Follow Us: Michigan.gov/EGLE

From: Jones, Clarence (EGLE)
Sent: Monday, May 06, 2019 7:43 AM
To: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: RE: City Accepts Amendment to Pilot DW CS Grant Extension to September 30 2019

Mike-

Mike sorry for any confusion, but program emails are always sent to the authorized representative for any program we have. In this case it is Darwin Watson who is the authorized representative for the Pilot Drinking Water Grant, and he is the one who must sign the extension letter. Also we must have the original signed HARD COPY of this document sent to our office. We cannot use a PDF. Please do this as soon as possible.

Thank you,

Clarence Jones

Project Manager/Environmental Quality Analyst

Michigan Department of Environment, Great Lakes, and Energy

Phone: 517-284-8410

Email: JonesC13@Michigan.gov

Follow Us: Michigan.gov/EGLE

Please note the changes in my signature block, that the MDEQ no longer exists . Instead, we are now the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

From: Mike O'Malley <momalley@cityofbentonharbormi.gov>
Sent: Friday, May 03, 2019 5:34 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>; Mike OMalley <momalley@cityofbentonharbormi.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>
Subject: City Accepts Amendment to Pilot DW CS Grant Extention to September 30 2019

Clarence,

It is hard for Darwin and I to keep up some times.

Especially, since you are emailing a copy of the correspondence to the wrong email for me.

And, I do not see them.

Please Remove My St. Joe City email and replace it with

momalley@cityofbentonharbormi.gov

This way I can be of service to Darwin though this Pilot grant. And, assist you in getting the information you request.

Attached: *Extend MDEQ Pilot Grant letter Signed.pdf*

Thanks, and have a nice weekend,

Mike O'Malley

Benton Harbor Water Superintendent

Jones, Clarence (EGLE)

From: Jones, Clarence (EGLE)
Sent: Monday, June 14, 2021 10:44 PM
To: Patton, Karol (EGLE)
Subject: FW: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

BH emails

Clarence T. Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes, and Energy
(EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Wednesday, May 15, 2019 10:39 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Mike-

Since for some reason I/we never received the original hard copy, please resend it to the following address:

Michigan Department of Environment, Great Lakes, and Energy - Revolving Loan Section
Clarence Jones
Constitution Hall - 4th Floor South
525 West Allegan Street
Lansing, MI 48933

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes, and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

From: Jones, Clarence (EGLE)
Sent: Friday, May 03, 2019 9:54 AM
To: Jason Marquardt <jmarquardt@abonmarche.com>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

See attachment.

Thank you,

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Michigan Department of Environment, Great Lakes, and Energy
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From: Jason Marquardt <jmarquardt@abonmarche.com>
Sent: Friday, May 03, 2019 7:37 AM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>; Darwin Watson <dwatson@cityofbentonharbormi.gov>; Mike O' Malley (momalley@cityofbentonharbormi.gov) <momalley@cityofbentonharbormi.gov>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Clarence,

Do you have a copy of the letter that you can pass along electronically?

Thanks,

Jason W. Marquardt, PE
Senior Project Engineer
Abonmarche
D 269.926.4565
T 269.927.2295 (Ext. 171)
C 269.876.9304
F 269.927.1017
W www.abonmarche.com

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Thursday, May 2, 2019 3:23 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>; 'omalley@sjcity.com' <omalley@sjcity.com>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>
Subject: RE: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Darwin-

We are still waiting. Please sign and return the hard copy of the City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter, we sent to you on March 29, 2019. If we do not receive the form, the Benton Harbor Project No. 1901-01 grant period will end on May 31, 2019. All deliverables will have to be in our office by 5:00 pm on May 31, 2019.

Thank you,

Clarence Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes, and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

Please note the changes in my signature block, that the MDEQ no longer exists . Instead, we are now the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

From: Jones, Clarence (EGLE)
Sent: Tuesday, April 23, 2019 2:03 PM
To: Darwin Watson <dwatson@cityofbentonharbormi.gov>; 'omalley@sjcity.com' <omalley@sjcity.com>
Cc: Jason Marquardt <jmarquardt@abonmarche.com>
Subject: City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter

Darwin-

Please sign and return an original hard copy of the City of Benton Harbor Pilot Drinking Water Project No. 1901-01 Extension Letter, we sent to you on March 29, 2019. We need to expedite getting the signed acknowledgment letter back to the city.

Please note the changes in my signature block, that the MDEQ no longer exists . Instead, we are now the Michigan Department of Environment, Great Lakes, and Energy (ELGE). Also the Revolving Loan Section has been changed to the Water Infrastructure Financing Section.

Please contact me if you have questions.

Clarence Jones
Project Manager/Environmental Quality Analyst
Water Infrastructure Financing Section
Michigan Department of Environment, Great Lakes, and Energy
Phone: 517-284-8410
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

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On Thu, Apr 11, 2019 at 9:32 AM Sarkipato, Ernest (DEQ) <SARKIPATOE@michigan.gov> wrote:

> Thank you Mike! Your work in keeping this system operating consistently will be vital in the coming months to help mitigate exposure to lead for BH citizens. I trust we will be conducting follow up sequential sampling in the near future to 'test' the efficacy of the treatment.
>
> Also, please remember to conduct monitoring of ortho phosphate in the distribution system to study the coating. Residuals may be low at first as the coating builds, but should stabilize close to the calculated dose over time.
>
> Ernie Sarkipato, P.E.
> Surface Water Treatment Specialist
> DEQ-Drinking Water and Municipal Assistance Division
> 616-307-0261
>
> On Mar 27, 2019, at 12:03 PM, Mike O'Malley <momalley@cityofbentonharbormi.gov> wrote:
>
> All involved (Ernie you better be on vacation!),
>
> We started feeding the Orthopolyphosphate into the water distribution system here at the plant on Monday afternoon.
>
> We need a few days in a row to iron out a dose of 1.5 ppm. So far we have:
>
> Monday into Tuesday: 1.35 ppm
> Tuesday into Wednesday: 1.18 ppm
>
> Ernie and Brandon did tons of work to help us get this going.
> Elhorn Engineering is our go-to Contractor for Corrosion Control. They will continue to work with us to evaluate the treatment and make adjustments as needed.
>
> Berrien County has been a REAL PARTNER in this whole lead thing. I do not remember all the names so if you 2, Nicki and Nick can let the others that helped know, that would be great.
>
> Thank you all for all the hard work you put into this whole lead exceedence issue in Benton Harbor.
>
> Some time (hopefully near future) the pipes serving all the residents and business in the City of Benton Harbor's water system will have this protection.
>
> Love (actually, just like) you all,
>
> Mike O'Malley
> Benton Harbor Water Superintendent
> (269) 363-0575

External BH Weekly Meeting

Tuesday, December 8, 2020 2:37 PM

ATTENDEES

Abonmarche: Chris J Cook;
F&V: Darold Harlan (May 2019); George Regan; Rob Jones; Catherine Winn; Blair Selover;
EGLE: Bolf, Michael, Ernie Sarkipato, Jeni Bolt; Brandon Onan
COBH: Ellis Mitchell; drice@bhcity.us;

AGENDA

1. Lead sampling, LSL inventory, LSL replacement (Generally, compliance with lead and copper rule)
2. OIC?
3. Emergencies: breaks, leaks, etc. (discuss miss dig, see attached)
4. Corrosion Treatment
5. Other treatment: coagulation and disinfection
6. SCADA upgrades, instrumentation and integration, and Historian
7. ACO Progress
    a. TMF
    b. Corrosion Study
    c. Filter to waste
    d. Intake rehab, mussel control
8. Alum Sludge
9. Finances

Jeni - brief ALE history

Cook: pDSMI?

As-builts

Intersection books have been entered into GIS.
-WAMP, difficulty finding WM age data (turned into an educated guess)
-Chris, some stories about destroyed records?

Darold - does Chris have spreadsheet for tap records? HE WILL SHARE TO HELP BUILD INVENTORY (ED WARD, proven track record for accuracy)
-records may be in booster station on Grand Boulevard (SHOULD LOOK)

Water/sewer maps, also road inventories

RECORDS: interface w/ Chris Cook for now

Blue Conduit -- there is some softening on allowing them to help, but still need to wait.
-they will want to pothole every service in town????? **Systematically, starting now.**

Onan - hopefully they could rule out a couple.

Rob - he would advocate for potholing, from his experience in Flint (documentation)

Rob - has a list of ~200 where MO said they are fairly certain are LSL

Darold - form to verify materials if meter changeout ever continues

OPERATIONS PLAN

George - wants some exact guidelines if he is doing an OIC role.
NEED MORE CONVERSATION W/ EGLE AND BLAIRE

ONAN - what about remote SCADA

Darold: Tom Coathe - everything on SCADA is ready to go to web.

**CONTINUE TO DISCUSS F-2 DESIGNATION ----------> **	**Bolf, this would need to come for city. May not be able to approve?**

Miss dig: ERNIE: CITY IS REQUIRED TO BUY A MEMBERSHIP.

Kathy: may be <$1000, contract needed to be signed by city. Then, city would likely need to subcontract out for miss dig. (F&V can do. Abonmarche?), requiring another contract.

CONTRACTORS NEED TO BE A MEMBER? (SELOVER)

Tim (abonmarche) is chasing down the miss dig.

Alum Sludge - demetrius wasn't able to meet w/ landfill. Landfill didn't show.

Phosphate feed: no disruptions so far.
Brandon: need to see 3 mg/L in distribution. Is that feasible?
Rob: hadn't heard that, has been focusing on monitoring so far.
-he will try, but flint's corrosion study is recommending 2 ppm.
Brandon: flint has a couple years worth of data already.

Mike - november MOR going to go smoothly?
Katherine Winn will be working with Rob and George to get that together.

Brandon - consider giving more time (past the 10th) to make sure it's accurate.

George: is rob going to BH tomorrow? Will meet with Rob before 11

Heads up: violation notice coming….30 day PN

DAROLD: SOC - do they have valid samples to reduce yet?

Ernie/Mike: no, wrong location on the recent bottles.

Chris: his impression is that Ellis is very supportive and on board.

From:	Jones, Clarence (EGLE)
To:	Arntz, Renee (EGLE)
Subject:	FW: Expenditures for Lead Pilot through September 2019
Date:	Tuesday, June 15, 2021 7:58:48 AM
Attachments:	LEAD PILOT GRANT PROJECT-estimate of spending through 12-31-19.xlsx image001.png

Here is the first one

Clarence T. Jones

Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy (EGLE)
Finance Division - Water Infrastructure Financing Section
Office Cell Phone: 517-599-4553
Email: JonesC13@Michigan.gov
Follow Us: Michigan.gov/EGLE

For Deliveries: Constitution Hall – 6th Floor South, 525 West Allegan, Lansing, MI 48933
For Mailings: P.O. Box 30457, Lansing, Michigan 48909-7957

From: Jones, Clarence (EGLE)
Sent: Monday, June 14, 2021 11:00 PM
To: Patton, Karol (EGLE) <PATTONK@michigan.gov>
Subject: FW: Expenditures for Lead Pilot through September 2019

BH emails

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From: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>
Sent: Wednesday, February 12, 2020 1:53 PM
To: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>; Chris J Cook <cjcook@abonmarche.com>
Subject: RE: Expenditures for Lead Pilot through September 2019

Hi Clarence – attached is the update spending for the City of Benton Harbor Pilot Drinking Water Grant. I will be compiling a grant Disbursement Request next week for the balance remaining. Let me know if you need anything else.

Take care,

Rhonda

Rhonda Hildebrand | Senior Accounting Consultant | PMGAP
Plante Moran, PLLC, 750 Trade Centre Way, Suite 300, Portage, MI 49002
Direct Dial: 269.982.6079 | Mobile: 269.449.7071 | Fax: 248.233.7565
Plante Moran | Twitter | Facebook | LinkedIn | Learn from Leaders | Manage Your Email Subscriptions
Celebrating our 21st year as one of FORTUNE's "100 Best Companies to Work For®"

From: Jones, Clarence (EGLE) <JONESC13@michigan.gov>
Sent: Friday, February 07, 2020 11:10 AM
To: Rhonda Hildebrand <Rhonda.Hildebrand@plantemoran.com>; Chris Cook <cjcook@abonmarche.com>
Cc: Mike O'Malley <momalley@cityofbentonharbormi.gov>; Ellis Mitchell <emitchell@cityofbentonharbormi.gov>
Subject: RE: Expenditures for Lead Pilot through September 2019

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Rhonda-

Please supply a project update and when the next Disbursement Request will be submitted for the city of Benton Harbor Pilot Drinking Water Grant No. 1901-01. Our last correspondence was early October 2019.

Please contact me if you have questions.

Clarence T. Jones
Project Manager/Environmental Quality Analyst
Michigan Department of Environment, Great Lakes,
and Energy
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Subject: Expenditures for Lead Pilot through September 2019

Hi Clarence – Mike and Jason have reviewed the attached schedule of costs through September 30. I am submitting the estimate rather than the draw request. I will prepare the draw request for Ellis to sign this week and will submit all of the paperwork through September 30.

Let me know if there is anything else that you need.

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High Pb result phone call

Monday, May 17, 2021 10:03 AM

EGLE Summary: ALE, treatment, OCCT study.

BCHD: support role, monitor health of residents
- -new/replacement filters for residents
- -PODS were pre- COVID, also mailing (hotline), some home deliveries
- -new partner opened a health center on Man Street, downtown
- -continue to track, have hired 1 staff person, some reminder calls going out
- *Probably some fatigue WRT replacement cartridges*

Abonmarche: constructon on streets, $15m, involves 150 svcs, getting close to done
- -Tracking these regarding
- -Future service replacements: shooting for 900
- -STAFF/PLUMBERS WILL BE IN HOMES

Rob Jones: around 40-50 samples so far. RP is going out, focusing on "top 60" which are known lead lines.
- -a couple people had asked for sampling

DHHS: JP, Kevin Kasischke:
- -plan developed in Jan 2021 to conduct 10 investigations. Only 3 repeats so far.
- -has some others that are 'non-repeat'
- -developing some education materials

Cartyea … will be moving into BH to do some blood testing (mobile lab)

-552 Buena Vista with a lead result of 469 ppb (1st liter) and 143 ppb (2nd liter), and a Copper result of 7650 ppb (1st liter) and 1440 ppb (2nd liter) on 4/27/2021
- Brandon - suspects particulate influencing. Could be sloughing off
- Filter w/ replacement

-1037 Pearl with a lead result of 109 lead (5th liter) on 4/27/2021
- Filter w/ replacement

-807 High with a lead result of 605 ppb (1st liter) and 145 ppb (5th liter) on 4/22/2021
- **May not have a filter**

-718 Territorial with a lead result of 21 ppb (1st liter) and 107 ppb (5th liter) on 4/22/2021
- *-note, this location had it's LSL removed in October of 2020 during routine construction.*
- **May not have a filter**

-1178 Broadway with a lead result of 22 ppb on 4/29/2021
- April 2019, DHHS had sampled previously (Kevin K)
- Filter w/ replacement

-1237 Columbus with a lead result of 23 ppb on 4/29/2021
- Filter w/ replacement, Kevin verified.
- Kevin K sampled this on 4/21/2021, sequentials didn't show elevated. (5ppb)

Summary of ALE status (ES) & Corrosion Treatment

Summary of filter distribution / maintenance (BCHD)

Summary of construction AND LSL removal efforts (Abonm.)

Summary of current sampling efforts (F&V)

Investigations so far (DHHS)

Overview of high sample results

NEED FOR FOLLOW-UP:
- **-communication/information, send (F&V)**
- **-investigation (DHHS)**
- **-filter/maintenance, education (BCHD)**

LSL Removals: impacts to BCHD

-consumer notice of lead
- -if elevated, some guidance is needed to reduce risk
- -these went out last week.

-in home inspections:
- -LSL removals
- -filter distributions
- -DHHS, provide info on filters to BCHD?

-Home flushing instructions needed
- -particulate (system wide)
- -construction (LSL removal specifically) AWWA C810
- -flashing red filter
- -EGLE guidance for flushing, COVID-19 page

Laura Drayton/CWPA/BCHD? SIMPLIFY EGLE's flushing, combine w/ consumer notice
- DHHS clean aerator
- www.mileadsafe.com flushing guide

Ask for sequentials on 100 ppb +, F&V might have this.
- **EMAIL**

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
OUDBIER	7/15/2019	8/1/2019	71290	9204	**INSTALL & TEST INSERTION MAGNETIC FLOW METER**			1,550.00		1,550.00
MCCROMETER	6/20/2019			526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
MEEKS	8/19/2019			2173	**LEAD SERVICE LINE REPLACEMENT-179 GARFIELD**			5,750.00		5,750.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	10/25/2019			2186	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	12/9/2019			2196	**LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	**LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA**			2,470.82		2,470.82
										-
									less overage	(451.96)
TOTAL TO DRAW THROUGH 12-31-2019						**-**	**-**	**55,481.46**	**-**	**55,029.50**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**205,282.16**	**13,909.34**	**284,000.00**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**(6,282.16)**	**6,090.66**	**-**

CITY OF BENTON HARBOR
PILOT DRINKING WATER PROGRAM
PROJECT NUMBER 1901-01
COSTS INCURRED THROUGH DECEMBER 31, 2019

VENDOR	SERVICE/INVOICE DATE	CHECK DATE	CHECK NUMBER	INVOICE	DESCRIPTION	PLANNING COSTS DISTRIBUTION INVENTORY	DRINKING WATER ASSET MGMT PLAN COSTS	LEAD SERVICE LINE CONSTRUCTION	REALLOCATION CORROSION CONTROL	TOTAL COSTS
ABONMARCHE	THRU 7/15/18	8/23/18	69288	122581	GRANT ADMIN, UPDATE ATLAS	2,478.75	2,837.50			5,316.25
	THRU 8/31/18	9/27/18	69488	123120	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	5,741.25	2,672.50	2,260.00		10,673.75
	THRU 9/30/18	10/11/18	69567	123487	GRANT ADMIN, UPDATE ATLAS, DOCUMENT PREP	4,095.00	3,591.60	3,450.00		11,136.60
	THRU 11/15/18	12/19/18	69991	124254	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	7,674.10	516.36	1,192.50		9,382.96
	THRU 12/15/18	1/10/19	70107	124634	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	4,945.00	2,517.50	335.00		7,797.50
	THRU 12/31/18	1/17/19	70176	124749	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	1,552.50	5,590.00			7,142.50
	THRU 1/31/19	2/28/19	70386	125102	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	5,929.25	-	1,187.35		7,116.60
	THRU 2/28/19	3/28/19	70548	125391	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	2,844.61	6,500.00	1,575.15		10,919.76
	THRU 5/15/19	5/30/19	70883	126139	UPDATE INVENTORY & ASSET MGMT PROGRAM, CONSTRUCTION	-	5,774.54			5,774.54
					TOTAL ABONMARCHE	**35,260.46**	**30,000.00**	**10,000.00**		**75,260.46**
										-
B&Z-CONTRACT	**THRU 12/31/18**	**2/14/19**	**70292**	**181239**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**9,000.00**		**9,000.00**
	THRU 1/31/19	**2/14/19**	**70292**	**190149/50/51**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**19,237.50**		**19,237.50**
	THRU 2/28/19	**3/14/19**	**70478**	**190256/57/58/59**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**21,060.00**		**21,060.00**
	THRU 4/26/2019	**5/23/19**	**70855**	**190437**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**5,895.00**		**5,895.00**
					TOTAL B&Z CONTRACT	**-**	**-**	**55,192.50**	**-**	**55,192.50**
MEEKS-CONTRACT	**THRU 12/31/18**	**2/13/19**	**70285**	**2116**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #1**			**5,265.00**		**5,265.00**
	THRU 1/31/19	**2/13/19**	**70285**	**2128**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #2**			**9,369.90**		**9,369.90**
	THRU 2/28/19	**3/28/19**	**70577**	**2131/2137/2138/2139**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #3**			**33,165.00**		**33,165.00**
	THRU 3/31/19	**4/11/19**	**70641**	**2143**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #4**			**9,000.10**		**9,000.10**
	THRU 5/9/19	**5/30/19**	**70902**	**2150/2151/PART RETAINAGE**	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-PAY REQUEST #5**			**16,162.20**		**16,162.20**
					TOTAL MEEKS CONTRACT	**-**	**-**	**72,962.20**	**-**	**72,962.20**
OTHER MISCELLANEOUS										
B&Z - MISC	4/26/19	5/28/19	70881	190442	2 INCH TAP AT WATER PLANT				585.00	585.00
MEEKS - MISC	5/9/19	5/16/19	70818	2155	PLACING TAP INSIDE WATER PLANT				275.00	275.00
CORE & MAIN	9/13/18	9/17/18	69492	439198	CURB BOX, TUBING AND OTHER MATERIALS			11,646.00		11,646.00
ELHORN	3/20/19	3/7/19	70436	277320	FORCE FLOW CARBOY SCALE/PUMP & INSTALL				5,970.00	5,970.00
ELHORN	3/12/19	3/21/19	70534	277556	CARUS 8600 LIQUID 55 GAL				2,110.00	2,110.00
ELHORN	5/14/19	5/30/19	70896	278419	POCKET COLORIMETER				582.00	582.00
MEAD & WHITE	3/31/19	4/11/19	70639	B8044-4	REMOTE PANEL FOR NEW ALUM PUMP & ELECTRICIAN HOURS				2,274.42	2,274.42
MEAD & WHITE	3/14/19	3/21/19	70541	B8539	LEAD PHOSPHATE PUMP POWER INSTALLATION				2,112.92	2,112.92
						-	-	**11,646.00**	**13,909.34**	**25,555.34**
TOTAL DRAW 1						**35,260.46**	**30,000.00**	**149,800.70**	**13,909.34**	**228,970.50**

EXPENDITURES INCURRED AND NOT DRAWN THROUGH SEPTEMBER 30, 2019

B&Z-CONTRACT	5/2/2019	6/13/2019	70954	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			6,132.50		6,132.50
MEEKS-CONTRACT	5/20/2019	6/13/2019	70990	RETAINAGE RELEASED	**SERVICE VERIFICATIONS-PROJECT NO. 18-0942-RETAINAGE**			3,000.00		3,000.00
ABONMARCHE	9/10/2019	9/13/2019	71521	127669	**LEAD SERVICE LINE CONSTRUCTION**			5,258.60		5,258.60
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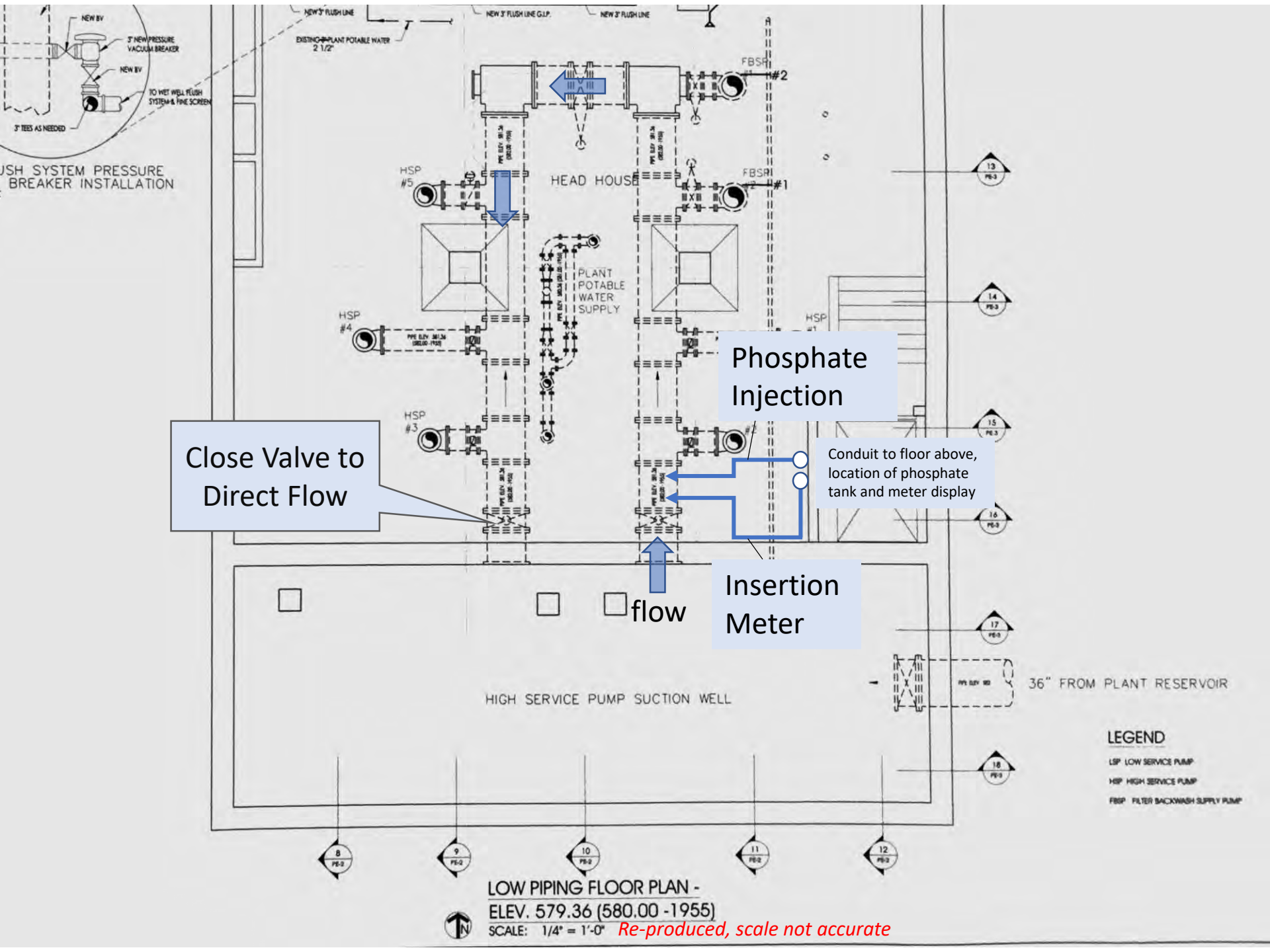
MCCROMETER	6/20/2019			526233RI	**FULL PRO INSPECTION MAG**			13,919.54		13,919.54
MEEKS	8/19/2019			2173	**LEAD SERVICE LINE REPLACEMENT-179 GARFIELD**			5,750.00		5,750.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	9/11/2019			2176	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			2,600.00		2,600.00
MEEKS	10/25/2019			2186	**LEAD SERVICE LINE REPLACEMENT-711 BUSS MAIN TO CURB STOP**			4,720.00		4,720.00
MEEKS	12/11/2019	12/12/2019	72118	2197	**LEAD SERVICE LINE REPLACEMENT-1063 SUPERIOR CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	12/9/2019			2196	**LEAD SERVICE LINE REPLACEMENT-711 BUSS CURB STOP TO METER**			3,740.00		3,740.00
MEEKS	11/25/2020	12/12/2019	72118	2193	**LEAD SERVICE LINE REPLACEMENT-876 WAUCEDA**			2,470.82		2,470.82
										-
									less overage	(451.96)
TOTAL TO DRAW THROUGH 12-31-2019						**-**	**-**	**55,481.46**	**-**	**55,029.50**
TOTAL SPENDING THROUGH 9-30-2019						**35,260.46**	**30,000.00**	**205,282.16**	**13,909.34**	**284,000.00**
AMOUNT PER GRANT						**35,000.00**	**30,000.00**	**199,000.00**	**20,000.00**	**284,000.00**
REMAINING GRANT FUNDS						**(260.46)**	**-**	**(6,282.16)**	**6,090.66**	**-**


NEW BV
3" NEW PRESSURE VACUUM BREAKER
NEW BV
TO WET WELL FLUSH SYSTEM & PINE SCREEN
3" TEES AS NEEDED
USH SYSTEM PRESSURE
BREAKER INSTALLATION
NEW 3" FLUSH LINE
NEW 3" FLUSH LINE G.I.P.
NEW 3" FLUSH LINE
EXISTING PLANT POTABLE WATER 2 1/2"
FBSP #2
FBSP #1
HSP #5
HSP #4
HSP #3
HSP #1
HSP #2
HEAD HOUSE
PLANT POTABLE WATER SUPPLY
Phosphate Injection
Close Valve to Direct Flow
Conduit to floor above, location of phosphate tank and meter display
Insertion Meter
flow
HIGH SERVICE PUMP SUCTION WELL
36" FROM PLANT RESERVOIR
LEGEND
LSP LOW SERVICE PUMP
HSP HIGH SERVICE PUMP
FBSP FILTER BACKWASH SUPPLY PUMP
LOW PIPING FLOOR PLAN -
ELEV. 579.36 (580.00 -1955)
SCALE: 1/4" = 1'-0"
Re-produced, scale not accurate

McCROMETER

FPI Mag™

Full Profile Insertion Flow Meter

The Only Hot Tap
Full Profile Insertion
Mag Meter

High Performance • Easy to Install

FPI Mag™

Unbeatable Value in Cost of Installation and Ownership

Ideal for Capital or Maintenance Projects, Retrofits and Sites Never Before Metered

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle / Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include:

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Simple Installation

The insertion design of the FPI Mag allows for easy installation across a wide range of applications and pipe sizes. Hot Tap installation allows you to insert the meter without interrupting service, de-watering lines, cutting pipe or welding flanges.

Lower Costs

Customers save 45%+ on installation and the total cost of ownership. The FPI Mag eliminates the need for heavy equipment and manpower necessary to support installation.

Unmatched Accuracy

The FPI Mag's multi-electrode design and unique operating principle delivers accuracy unmatched by other insertion meters and rivals the performance of full-bore mag meters.

Robust Construction

With no moving parts, there is nothing to wear or break. The sensor body is made from heavy-duty 316 stainless steel for maximum structural integrity. The sensor body is hermetically sealed and protected by NSF certified 3M fusion-bonded epoxy coating.

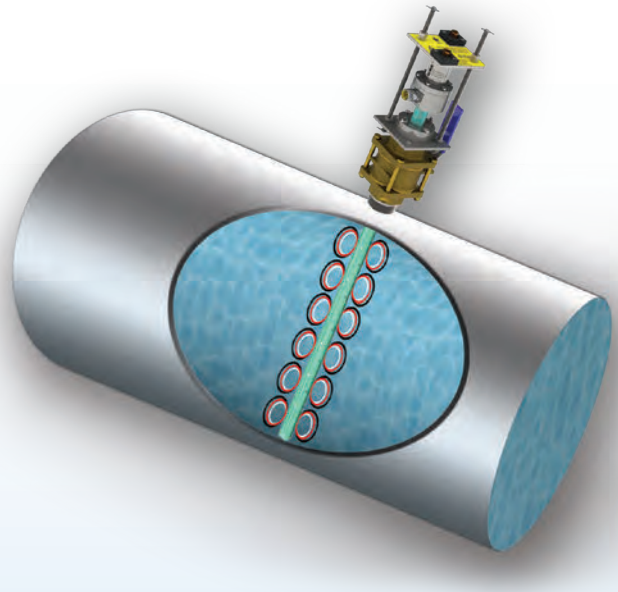
Versatile

The FPI Mag is ideal for capital or maintenance projects, retrofits and sites never before metered. The unique combination of accuracy, ease of installation and total cost savings make the FPI Mag the perfect choice for a wide range of Municipal and Industrial applications.

FPI Mag™

- **Simple Installation**
- **Lower Costs**
- **Unmatched Accuracy**

Principle of Operation



The FPI Mag operates based on Faraday's Law of Electromagnetic Induction: When water (a conductor) moves through a magnetic field, it produces a voltage that is directly proportional to the velocity of the conductor.

How it Works ...

- Electromagnetic coils installed inside the entire length of the sensor produce magnetic fields
- Stainless steel electrode pairs installed on the outside of the entire sensor length collect the induced voltage caused by the flowing water
- The total voltage signal is then transmitted to the converter electronics where it is converted to an average flow velocity
- The converter then multiplies this average flow velocity by the pipe's cross-sectional area to create a volumetric flow rate

Rivals the Performance of a Full-Bore Mag!

Multi-Electrode design delivers accurate full profile measurement with repeatable results

PERFORMANCE SPECIFICATIONS

Range:	0.3 ft/s to 32 ft/s (0.1 m/s to 10 m/s)
Accuracy:	Up to ± 0.5% from 1 ft/s to 32 ft/s (0.3 m/s to 10 m/s) Up to ± 1% from 0.3 ft/s to 1 ft/s (0.1 m/s to 0.3 m/s)
Linearity:	0.3% of reading
Pipe Sizes:	4" - 138" (100 mm to 3,500 mm)
Materials:	316 Stainless Steel Sensor Body, Insertion Hardware and Sensor Electrodes NSF Certified 3M Fusion-Bonded Epoxy Coating

CERTIFICATIONS AND APPROVALS

Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 & CSA C22.2 No. 61010-1-04

ISO 9001:2008 certified quality management system

To learn more and see a demonstration, go to:
www.mccrometer.com/fpimag

M-SERIES CONVERTER

The FPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The McCrometer Value Difference

For over 55 years, McCrometer has demonstrated an unyielding commitment to integrity which is reflected in our stringent flow meter calibration processes. Each flow meter is individually wet calibrated in one of our two world-class NIST traceable calibration facilities and delivered with a Certificate of Calibration.

NIST
National Institute of Standards and Technology

Our Hemet, California factory boasts a robust Calibration Test Lab that enables production of the most accurate and precise flow instrumentation. The test facility utilizes three gravimetric systems and two volumetric systems providing accuracy and calibration tests of flow meters from 1/2 to 20-inch diameter, with flow rates up to 4,000 gpm.

Our large volume test facility is located in Porterville, California. This facility is one of the world's largest volumetric test facilities owned by a meter manufacturer, and it offers accuracy and calibration tests of flow meters from 3 to 72-inch diameter, with flow rates up to 60,000 gpm.

View the Demo:

McCROMETER

www.mccrometer.com
3255 West Stetson Avenue, Hemet, California 92545 USA
Phone 800-220-2279 | 951-652-6811 | Fax 951-652-3078

© 2012-2013 by McCrometer, Inc.
U.S. Patent 8,136,410. Foreign Patents Pending.

Printed in USA

Lit Number 30120-45 Rev 1.3 / 05-13

Represented by:

McCROMETER

M-SERIES ELECTROMAGNETIC FLOW METER CONVERTER

Installation, Operation and Maintenance Manual

30120-47, Rev. 2.5
May 31, 2018

Important Information:

Converter Model Number: _____

Converter Serial Number: _____

Meter Serial Number: _____

RETAIN THIS MANUAL - DO NOT DISCARD

SAFETY 1
1.0 M-SERIES CONVERTER OVERVIEW 2
1.1 Serial Numbers 4
2.0 CONVERTER INSTALLATION 4
2.1 Mounting The Converter 4
2.2 Installing Cables To Converter And Service Loop 4
2.3 Pulling Sensor Cable Through Electrical Conduit 5
3.0 ELECTRICAL CABLE CONNECTIONS 6
3.1 Terminal Block Diagram 6
3.2 Sensor Wiring 7
3.2.1 FPI Mag 394L Bidirectional Sensor 7
3.2.2 FPI Mag 395L Forward Only Sensor 7
3.2.3 Ultra Mag Body Style 1: 2", 3", And 14+" 8
3.2.4 Ultra Mag Body Style 2: 4" through 12" 8
3.2.5 SPI Mag 9
3.3 Converter Grounding 9
3.3.1 Panel Mount Converters 9
3.3.2 FPI Mag 395L and Ultra Mag Body Style 2 10
3.3.3 Ultra Mag Body Style 1 10
3.4 4-20mA Hook-Up 11
3.5 Opto-Isolated Pulse Output Hook-Up 12
3.6 Opto-Isolated Pulse Input 13
3.7 Converter Power Hook-Up 14
4.0 CONVERTER START-UP - ALL SENSORS 15
4.1 Menu Navigation 15
4.2 Front Panel Display 16
4.3 M-Series Menu Structure 17
4.4 Factory Set Key Code 17
5.0 PROGRAMMING EXAMPLE 18
6.0 MENU 0 - QUICK START 19
7.0 MAIN MENU DESCRIPTIONS 23
7.1 Menu 1- Sensor 23
7.2 Menu 2 - Scales 25
7.3 Menu 3 - Measure 27
7.4 Menu 4 - Alarms 27
7.5 Menu 5 - Inputs 28
7.6 Menu 6 - Outputs 28
7.7 Menu 7 - Communication 30
7.8 Menu 8 - Display 31
7.9 Menu 9 - Data Logger 32
7.10 Menu 10 - Diagnostics 32
7.11 Menu 11 - Internal Data 34
8.0 ALARM MESSAGES 36
9.0 SPECIFICATIONS 37
10.0 RETURNING A UNIT FOR REPAIR 38
11.0 TROUBLESHOOTING GUIDE 39
APPENDIX 1.0 UNITS OF MEASURE 40
APPENDIX 2.0 CONVERSION TABLES 41
WARRANTY STATEMENT 42

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SAFETY

Safety Symbols And Warnings

Throughout this manual are safety warning and caution information boxes. Each warning and caution box will be identified by a large symbol indicating the type of information contained in the box. The symbols are explained below:

This symbol indicates important safety information. Failure to follow the instructions can result in serious injury or death.

This symbol indicates important information. Failure to follow the instructions can result in permanent damage to the meter or installation site.

Safety Warnings

When installing, operating, and maintaining McCrometer equipment where hazards may be present, you must protect yourself by wearing Personal Protective Equipment (PPE) and be trained to enter confined spaces. Examples of confined spaces are manholes, pumping stations, pipelines, pits, septic tanks, sewage digesters, vaults, degreasers, storage tanks, boilers, and furnaces.

WARNING!
Incorrect installation or removal of FPI Mag meters can result in serious injury or death. Read the instructions in this manual on the proper procedures carefully.

WARNING!
Never enter a confined space without testing the air at the top, middle, and bottom of the space. The air may be toxic, oxygen deficient, or explosive. Do not trust your senses to determine if the air is safe. You cannot see or smell many toxic gases.

WARNING!
Never enter a confined space without the proper safety equipment. You may need a respirator, gas detector, tripod, lifeline, and other safety equipment.

WARNING!
Never enter a confined space without standby/rescue personnel within earshot. Standby/rescue personnel must know what action to take in case of an emergency.

WARNING!
Pressurized pipes should only be hot tapped, cut, or drilled by qualified personnel. If possible, depressurize and drain the pipe before attempting any installation.

WARNING!
Carefully read all safety warning tags attached to the meter.

At the end of its lifetime, this product shall be disposed of in full compliance with the environmental regulations of the state in which it is located.

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1.0 M-SERIES CONVERTER OVERVIEW

Read this entire manual prior to installation and/or changing any settings. Retain this manual in your records, DO NOT DISCARD.

The M-Series signal converter is the reporting, input and output control device for the sensor. The converter allows the measurements, functional programming, control of the sensor and data recording to be communicated through the display and inputs & outputs. The M-Series microprocessor-based signal converter has a twelve-point curve-fitting algorithm to improve accuracy, dual 4-20mA analog outputs, an RS485 communication port, an 8-line graphical backlit LCD display with 3-key touch programming, and a rugged enclosure that meets IP67. In addition to a menu-driven self-diagnostic test mode, the converter continually monitors the microprocessor's functionality. The converter will output rate of flow and total volume. The converter also comes standard with password protection and many more features.

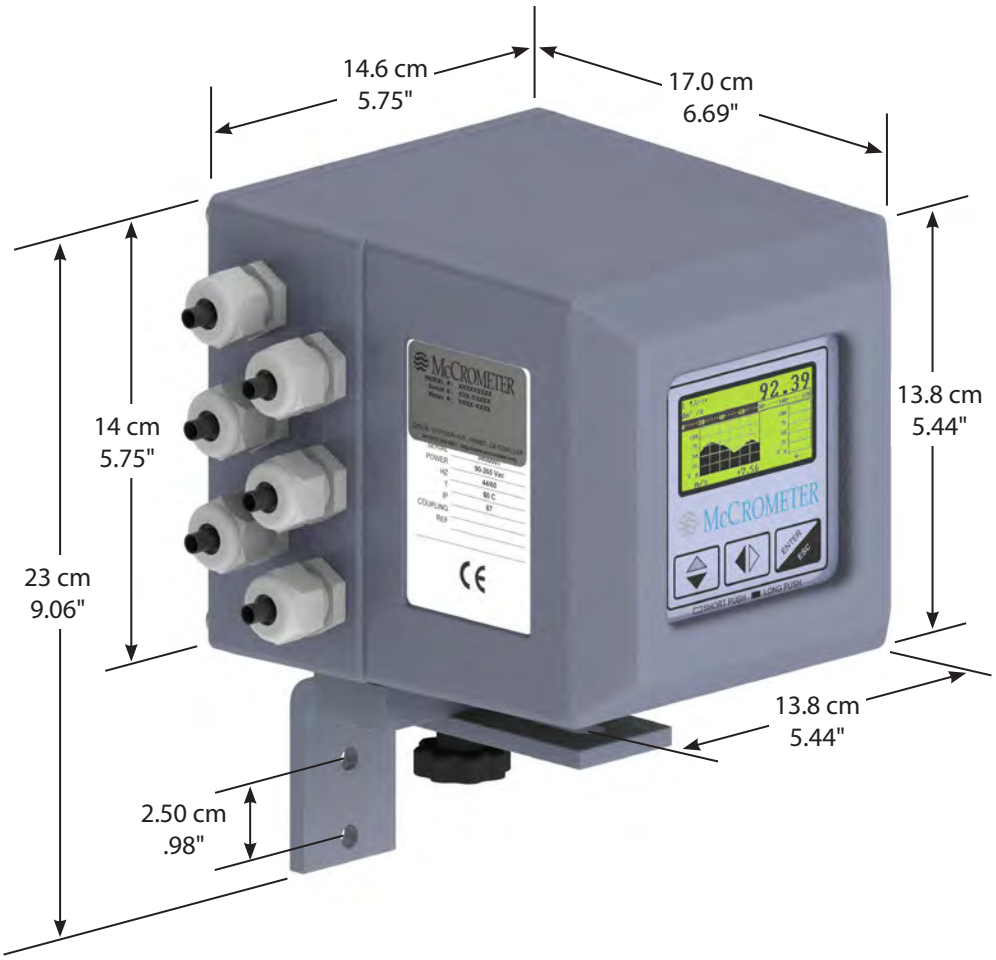

Figure 1. Electronic Converter Dimensions

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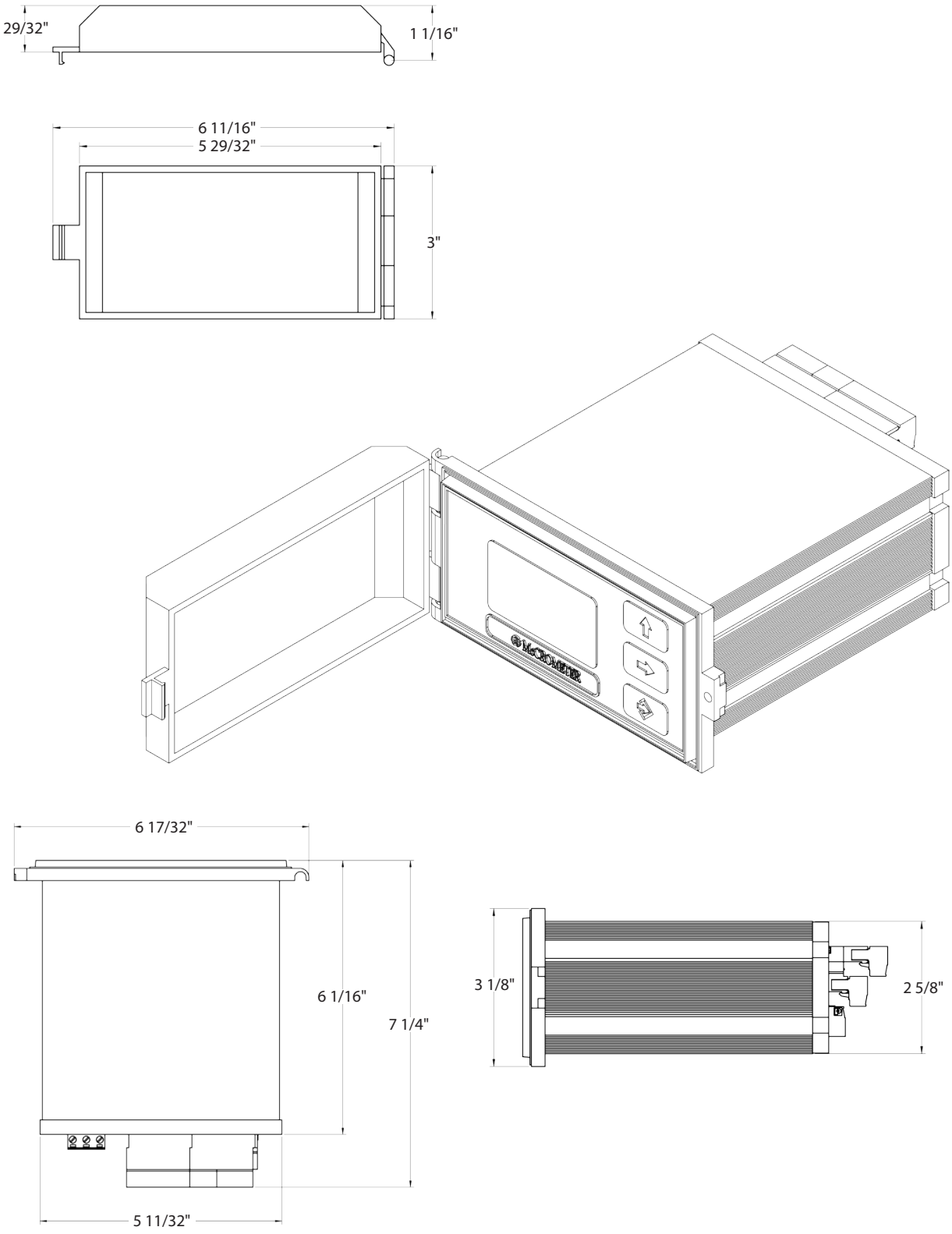

Figure 2. Panel Mount Converter Dimensions

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1.1 Serial Numbers

The converter and sensor are supplied as a matched system. Verify the meter serial numbers on both the converter and sensor match. This will ensure a properly calibrated system.

The tag on the side of the converter has the Converter Model Number, the Converter Serial Number, the Meter Model Number and the Meter Serial Number. An example is show below as Figure 3.

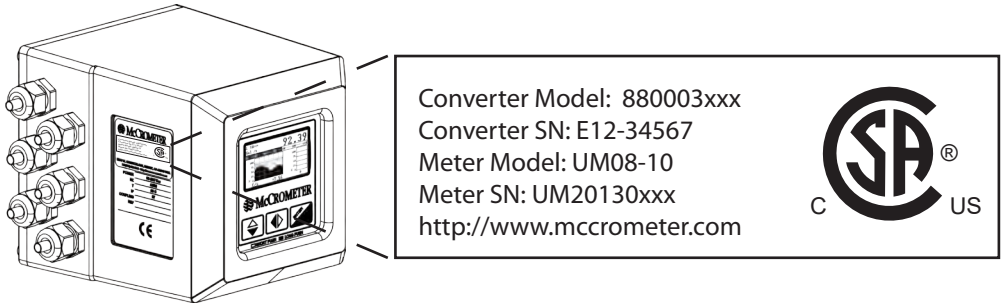

Figure 3. Converter Serial Number Tag

IMPORTANT: Verify the Meter Serial Numbers on both the converter and sensor match. This will ensure a properly calibrated system. The Meter Serial Number is located on the side of the sensor, and the Converter Serial Number and the Meter Serial Number are located on a label on the side of the converter. Ensure the Meter Serial Number on the sensor and the converter tags match.

2.0 CONVERTER INSTALLATION

2.1 Mounting The Converter

If possible mount the converter in an electronics shed or environmental enclosure. If the converter is mounted outdoors a sun shield is recommended. The sun shield should be oriented in a direction to reduce sun damage and ensure readability. The converter is mounted using two bolts (see Figure 1). A service loop in the cables is required (see section 2.2). This electronic unit is rated IP67 for temporary flooding.

2.2 Installing Cables To Converter And Service Loop

Conduit of any kind ***CANNOT*** be attached directly to the electronics enclosure. Attaching conduit directly to the enclosure will introduce dangerous gasses and moisture into the enclosure creating a dangerous condition, and will remove the enclosure's IP67 rating. **Attaching conduit to the enclosure or altering the enclosure in any way will void the warranty.**

Any cable running through a conduit must exit the conduit and have a minimum of an 8" service loop before entering the electronics enclosure through the cable glands. All cable compression glands must be properly tightened to prevent moisture intrusion and maintain the IP67 rating. This allows the electronics enclosure to be rotated and the rear panel to be accessed. If electrically bonding (grounding) the enclosure to metallic conduit or raceways, secure a lead wire to the enclosures back panel screw and attach the lead to a listed and approved conduit grounding bushing (see Figure 4). To insure IP67 rating use only round cable 0.125" to 0.375" in diameter.

IMPORTANT: Do not cut or alter the cable length on power or signal cables!
Connections to the sensor must be made with cable supplied by McCrometer specifically for that purpose. Do not substitute the supplied cable with other types of cable, even for short runs. For repairs or added lengths of cable, the entire cable between the sensor and the converter must be replaced. (Consult factory for replacement cable.)

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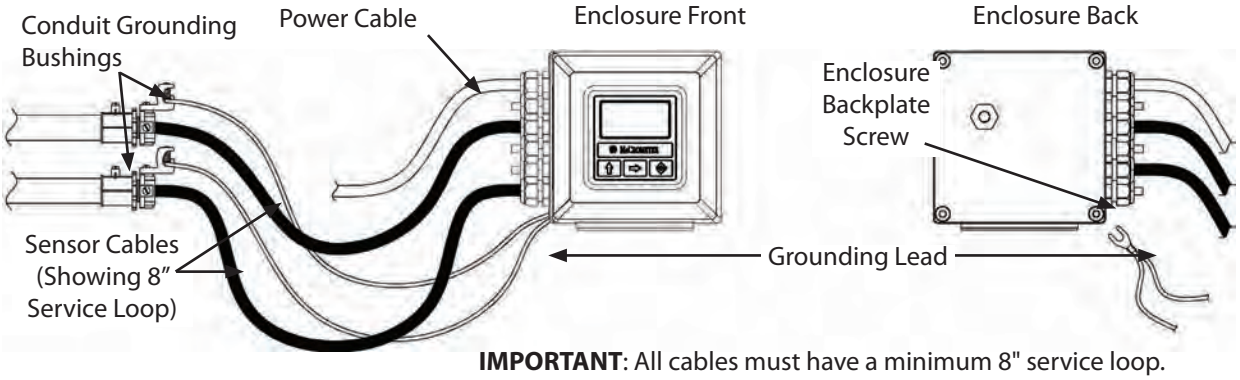
WARNING: Do not connect any form of conduit directly to the converter enclosure. Doing so will allow moisture and potentially dangerous gasses to enter directly into the converter. Attaching any conduit to the enclosure, or altering the enclosure in any way will void the warranty.



IMPORTANT: All cables must have a minimum 8" service loop.

Figure 4. Cable Installation, A Service Loop And Bonding To Metallic Conduit

2.3 Pulling Sensor Cable Through Electrical Conduit

It is very important to protect the end of the sensor cable when pulling it through a conduit. Water can accumulate in low portions of conduit. Always use the factory supplied cable cover, or similar method, to seal the end of the cable against water when pulling the cable through conduit (see Figure 5). This will ensure proper operation of the meter.

1. Tie a rope or cable-snake securely around the middle of the cable cover.
2. Carefully pull the rope or snake until the sensor cable end clears the conduit.
3. Bring the cable end to the converter location. If necessary, secure the cable so that it does not fall back through the conduit.
4. Remove the cable cover by pulling the rip wire. The cable cover will tear off (discard the cover).

CAUTION: Do not cut the cable cover off. Doing so may damage the sensor cable and adversely effect the calibration of the meter.

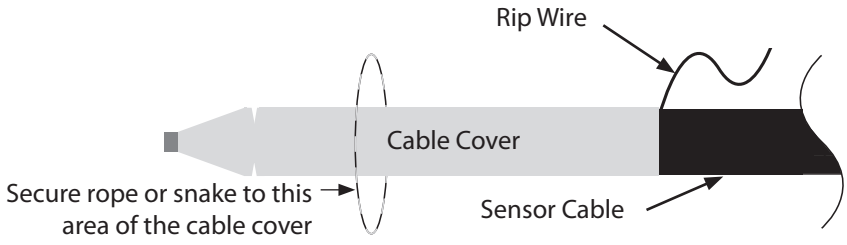


Figure 5. Cable Cover

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3.0 ELECTRICAL CABLE CONNECTIONS

All electrical cables enter the converter through compression fittings located on the side of the converter. Ensure that all compression glands are properly tightened and all unused fittings are plugged so the case remains sealed.

CAUTION - Always disconnect the power cord before attempting any electrical connections.

3.1 Terminal Block Diagram

All connections are made on the terminal blocks. To access the terminal blocks, loosen the four screws on the back of the converter to remove the rear cover.

NOTE: The terminal blocks unplug from the circuit board for easy connection.

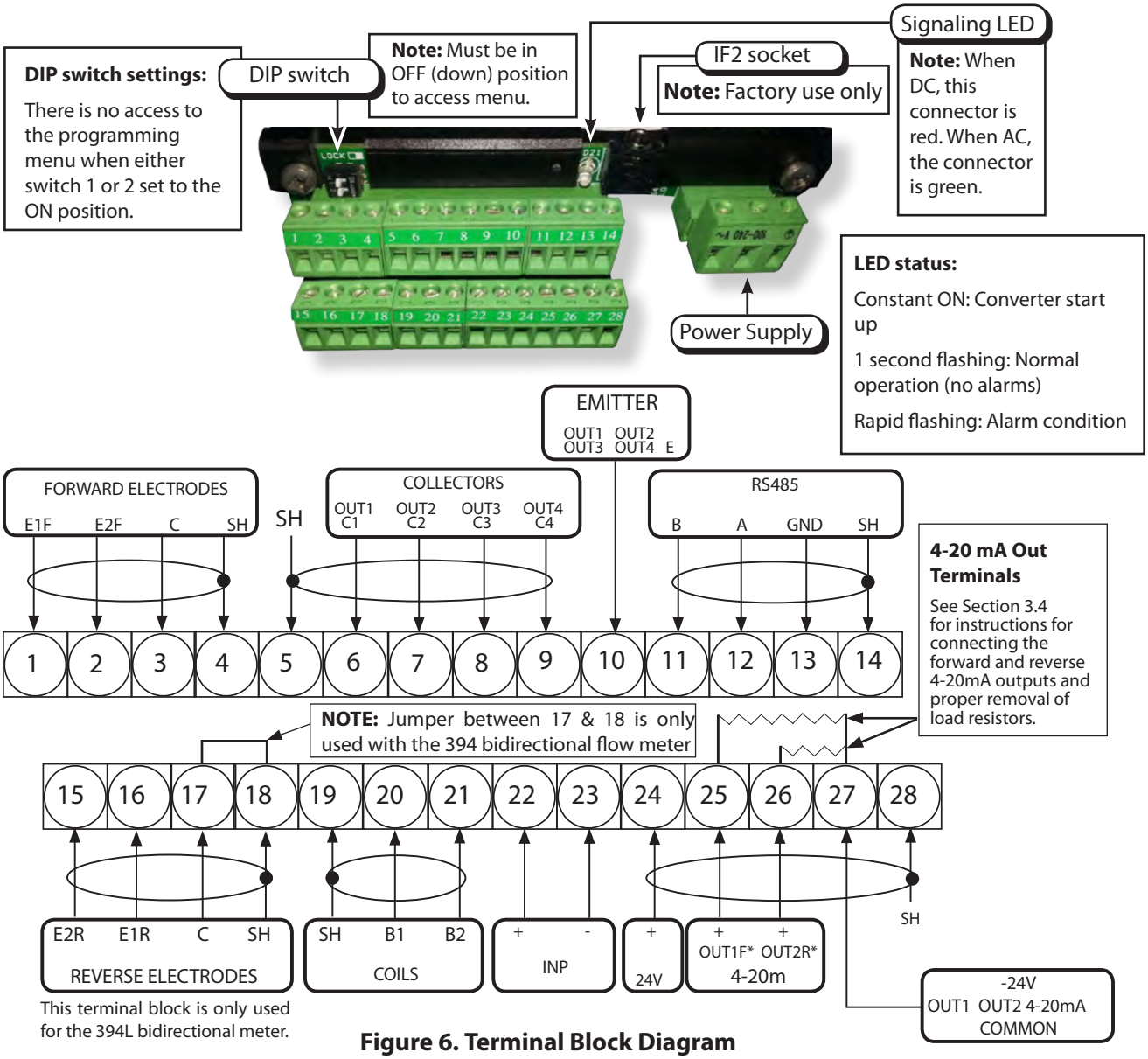

Figure 6. Terminal Block Diagram

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3.2 Sensor Wiring

***IMPORTANT:** See Section 3.3, Figure 13 for instructions on attaching the chassis ground wire to the converter ground lug.

3.2.1 FPI Mag 394L Bidirectional Sensor

***IMPORTANT:** The 394 Bidirectional meter wiring requires a jumper between terminals 17 and 18. See note in Figure 6.

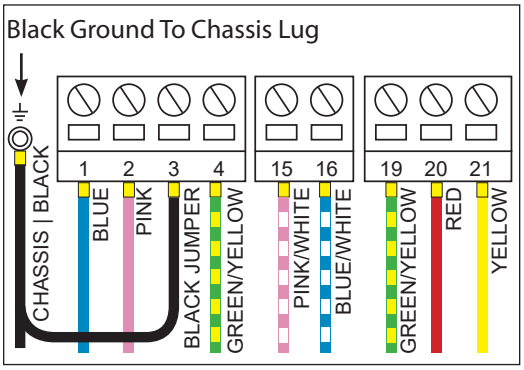

Figure 7. FPI Mag 394L Sensor Cable Connections

Terminal Block Assignments

Terminal	Cable	Wire Color
#1 (E1F)	A	Blue
#2 (E2F)	A	Pink
3C	B	Black
#4 (SH)	A	Green/Yellow
#15 (E2R)	A	Pink/White
#16 (E1R)	A	Blue/White
Chassis Lug	B	Black
#19 (SH)	B	Green/ Yellow
#20 (B1)	B	Red
#21 (B2)	B	Yellow

Cable Diameters:

Cable A (15039): 0.300"
Cable B (15036): 0.248"

3.2.2 FPI Mag 395L Forward Only Sensor

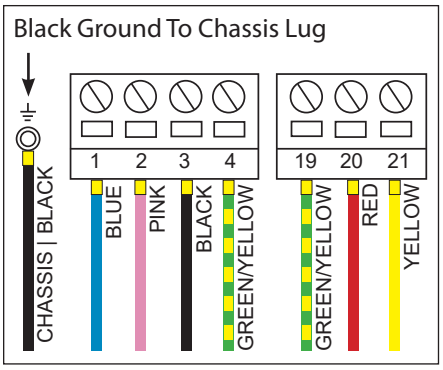

Figure 8. FPI Mag 395L Sensor Cable Connections

Terminal Block Assignments

Terminal	Cable	Wire Color
#1 (E1F)	A	Blue
#2 (E2F)	A	Pink
#3 (C)	A	Black
#4 (SH)	A	Green/Yellow
Chassis Lug	B	Black
#19 (SH)	B	Green/ Yellow
#20 (B1)	B	Red
#21 (B2)	B	Yellow

Cable Diameters:

Cable A (15035): 0.248"
Cable B (15036): 0.248"

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3.2.3 Ultra Mag Body Style 1: 2", 3", And 14+"

***IMPORTANT:** See Section 3.3, Figure 14 for instructions on attaching the chassis ground wire to the converter ground lug.

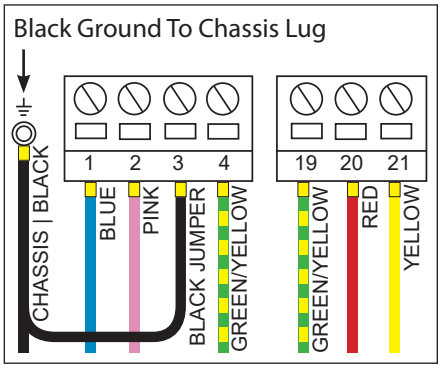

Figure 9. Ultra Mag Body Style 1 Sensor Cable Connections

Terminal Block Assignments

Cable	Terminal	Wire Color
A	#1 (E1F)	Blue
A	#2 (E2F)	Pink
B	#3C	Black
A	#4 (SH)	Green/Yellow
B	Chassis Lug	Black
B	#19 (SH)	Green/ Yellow
B	#20 (B1)	Red
B	#21 (B2)	Yellow

Cable Diameters:

Cable A (15035): 0.248"
Cable B (15036): 0.248"

3.2.4 Ultra Mag Body Style 2: 4" through 12"

***IMPORTANT:** See Section 3.3, Figure 13 for instructions on attaching the chassis ground wire to the converter ground lug.

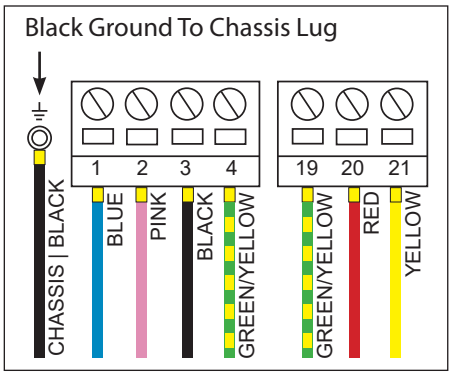

Figure 10. Ultra Mag Body Style 2 Sensor Cable Connections

Terminal Block Assignments

Terminal	Cable	Wire Color
#1 (E1F)	A	Blue
#2 (E2F)	A	Pink
#3 (C)	A	Black
#4 (SH)	A	Green/Yellow
Chassis Lug	B	Black
#19 (SH)	B	Green/ Yellow
#20 (B1)	B	Red
#21 (B2)	B	Yellow

Cable Diameters:

Cable A (15035): 0.248"
Cable B (15036): 0.248"

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3.2.5 SPI Mag

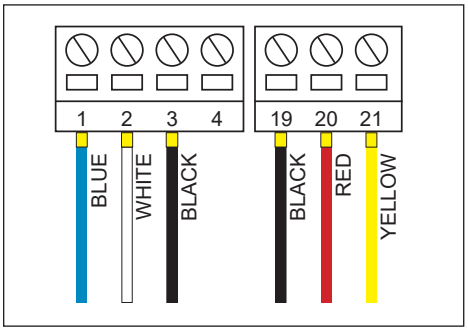

Figure 11. SPI Mag 282L Sensor Cable Connections

Cable	Terminal	Wire Color
A	#1 (E1F)	Blue
A	#2 (E2F)	White
A	#3 (C)	Black
A	#19 (SH)	Black
A	#20 (B1)	Red
A	#21 (B2)	Yellow

Cable Diameter:

Single Cable (36002): 0.250"

3.3 Converter Grounding

3.3.1 Panel Mount Converters

For panel mount converters, insert the Black Ground wire from Cable B into the Ground terminal in the Power Block as shown in Figure 12.

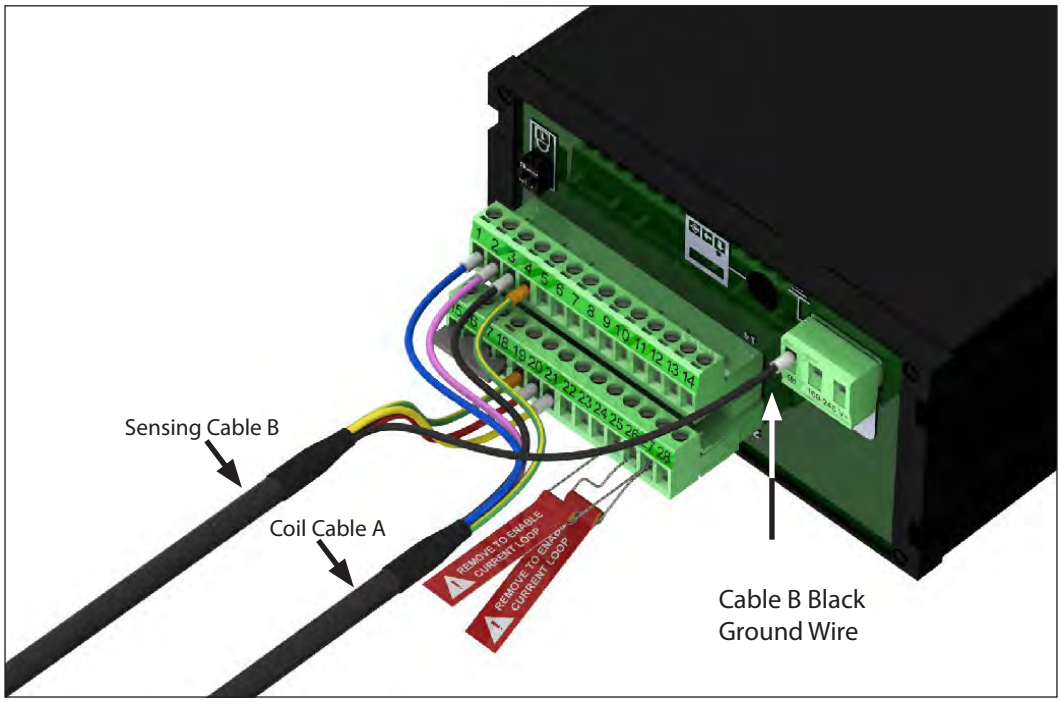

Figure 12. Panel Mount Converter Grounding

corrected 1-10-19

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3.3.2 FPI Mag 395L and Ultra Mag Body Style 2

On converters attached to the FPI Mag 395L and Ultra Mag body style 2 flow meters, the sensor cable has a ground wire fitted with a loop. Attach the wire with the loop to the enclosure's ground terminal lug as shown in Figure 19.

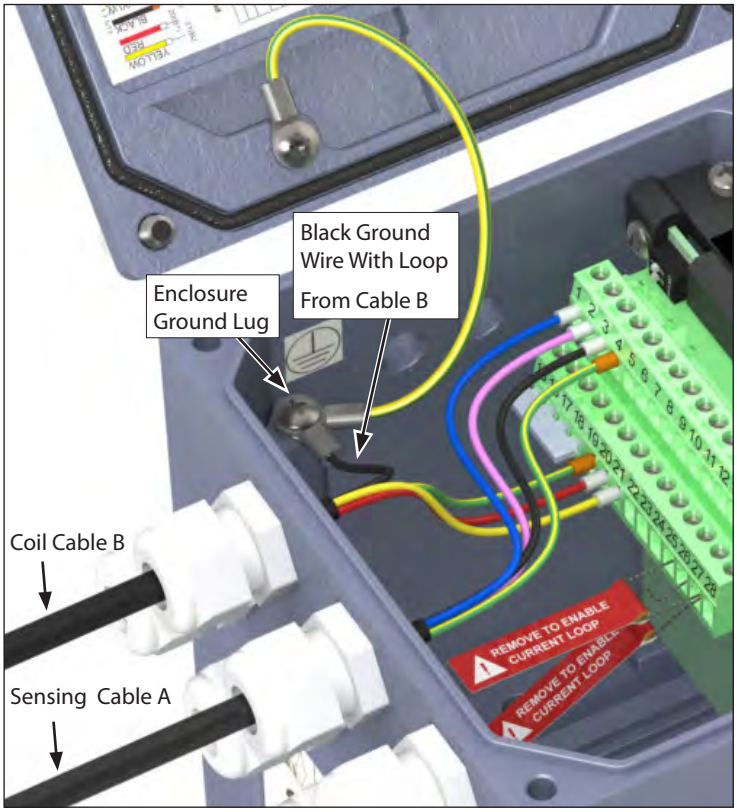

Figure 13. Converter Grounding With Cable Lug For FPI Mag 395L And Ultra Mag Body Style 2

3.3.3 Ultra Mag Body Style 1

On converters attached to the Ultra Mag body style 1 flow meters, the sensor cable has a ground wire fitted with a loop and a terminal extension. Attach the wire to the enclosure's ground terminal lug as shown in Figure 14 via the wire end loop, then connect the wire extension to Terminal #3.

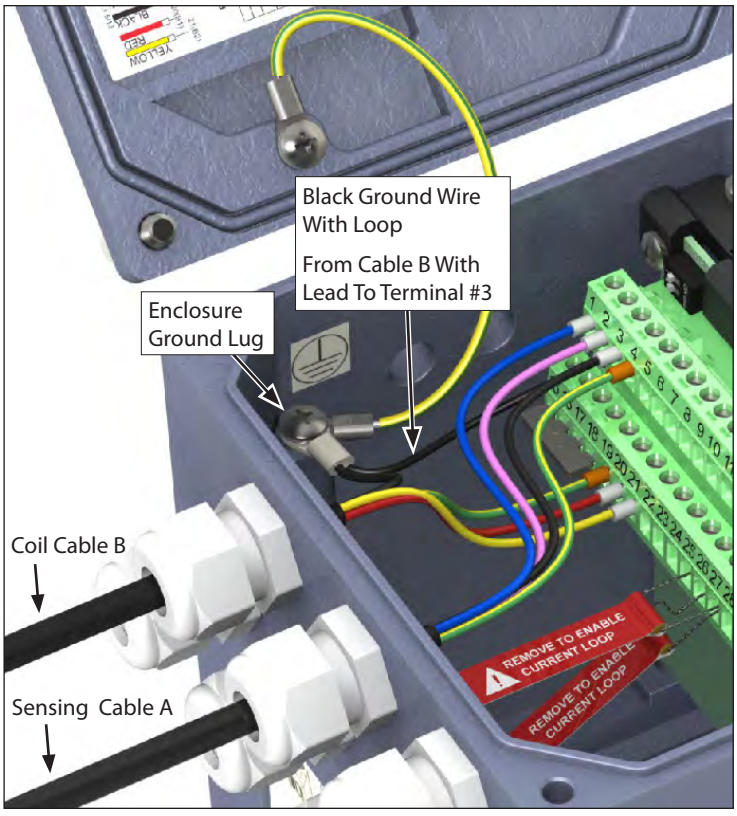

Figure 14. Converter Grounding With Cable Lug And Ground Lead For Ultra Mag Body Style 1

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3.4 4-20mA Hook-Up

Isolated 4-20mA current loops are used to output flow data to external devices. Maximum load impedance is 1,000Ω, and the maximum voltage without load is 27VDC. The converter has the capability to detect a loss of load on this output. To disable this function set the value "mA Val. Fault" under the ALARMS menu to zero (see section 7.4). A graphical example of the usage of the current loop with external device is shown below:

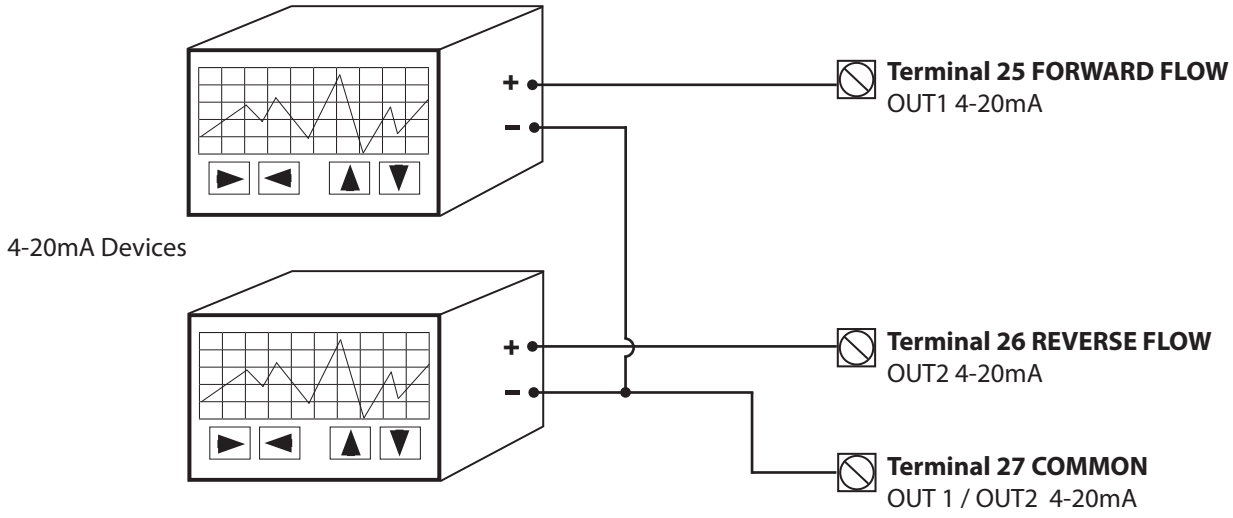

Figure 15. 4-20mA Hook-Up

IMPORTANT - RESISTOR REMOVAL FOR 4-20mA OUTPUTS
It is required to remove the resistors from terminals 25 & 27 and/or 26 & 27 before attaching 4-20mA cables.

FORWARD FLOW: Remove the resistor from terminals 25 and 27.
REVERSE FLOW: Remove the resistor from terminals 26 and 27.

See Section 3.1, "Terminal Board", Figure 6.

If the external device requires a voltage input, a precision resistor placed across the input terminals of the external device will change the current to voltage. Calculate the required resistor using Ohm's law (V = I x R). For example, a 250Ω resistor will provide an input voltage of one to five volts with the transmitter range being set from 4mA to 20mA. An additional 4 to 20mA loop output is available.

IMPORTANT

The converter powers the 4-20mA loops. Do not use external power for the 4-20mA loop as it may cause permanent damage to the converter.

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3.5 Opto-Isolated Pulse Output Hook-Up

The four outputs are open collector transistor outputs used to communicate with or activate external devices when the flow reaches a predetermined set point.

- Opto-isolated output with collector and emitter terminals floating and freely connectable
- Maximum switching voltage: 40 VDC
- Maximum switching current: 100mA
- Maximum saturation voltage between collector and emitter 1.2V@100mA
- Maximum switching frequency (load on the collector or emitter, RL=470Ω, VOUT=24VDC): 1250Hz
- Maximum reverse current bearable on the input during an accidental polarity reversion (VEC): 100mA
- Insulation from other secondary circuits: 500 V

Example 1: A common application usng all four outputs to exhibit four unique signals

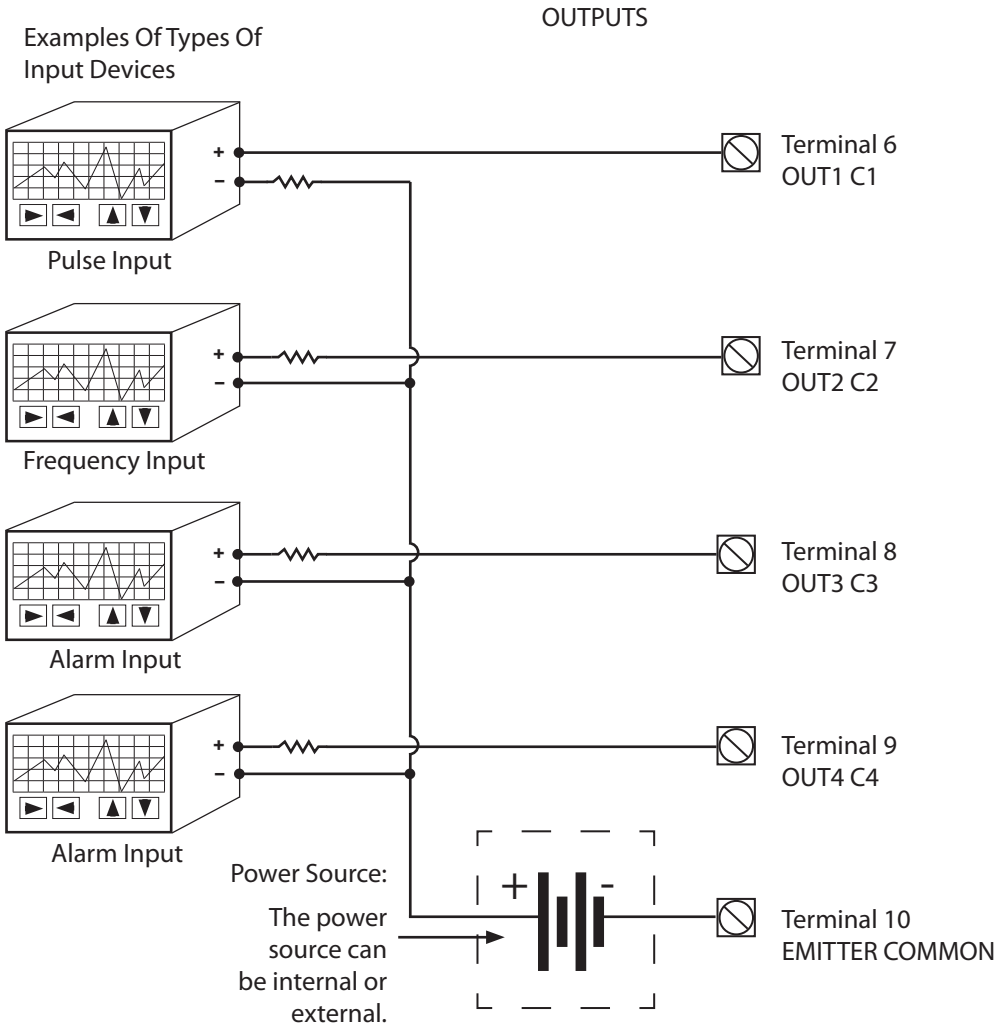

Figure 16. Opto-Isolated Pulse Output Diagram

IMPORTANT

Outputs are not isolated from each other. All outputs MUST use the same power source.

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Example 2: A common application using one output with one positive signal (+24V from PLC)

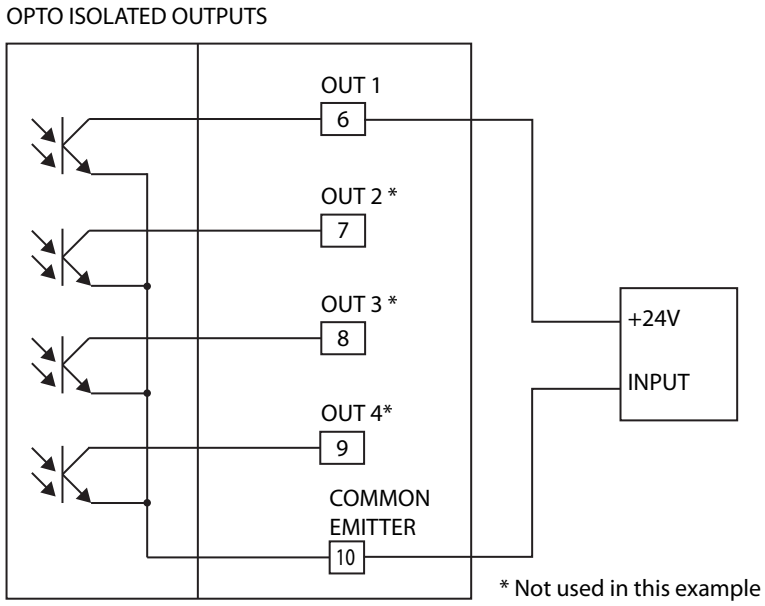

Figure 17. Opto-Isolated Pulse Output Diagram

3.6 Opto-Isolated Pulse Input

- Opto-isolated pulse input
- 500 V isolation
- 2-40 VDC on voltage
- Input programming per input menu, will perform functions set to ON.

Input example:

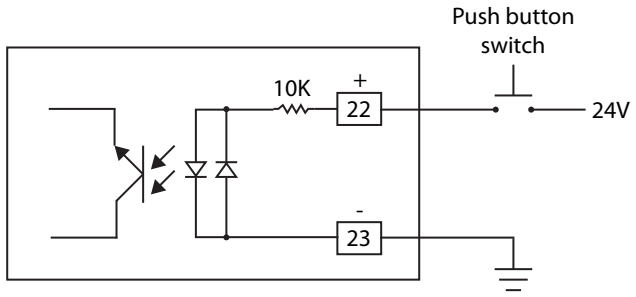

Figure 18. Opto-Isolated Pulse Input Diagram

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3.7 Converter Power Hook-Up

WARNING!

Hazardous supply voltage can shock, burn, or cause death.

The power supply line must be equipped with external surge protection for current overload (fuse or circuit breaker with limiting capacity not greater than 10A). It must be easily accessible for the operator and clearly identified.

Power connection is made using the power terminal block on the upper right side of the terminal board.

NOTE: The terminal block uplugs from the circuit board for easy connection. Connect earth ground to the protective grounding terminal before making other connections. The power supply of a standard converter is 90-265VAC, 44-66Hz at maximum 20W. DC converter is available as an option.

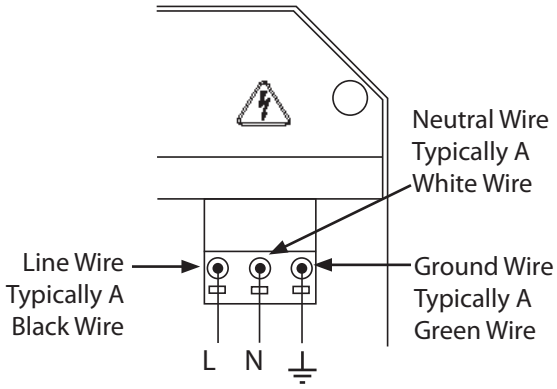

Figure 19. AC Power Supply Terminal Block

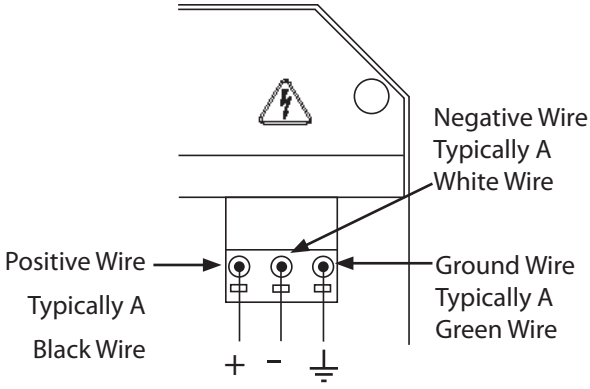

Figure 20. Optional DC Power Supply Terminal Block

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4.0 CONVERTER START-UP - ALL SENSORS

Before starting up the converter please verify the following:

- Power supply voltage must correspond to that specified on the data plate (located on the side of the converter)
- Electric connections must be wired as described in this manual
- Ground connections must be properly installed

When the converter is powered it initiates a verification cycle of the converter. During the verification cycle the converter displays an incrementing diagnostic number. When the diagnostic is complete, if an error is found, an error number will be displayed referencing the chart at the back of this manual. A text message will also be displayed on the alarm screen.

NOTE: To view alarms, press the RIGHT arrow key from the main display screen.

4.1 Menu Navigation

To navigate through the menus on the converter, the keys on the keypad use the following conventions:

Key: **Function:**

Up/Down Key

UP/DOWN KEY (for moving cursor up or down)

SHORT PRESSING (< 1 SECOND):

Moves the cursor up to the previous subject on the menu
Increases the numeric figure of the parameter highlighted by the cursor

LONG PRESSING (> 1 SECOND):

Moves the cursor down to the next subject on the menu
Decreases the numeric figure of the parameter highlighted by the cursor

Right/Left Key

RIGHT/LEFT KEY (for moving cursor right or left)

SHORT PRESSING (< 1 SECOND):

Moves the cursor to the right on the input field
Moves the cursor to the following subject of the menu
Changes the display of the process data

LONG PRESSING (> 1 SECOND):

Moves the cursor to the left on the input field
Moves the cursor to the previous subject on the menu

Note: Push and hold for eight seconds to cycle through contrast settings.

Enter/Esc Key

ENTER/ESC KEY (for changing settings)

SHORT PRESSING (< 1 SECOND):

Opens the Quick Start menu for the instrument configuration
Enters the selected function
Cancels the selected function under progress

LONG PRESSING (> 1 SECOND):

Confirms the selected function
Leaves the current menu

Figure 21. Converter Key Conventions

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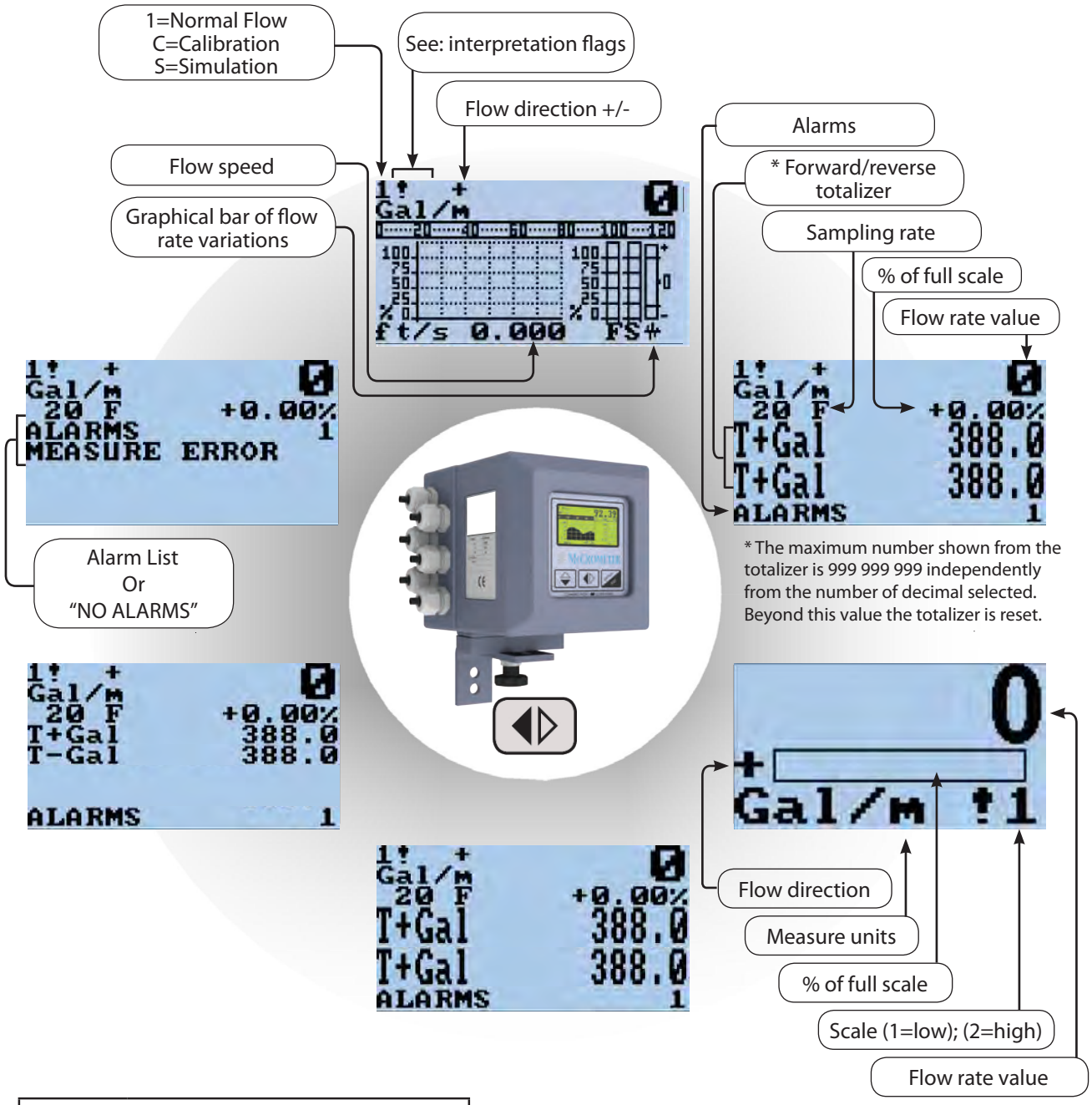
4.2 Front Panel Display

Push to change to the next screen display. Each button press changes the screen and cycles through the six displays shown below.



INTERPRETATION FLAGS	
FLAGS	DESCRIPTION
⇕	Alarm maximum or minimum activated
!	-Interruption coils circuit -Signal error -Empty pipe
⎍	Pulse output saturation (reduce TIME PULSE)

NOTE: Visualization of the pages can change depending on which functions are enabled or disabled.

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4.3 M-Series Menu Structure

The following is the menu structure for the M-Series converter. NOTE: Some menus change as options are enabled.

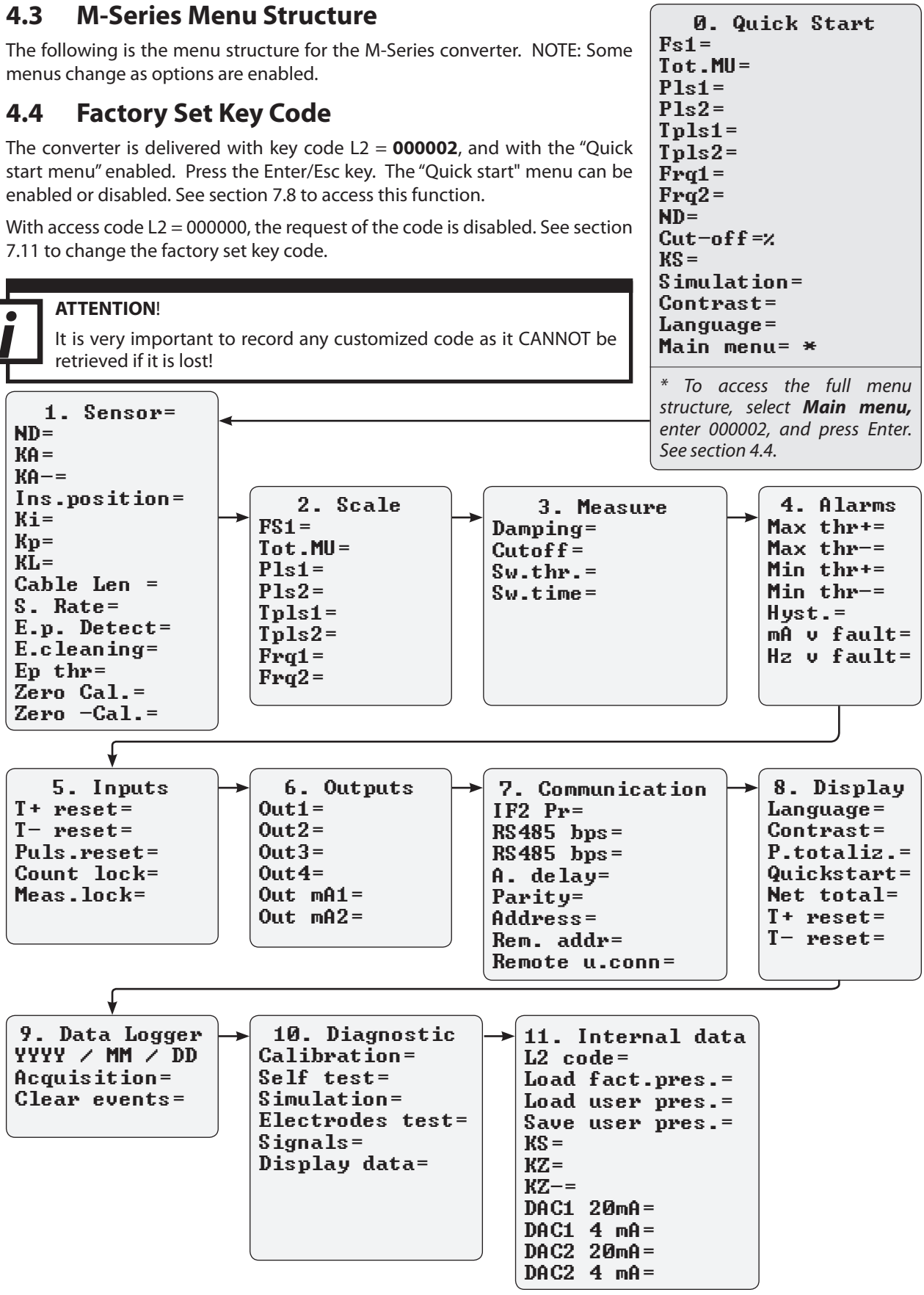
4.4 Factory Set Key Code

The converter is delivered with key code L2 = **000002**, and with the "Quick start menu" enabled. Press the Enter/Esc key. The "Quick start" menu can be enabled or disabled. See section 7.8 to access this function.

With access code L2 = 000000, the request of the code is disabled. See section 7.11 to change the factory set key code.

ATTENTION!

It is very important to record any customized code as it CANNOT be retrieved if it is lost!



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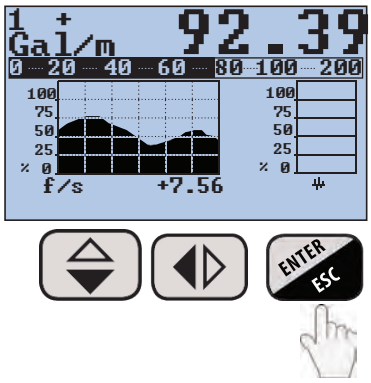
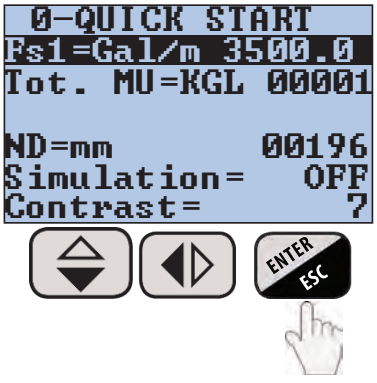
5.0 PROGRAMMING EXAMPLE

The steps below demonstrate how to modify the full scale value from 3500 Gal/m to 3000 Gal/m from the "Quick start menu".

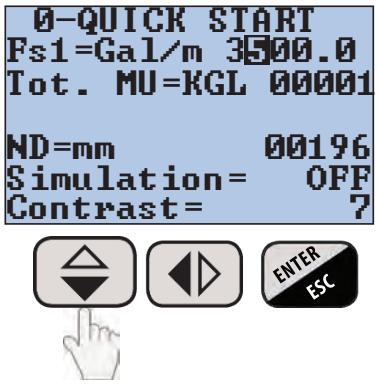


Enter the "Quick Start Menu"



Access the function "Fs1"

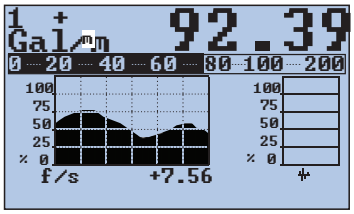
Push Repeatedly



Change the value

Confirm the new value with a short press

Long push to exit to the main page



Main visualization page

Figure 22. Programming Example Screens

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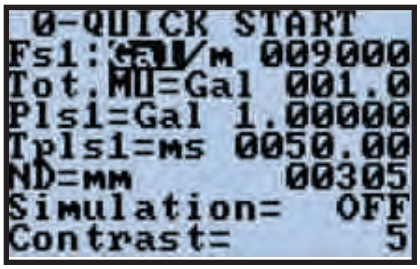
6.0 MENU 0 - QUICK START

NOTE: The Quick Start menu is configured at the factory. Some menus may not be available in your configuration. If the quick start menu is not present as the first menu option, then it has been disabled (see section 7.8 in the Display Menu). The instructions that follow explain each menu position within the Quick Start menu.

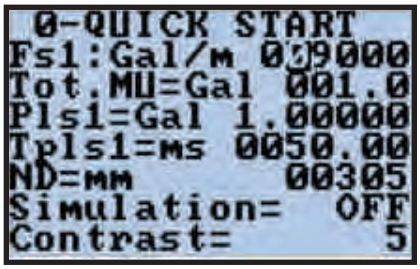
FS1

The Full Scale range 1. The units of measure and full scale range of the meter that defines the 20mA output. Generally this value is set 10% over the anticipated max flow. US standard & metric units are selectable from this menu.

To change the full scale value, highlight the "Fs1" menu and press the Enter/Esc key. The unit will highlight. Press the Up/Down key to scroll thru the different available units. See Appendix 1.0 for available units of measure.

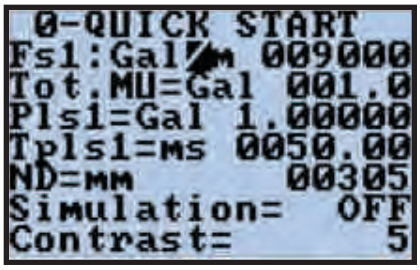


Once you have selected the desired unit press the Right/Left key twice to highlight the lower case letter that represents the time unit. Again press the Up/Down key to scroll thru the available time units. Once the unit of measure and time unit have been selected press the Right/Left key to select the numeric value. Pressing the Up/Down key to set the digit and Right/Left key to move to the next digit.



Once the desired value is entered press the Enter/Esc key to exit/highlight the menu.

If a unit you are looking for is not in the current list press the Right/Left key and scroll to the "/" between the unit of measure and time unit selections and press the Up/Down key to switch between U.S. Standard and Metric units.



Once the desired value is entered quick push the Enter/Esc key to highlight the entire line and then long push Enter/Esc to exit back to the display.

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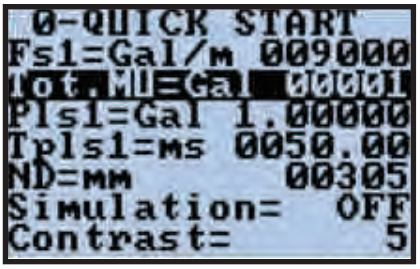
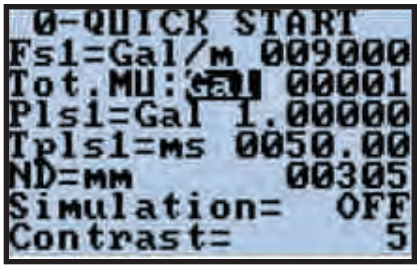
Tot. MU

The totalizer unit/multiplier as well as the visible decimal place is set here.

To change the totalizer unit/multiplier select the "Tot. MU" menu by highlighting the menu and press the Enter/Esc key. This will highlight the unit/multiplier. See Appendix 1.0 for available units of measure.

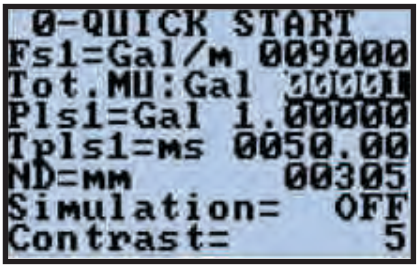


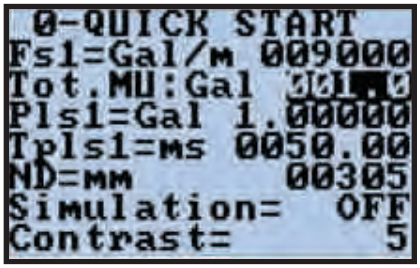


Press the Up/Down key to scroll through the available units until the desired unit has been selected.

NOTE: The totalizer multiplier is built into the unit of measure, so for gallons multiplied by 1000, select Kgal.

Once the unit of measure is selected press the Right/Left key twice to highlight the numeric value to the right. Then press the Up/Down key to change the decimal resolution displayed for this totalizer. Changing the decimal resolution will not change the multiplier. The available selections are 00001, 001.0, 01.00, and 1.000.





If the desired unit of measure is not in the current list, press the Right/Left key and scroll to the blank space between the unit/multiplier and the numeric decimal resolution selection and press the Up/Down key to switch between U.S. Standard and Metric units.

Pls1

The pulse increment value and unit of measure for the pulse output 1. This option is only available when "out1" in Menu 6 - Outputs 8.6.1 is set to "#1 IMP".

Pls2

The pulse increment value and unit of measure for the pulse output 2. This option is only available when "out2" in Menu 6 - Outputs 8.6.2 is set to "#2 IMP".

Tpls1

Duration of the pulse output 1 expressed in milliseconds. This option is only available when out1 in Menu 6 - Outputs 8.6.1 is set to #1 IMP+. The pulse duration can be set from .4 to 9999.99.

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IMPORTANT

The converter cannot detect the type of device it is connected to so it is up to the user to verify the setting is compatible with the external device receiving the pulse. Incorrect settings can damage the receiving device. See section 7.6, "Menu 6 - Outputs" for output specifications.

Tpls2

Duration of the pulse output 1 expressed in milliseconds. This option is only available when out2 in "Menu 6 - Outputs" is set to #2 Freq. The pulse duration can be set from .4 to 9999.99.

ND

Inside Pipe Diameter. The inner diameter of the pipe entered in millimeters. Setting the ND value to zero will cause the converter to display the velocity instead of flow rate. Totalizer will then increment in feet or meters. **NOTE**: Nominal pipe size and the pipe inside diameter are in most cases different from one another. The calculation of a paired FPI Mag system is derived from the pipe inside diameter. Ensure the correct value is supplied for a properly calibrated system.

Cut-off

Cutoff point which all flow is reported as zero. This value is set as a percentage of the full scale.

Simulation

Simulation enable. Setting this menu to ON will generate an internal signal that simulates flow and allows the outputs and all connected instruments to be tested. After simulation is set to ON, the flow can be set to a percentage based on the current FS1 setting -125% to 125%.

To enable the simulation function, use the Right/Left key to highlight the Simulation menu and press the Enter/Esc key, you will be prompted for code L2. Use the Up/Down and Right/Left keys to enter the code 00002. Then press the Enter/Esc key to enter the code.

The simulation function can now be toggled from OFF to ON by using the Up/Down key. Select ON to turn on the Simulation mode and press the Enter/Esc key.

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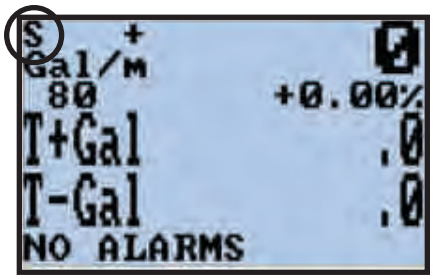
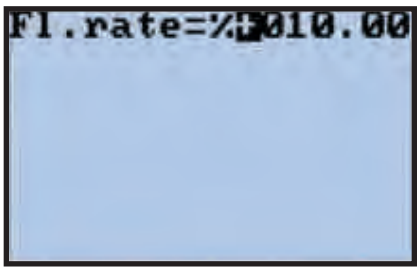
Press and hold the Enter/Esc key to exit back to the visualization page. **NOTE:** There will now be a "S" in the upper left corner, this indicates the simulation mode is active.

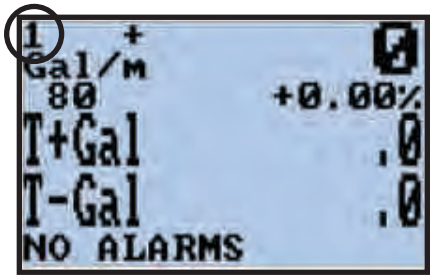


Press the Enter/Esc key. This will bring up the flow simulation set up screen. Use the Right/Left key and the Up/Down key to enter in the flow rate percentage value for the simulation. Press the Enter/Esc key to enter that value.



The converter will start to read flow. It may take a few seconds for the readings to appear. Repeat the above steps as needed to observe the different flow rates desired.

To exit out of simulation mode, re-enter into the simulation set up screen (see above) and then press and hold the Enter/Esc key. This will exit out to the visualization screen, and the "S" in the upper left corner of the screen will return to a "1".



Contrast
Display contrast set point. The display contrast can be changed to make the display appear more visible based on the users preference. This menu can be set 0 to 15 with the change only taking affect once the menu selection has been selected by pressing the enter key. The factory default is 5.

NOTE: If set too high or too low the display can become unreadable. If this happens wait 60 seconds from the time of the last button push for the display to time out to the visualization page. From the visualization page press and hold the Right/Left button. The display will cycle through a different preset display contrast settings every 8 seconds. Release the button once you have found a setting that can be read.

Language
Choose a language to display the converter menus in.

The available options are EN = English, IT = Italian, FR = French, SP = Spanish and DE = German.

Main menu
This allows access to the main menu which contains advanced configuration menus.

NOTE: If the Quick Start menu is disabled, from the flow visualization press the Enter/Esc. The L2 passcode screen will appear. Enter the passcode of 000002, then press the Enter/Esc key.

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7.0 MAIN MENU DESCRIPTIONS

Press the key Enter/Esc key to go to the Main menu directly when the "Quick start menu" is disabled. When it is not disabled you can select the Main menu from the "Quick start menu". The functions in the Quick Start menu and the Main menu are explained below. Please note that some functions are only displayed if other functions are enabled or with the insertion of additional modules.

7.1 Menu 1- Sensor

ND Inside Pipe Diameter
The inner diameter of the pipe entered in millimeters. **NOTE:** The flow accuracy will only be as good as the accuracy of the actual pipe ID entered into the converter. The "Nominal Pipe Size" often referred to can be different from the actual pipe ID and if used cause a substantial error in flow reading. Setting the ND value to zero will cause the converter to display the velocity instead of flow rate. Totalizer will then increment in feet or meters.

KA
Factory calibrated gain for the forward flow. Do not change the value.

KA-
Factory calibrated gain for the reverse flow. Used ONLY for bidirectional meters. Do not change the value.

Cable length
Cable length set in increments of 10 meters, rounded to the nearest 10 meter increment.

S. rate
Factory calibrated frequency sampling rate. Do not change the value.

E.P. Detect
Set the empty pipe alarm to on or off. Factory default = ON.

NOTE: Setting the E.P. Detect to "off" can cause the sensor to display environmental/electrical noise as flow.

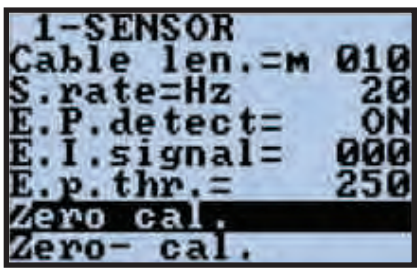
E.cleaning
Factory set value. Do not change the value.

E.p. thr
Empty Pipe Threshold is the numeric value selected during the Empty Pipe Calibration function. In some cases it may be required to manually adjust this value to be more compatible with an installation. For assistance adjusting this value contact McCrometer Technical Support. Available settings are from 20-250.

Zero Cal.
Zero point calibration function for the forward flow.

To perform the Zero point Calibration select the Zero Cal. Menu by highlighting the menu and press the Enter/Esc key. This will enable the zeroing function. You will see a percent value that is positive or negative.

IMPORTANT - The water must be perfectly still before starting the Zero Cal process or an offset will be introduced into the flow report.



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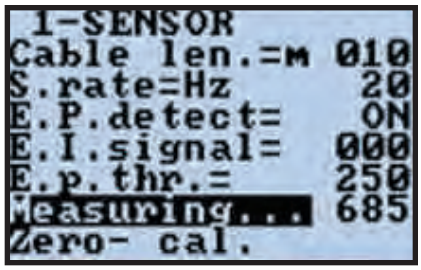
Now press and hold the Up/Down button and release when the message "Measuring. . . " appears. The converter counts up from zero to 1,000, after which the zero point is set. The new value should be less than before the autozero was performed. if not, then verify that there is no flow in the pipe and repeat.



Zero Cal.

Zero point calibration function for the reverse flow. See above instructions and repeat for the reverse zero calibration.

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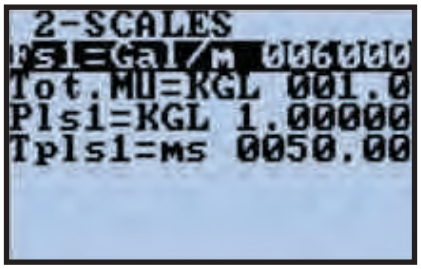
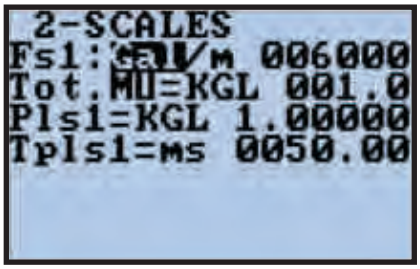
7.2 Menu 2 - Scales

FS

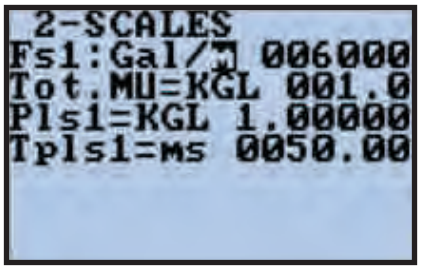
The Full Scale range 1. The full scale units of measure of the meter that defines the 20mA output and the general maximum flow for the meter. U.S. Standard and metric units are selectable from this menu. See Appendix 1.0 for available units of measure.

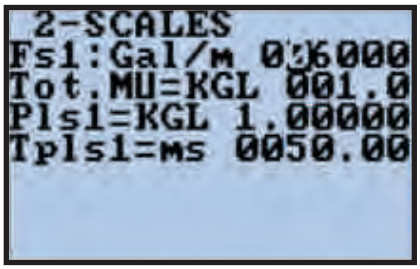
To change the full scale value, highlight the "Fs1" menu and press the Enter/Esc key. The unit will highlight. Press the Up/Down key to scroll thru the different available units.





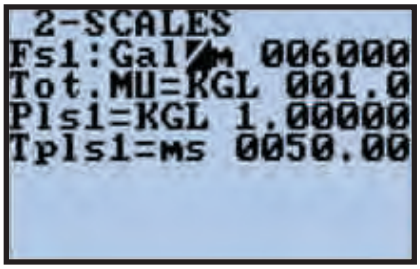
Once you have selected the desired unit press the Right/Left key twice to highlight the lower case letter that represents the time unit. Again press the Up/Down key to scroll thru the available time units. Once the unit of measure and time unit have been selected press the Right/Left key to select the numeric value. Press the Up/Down key to set the digit and the Right/Left key to move to the next digit.





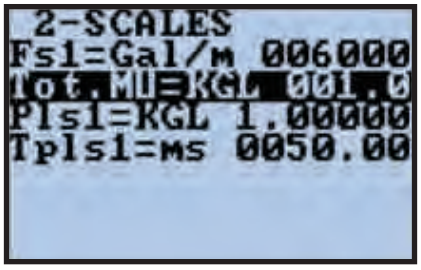
If a unit you are looking for is not in the current list press the Right/Left key and scroll to the "/" between the unit and time unit selection and press the Up/Down key to switch between U.S. standard & metric units.

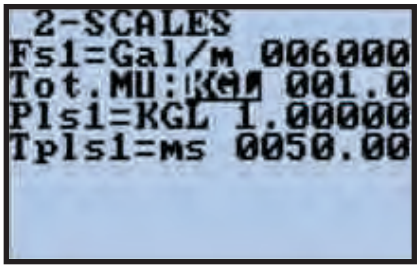
Once the desired value is entered quick push Enter/Esc to high light the entire line and then long push Enter/Esc to exit back to the display.



Tot. MU

Totalizer Multiplier Unit. To change the Totalizer Multiplier unit select the "Tot. MU" menu by highlighting the menu and press the Enter/Esc key. This will highlight the unit/multiplier line. See Appendix 1.0 for available units of measure.





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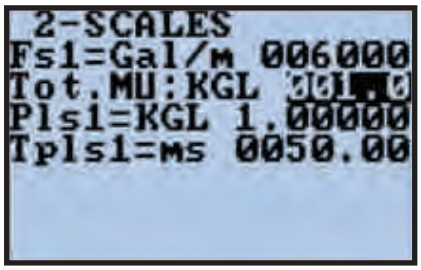
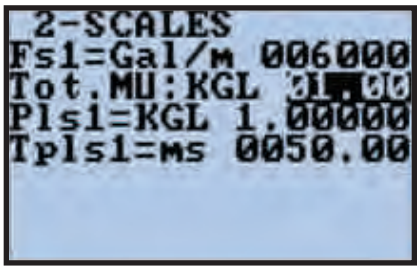
Press the Up/Down key to scroll thru the different available units until the desired unit has been selected. **NOTE:** the totalizer multiplier is built into the unit of measure so if you want gallons times 1000 you must select Kgal. Once selected, press the Right/Left key twice to highlight the numeric value to the right. Pressing the Up/Down key will change the decimal resolution displayed for this totalizer but will not change the multiplier. The available selections are 00001, 001.0, 01.00, and 1.000.

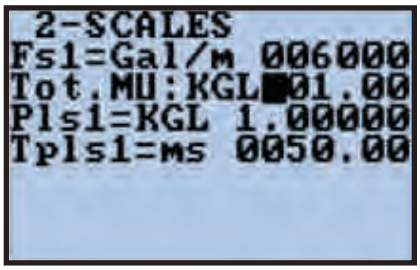




If a unit you are looking for is not in the current list press the Right/Left key and scroll to the blank space between the unit/multiplier and the numeric decimal resolution selection and press the Up/Down key to switch between US standard & metric units.

NOTE: Maximum Fs1 value is equivalent to 33.418 FPS.
Minimum Fs1 value is equivalent to 1.337 FPS.

NOTE: Converter will only accept settings based on possible max setting less than 99999.
Example: 35" Line ND = 889 mm max
Flow rate = 10220 GPM
Converter will not accept GPM/M. Unit must be entered as KGL/M.



Pls1
The pulse increment value and unit of measure for the pulse output 1. This option is only available when "out1" in "Menu 6 - Outputs" (section 7.6) is set to "#1 IMP".

Pls2
The pulse increment value and unit of measure for the pulse output 2. This option is only available when "out2" in "Menu 6 - Outputs" (section 7.6) is set to "#2 IMP".

Tpls
Duration of the pulse output 1 expressed in milliseconds. This option is only available when out1 in Menu 6 - "Menu 6 - Outputs" (section 7.6) is set to "#1 IMP". The pulse duration can be set from .4 to 9999.99.

Tpls2
Duration of the pulse output 1 expressed in milliseconds. This option is only available when out2 in Menu 6 - "Menu 6 - Outputs" (section 7.6) is set to "#2 IMP". The pulse duration can be set from .4 to 9999.99.

Frq1
Full scale frequency value for output 1. This option is only available when out1 in "Menu 6 - Outputs" (section 7.6) outputs is set to "#1Freq (+/-)". The value is set in hertz between 0.1 to 1,000.0.

Frq2

Full scale frequency value for output 2. This option is only available when out2 in "Menu 6 - Outputs" (section 7.6) is set to "#2FREQ (+/-)". The value is set in hertz between 0.1 to 1,000.0.

IMPORTANT

The converter cannot detect the type of device it is connected to so it is up to the user to verify the setting is compatible with the external device receiving the pulse. Incorrect settings can damage the receiving device. See section 7.6, "Menu 6 - Outputs", for output specifications.

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7.3 Menu 3 - Measure

Damping
This sets the dampening or filter setting for the meter. This setting is extremely important. The correct filter setting ensures the proper response of the meter to the measured flow rate. The available dampening filter values range from 0 (no dampening or dampening OFF) to a maximum dampening of 1,000 seconds. There are also some specialized settings, SMART 1, SMART 2, and SMART 4, which dampen small flow variations but react more aggressively to large variations. With the dampening turned off the converter responds immediately to any change in flow. This can result in a noisy output and should only be used in batching operations were flow rates are highly regulated and incremental quantities of flow are small. With the dampening set to values between 0.2 seconds and 1000 seconds the converter buffers and averages flow data over the period of time specified. Larger values tend to provide a quieter and more stable output but will respond more sluggishly to large changes or transitions in flow rate. The specialized, SMART settings are not intended for use with the FPI, SPI, or UltraMag flow meters and should not be selected. Typically, the FPI, SPI, and UltraMag meters are set with a damping of 10 seconds. This setting can be changed to make the meter more or less responsive and/or stable. To make large changes to the setting please contact the factory to understand the application specific consequences of doing so.

Cut-off
Cutoff point which all flow is reported as zero. This value is set as a percentage of the full scale. (Note: Default cut-off point = 2.0% of full scale.)

7.4 Menu 4 - Alarms

Max Thr +
Max Thr +, Maximum flow threshold, forward flow. This is the set point to trigger a high flow alarm set as a percentage of full scale. This function is disabled when set to zero.

Max Thr -
Maximum flow threshold, reverse flow. This is the set point to trigger a high flow alarm set as a percentage of full scale. This function is disabled when set to zero.

Min thr +
Minimum flow threshold, forward flow. This is the set point to trigger a low flow alarm set as a percentage of full scale. This function is disabled when set to zero.

Min thr -
Minimum flow threshold, reverse flow. This is the set point to trigger a high flow alarm set as a percentage of full scale. This function is disabled when set to zero.

Hyst.
Alarm Hysteresis. Set 0-25%. This sets the lag in response based on a percentage of the full scale. Example if the alarm triggers at 100% and the hysteresis is set to 2% then once triggered the current rate must change beyond 2% to exit out of the current alarm state. This setting applies to all alarms.

mA v. fault
mA value fault. Current output value during alarm events set as a percentage 0-120% of the current output range. The current range 0/4mA to 20/22mA is set in "Menu 6 - Outputs" (section 7.6). For example, if an empty pipe alarm is present and the mA v. fault value is set to 10% and the current scaling is set 4 to 20mA, then the current output would send a 2mA signal until the empty pipe alarm is cleared. This function is disabled when set to zero.

Hz v. fault
Hertz value fault. Frequency output value during alarm events set as a percentage 0-125% of the frq1/frq2 range. For example, if an empty pipe alarm is present and the Hz v. fault value is set to 110% and the Frq1 scaling is 100 Hz, then the frequency output on channel 1 would send a 110 Hz signal until the empty pipe alarm is cleared. This function is disabled when set to zero.

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7.5 Menu 5 - Inputs

T+ reset
Positive Totalizer Reset Enable. Set by turning on or off. This allows for the positive total totalizer to be reset through the input.

T- reset
Negative Totalizer Reset Enable. Set by turning on or off. This allows for the negative total totalizer to be reset through the input.

Puls.reset
Pulse Output Reset Enable. Set by turning on or off. This allows for the totalized pulses to be reset through the input.

Count lock
Totalizer Count Lock Input Enable, Set by turning on or off. This allows for the totalizers to be locked (frozen) when the input is active.

7.6 Menu 6 - Outputs

Out 1
Transistor output channel 1. See tables on the next page for available settings.

Out 2
Transistor output channel 2. See tables on the next page for available settings.

Out 3
Transistor output channel 3. See tables on the next page for available settings.

Out 4
Transistor output channel 4. See tables on the next page for available settings.

Out mA1
Current output channel 1. See tables on the next page for available settings.

Out mA2
Current output channel 2. See tables on the next page for available settings.

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Outputs available for open collector transistor outputs #1 & #2 only:

Function Symbol	Function Explanation
#1 IMP+	Pulse on output 1 for forward flow rate. Only assignable to channel 1. This option will trigger 1 pulse per PLS1 setting.
#1 IMP-	Pulse on output 1 for reverse flow rate. Only assignable to channel 1. This option will trigger 1 pulse PLS1 setting.
#1 IMP	Pulse on output 1 for forward and reverse flow rate. Only assignable to channel 1. This option will trigger 1 pulse per PLS1 setting.
#2 IMP +	Pulse on output 2 for forward flow rate. Only assignable to channel 2. This option will trigger 1 pulse per PLS2 setting.
#2 IMP -	Pulse on output 2 for reverse flow rate. Only assignable to channel 2. This option will trigger 1 pulse per PLS2 setting.
#2 IMP	Pulse on output 2 for forward and reverse flow rate. Only assignable to channel 2. This option will trigger 1 pulse per PLS2 setting.
#1 FREQ+	Frequency on output 1 for forward flow rate. Only assignable to channel 1. This option will trigger a frequency output for forward flow per Frq1 setting.
#1 FREQ-	Frequency on output 1 for reverse flow rate. Only assignable to channel 1. This option will trigger a frequency output for reverse flow per Frq1 setting
#1 FREQ	Frequency on output 1 for forward and reverse flow rate. Only assignable to channel 1. This option will trigger a frequency output for both forward and reverse flow per Frq1 setting.
#2 FREQ+	Frequency on output 2 for forward flow rate. Only assignable to channel 2. This option will trigger a frequency output for forward flow per Frq2 setting.
#2 FREQ-	Frequency on output 2 for reverse flow rate. Only assignable to channel 2. This option will trigger a frequency output for reverse flow per Frq2 setting.
#2 FREQ	Frequency on output 2 for forward and reverse flow rate. Only assignable to channel 2. This option will trigger a frequency output for both forward and reverse flow per Frq2 setting.

Outputs available for open collector transistor outputs #1 through #4.

Function Symbol	Function Explanation
SIGN	Flow direction output (energized = reverse flow)
RANGE	Not Supported
MAX AL+	Max. forward flow rate output (energized = alarm off) per max thr + setting
MAX AL-	Max. reverse flow rate output (energized = alarm off) per max thr - setting
MAX AL	Max. forward and reverse flow rate output (energized = alarm off) per both max thr + and - setting
MIN AL+	Min. forward flow rate output (energized = alarm off) per min thr + setting
MIN AL-	Min. reverse flow rate output (energized = alarm off) per min thr - setting
MIN AL	Min. forward and reverse flow rate output (energized = alarm off) per both min thr + and - setting
MAX+MIN	Max. and min. flow rate alarm output (energized = alarm off) per both max and min settings
EMPTY PIPE	Empty pipe alarm output (energized = alarm off) per EP detect and EP thr settings
OVERFLOW	Out of range alarm output (energized = flow rate is in range) per FS1 setting
Hardw AL.	Cumulative alarm output; interrupt coils, empty pipe, and/or measure error (energized = alarms off)
EXT. COMM.	Not Supported

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CURRENT VALUES IN mA ASSOCIATED TO THE % VALUE OF FULL SCALE					
POSSIBLE FIELD	REVERSE FLOW VALUE		ZERO	DIRECT FLOW VALUE	
	≤ - 110%	-100%	0%	+100%	≥+110%
OutmA= 0 ÷ 20 +	0	0	0	20	20
OutmA= 0 ÷ 22 +	0	0	0	20	20
OutmA= 4 ÷ 20 + [1]	4	4	4	20	20
OutmA= 4 ÷ 22 +	4	4	4	20	20
OutmA= 0 ÷ 20 -	20	20	0	0	0
OutmA= 0 ÷ 22 -	22	20	0	0	0
OutmA= 4 ÷ 20 - [2]	20	20	4	4	4
OutmA= 4 ÷ 22 -	22	20	4	4	4
OutmA= 0 ÷ 20	20	20	0	20	20
OutmA= 0 ÷ 22	22	20	0	20	22
OutmA= 4 ÷ 20	20	20	4	20	20
OutmA= 4 ÷ 22	22	20	4	20	22
OutmA= 0 ÷ 20 —0+	0	0	10	20	20
OutmA= 0 ÷ 22 —0+	0	1	11	21	22
OutmA= 4 ÷ 20 —0+	4	4	12	20	20
OutmA= 4 ÷ 22 —0+	4	4.8	12.8	20.8	22

1 Default mA1 setting

2 Default mA2 setting

7.7 Menu 7 - Communication

IF2 pr.
Protocol for IF2 port. Set to DPP or HTP. This sets the protocol used for communication to the IF2 device, either Data Packet Protocol (DPP) or Hyper Text Protocol (HTP). Default is DPP.

RS485 bps
RS485 output speed. This sets the RS485 baud rate (4800, 9600, 19200, or 38400).

A. delay
Instrument answer delay. This sets the answer delay in microseconds (0, 20, 40, 60, 80, 100, 120, or 140).

Address
DEVICE ADDRESS (0 to 255) – This sets the address of the device for RS485 communication.

Rem.addr
REMOTE ADDRESS (0 to 255) – This sets the address of a second remote converter.

Remote u.conn
REMOTE CONNECTION – Pressing this connects the remote terminal. The connection will be interrupted after 10 seconds of inactivity

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7.8 Menu 8 - Display

Language
Converter language. This sets the converter language EN (English), IT (Italian), FR (French), SP (Spanish), or DE (German).

Contrast
Display contrast set point. The display contrast can be changed to make the display appear more visible based on user preference. This menu can be set 0 to 15. The change will take affect once the menu selection has been selected by pressing the Enter/Esc key. The factory default is 5.

NOTE: if set too high or too low the display can become unreadable. If this happens then wait 60 seconds from the time of the last button push for the display to time out to the visualization page. From the visualization page press and hold the Right/Left button. The display will cycle through a different preset display contrast settings every 8 seconds. Release the button once you have found a setting that can be read.

Quick start
Quick Start Menu Enable. This setting toggles between on and off. If set to "off" it will hide the quick start menu.

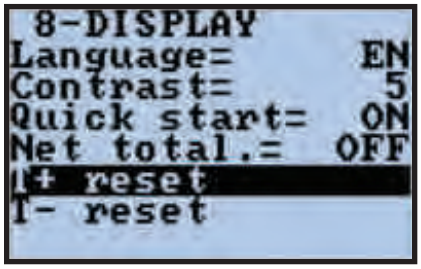
Net total
Totalizer Net Enable. This setting toggles between on and off. Setting this menu to "on" will replace the current forward and reverse totalizers with the net totalizers on the visualization.

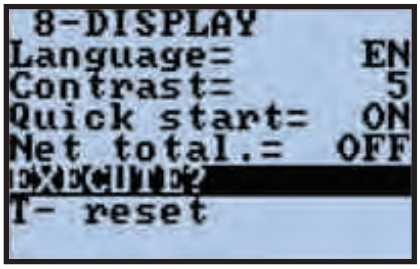
T+ reset
Totalizer reset, forward. Resets the forward flow totalizer.

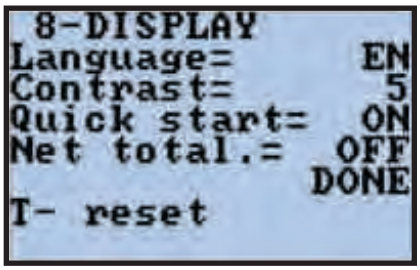
T- reset
Totalizer reset, reverse. Resets the reverse flow totalizer.

To reset the totalizer, highlight the totalizer reset option to be reset. Quick press the Enter/Esc key. The display will show “EXECUTE?”. Press and hold the Enter/Esc key to continue. The display will flash "Done". The visualization pages will now show the totalizer as reset.

NOTE: There is no function to reset the Net Totalizer. To reset the Net Totalizer, both the "+" and the "-" totalizers must be reset.







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7.9 Menu 9 - Data Logger

YYYY/MM/DD
Date and time. This sets the date and time in the converter. The format for entering the date and time is year / month / day and time is hours : minutes : seconds.

Acquisition
Event logger for internal alarms. This setting toggles between on and off. This menu enables event logging to capture alarm events internally for diagnostic purposes. This data can't be extracted.

Display events
Displays the stored alarm events in order, up to a maximum of 64 events.

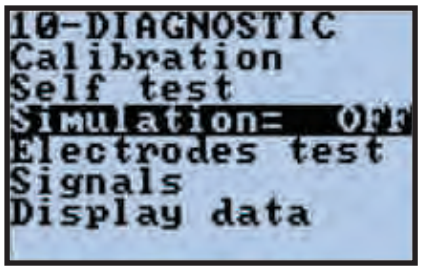
Clear events
Clears all stored events.

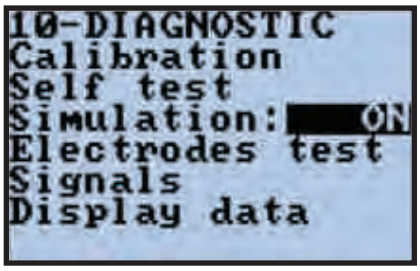
7.10 Menu 10 - Diagnostics

Calibration
Initiates the calibration of the converter. To activate press the Enter key and then, at the question: "EXECUTE?" press the Esc key to start calibration, or any other key for escape back. During the calibration process a "C" is displayed in the upper left corner of the display.

Self-test
Converter self test. Executed command. Running the self-test will cause the converter to run an internal diagnostic test that will check for internal hardware and software errors. The converter will reboot. Once the self-test is complete if any errors are found then the error code for each error will be displayed. Refer to section 8.0, "ALARM MESSAGES", for a list of possible error codes.

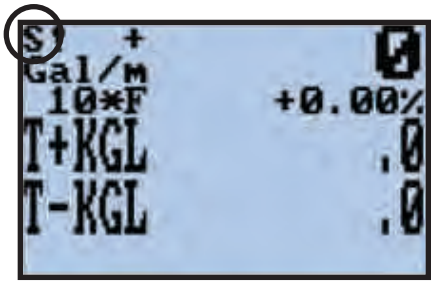
Simulation
Simulation enable. Setting this menu to ON will generate an internal signal that simulates flow and allows the outputs and all connected instruments to be tested. After simulation is set to ON, the flow can be set to a percentage based on the current FS1 setting of -125% to 125%.





To enable the simulation function highlight the Simulation menu and press the (enter/esc) key. Toggle the simulation function from OFF to ON using the Up/Down key. Press and hold the (enter/esc) key to exit back to the main menu and once again to exit to the visualization page.

NOTE: you will now have an "S" in the upper left corner, this indicates the simulation mode is active.



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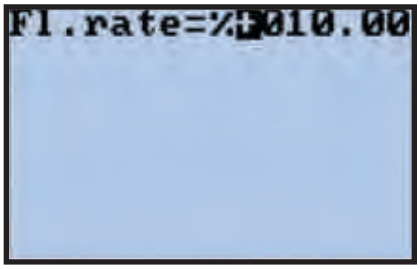
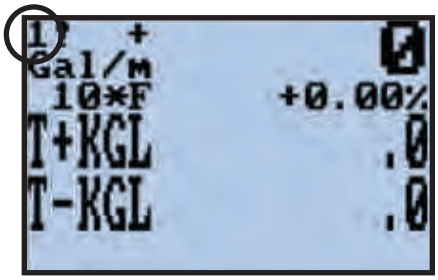
Press the Enter/Esc key. This will bring up the flow simulation set up screen. Use the Right/Left key and the Up/Down key to enter in the flow rate percentage value for the simulation. Press the Enter/Esc key to enter that value.



The converter will start to read flow. It may take a few seconds for the readings to appear. Repeat the above steps as needed to observe the different flow rates desired.

To exit out of simulation mode, re-enter into the simulation set up screen (see above) and then press and hold the Enter/Esc key. This will exit out to the visualization screen, and the "S" in the upper left corner of the screen will return to a "1".



Electrodes test
Executed function. This function tests the internal electrode circuits for proper operation. This is a factory service menu.

Signals
This menu displays graphical representations to various input and output signals. This is a Factory service menu.

Display data
Numeric display for various internal settings and raw measured signals. This is a Factory service menu.

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7.11 Menu 11 - Internal Data

L2 code
Level 2 passcode. This menu changes the 2 level passcode. The factory default is 000002.

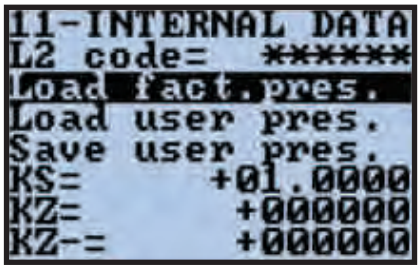
CAUTION - if the passcode is changed from the default value and is lost, it CANNOT be recovered. In the event the passcode is lost the converter can be returned to the factory to be reset. Note all data is lost during this process.

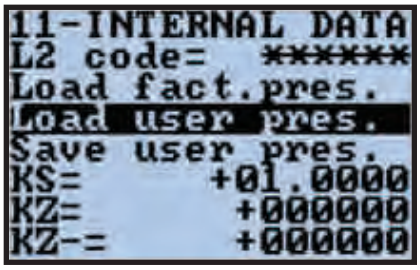
Load fact. Pres.
Load factory presets. This is an executed menu. Executing this menu will reset all programmed values to the original factory default values.

NOTE: This menu is customized for a specific sensor. Confirm the converter has not been moved or paired with another sensor prior to executing this menu.

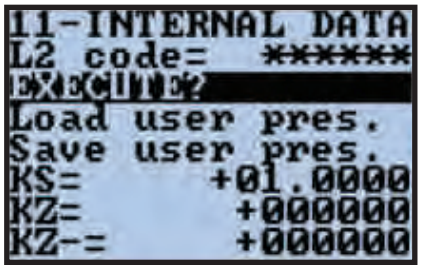
Load user pres.
Load User Presets. This is an executed menu. Executing this menu will reset all programmed values to a user defined set of programming values. These values are set using the "Save user pres." Menu.

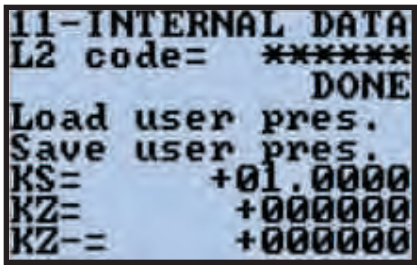
To reload the factory or user presets select the desired set of presets by highlighting the menu and press the Enter/Esc key.





You will be asked if you want to "execute?" the function. Press and hold the Enter/Esc key. This will load the saved preset values. The display will flash "DONE" once the converter has finished reprogramming the preset values.





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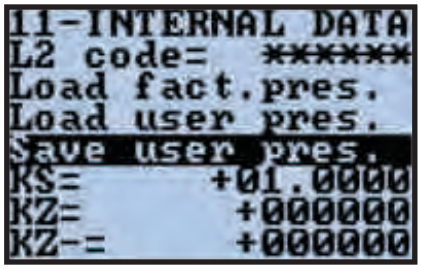
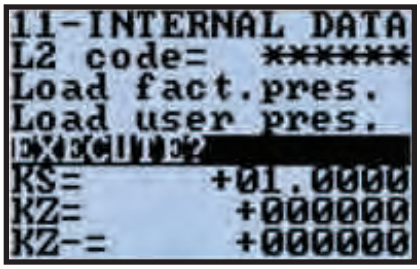
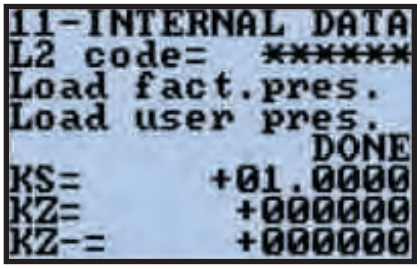
Save user pres.
Saves user presets. This is an executed menu.

To save a user defined program start by reviewing each and every programming menu and confirm that each value is set as desired. Once it is confirmed the programming is set as desired, navigate to the "Save user pres." menu and press the Enter/Esc key. You will be prompted if you want to "execute?". Press and hold the Enter/Esc key and the display will flash "DONE". Your user defined presets have now been saved and can be recalled anytime by executing the "Load user pres." function.







KS
Field adjustment coefficient. This value is a direct multiplier that is used as a field adjustment/correction coefficient.

KZ
Forward zero point coefficient. The forward zero point coefficient is selected when the zero calibration is run. This menu will allow for manual adjustments of the forward zero point.

KZ-
Reverse zero point coefficient. Used ONLY for forward and reverse sensors. The reverse zero point coefficient is selected when the zero calibration is run. This menu will allow for manual adjustments of the reverse zero point

DAC1 20mA
Current output channel 1 20 mA trim. This is a factory service menu.

DAC1 4mA
Current output channel 1 4 mA trim. This is a factory service menu.

DAC2 20mA
Current output channel 2 20 mA trim. This is a factory service menu.

DAC2 4mA
Current output channel 2 4 mA trim. This is a factory service menu.

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8.0 ALARM MESSAGES

During meter setup, you may see error messages and codes. These messages and codes are explained below.

MESSAGES	ANOMALIES	ACTION TO TAKE
NO ALARMS	Everything works regularly	-------
MAX ALARM	The flow rate is higher than the maximum threshold set	Check the maximum flow rate setting and process conditions. (Menus Max Thr and +Fs1)
MIN ALARM	The flow rate is lower than the minimum threshold set	Check the minimum flow rate threshold setting and process conditions. (Menu +Fs1)
FLOW RATE >FS	The flow rate is higher than the full scale value set on the instrument	Check the full scale value setting on the instrument and the process conditions/ (Menu Fs1)
PULSE/FREQ .FS	The output channel is saturated.	Set a bigger frequency unit or, if the connected counting device allows it, reduce the pulse duration value. (Menu Tpls)
EMPTY PIPE	The measuring pipe is empty or the detection system has not been properly calibrated	Check whether the pipe is empty.
INPUT NOISY or MEASURE ERROR	The measure is strongly effected by external noise or the cable connecting the converter to the sensor is broken	Check the status of the cables connecting the sensor, the grounding connections of the devices or the possible presence of noise sources
EXCITATION FAIL	The coils or the cable connecting the sensor are interrupted	Check the connecting cables to the sensor
CURR. LOOP OPEN	The 0/4-20ma output on board or the optional one are not correctly closed on a valid load	Verify the load is applied to the output (max 1000 ohm) or a resistor is in place. To disable the alarm, set the "mA VAL.FAULT" value (menu alarm) to 0.

ERROR CODES	ANOMALY DESCRIPTION	ACTION TO TAKE
0001	Problem with watch-dog circuit	ADDRESS TO FACTORY TECHNICAL SUPPORT
0002	Wrong configuration work data in EPROM	
0004	Wrong configuration safety data in EPROM	
0008	Defective EPROM	
0010	Defective keyboard (one or more keys are pushed during the test)	
0020	Power supply voltage (+3.3) is out of range	
0040	Power supply voltage (+13) is too low (<10V)	
0080	Power supply voltage (+13) is too high (>14V)	
0200	Timeout calibration input (input circuit is broken)	
0400	Gain input stage is out of range	Check the status of the cables connecting the sensor to the converter, the grounding connections of the devices or the possible presence of strong and anomalous noise sources
0800	Interruption on the coils circuit	Check the status of the cables connecting the sensor to the converter
0C00	Cumulative alarm 0800+0400	See single code

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9.0 SPECIFICATIONS

POWER REQUIREMENTS:

AC: 90-265 VAC / 45-66 Hz (20W/25VA) or
DC: 10-35 VDC (21 W)
AC or DC must be specified at time of ordering.

STANDARD OUTPUTS:

Single [1] or dual [2] 4-20mA Outputs: Galvanically isolated and fully programmable for zero and full scale (0-21mA rangability)

Two [1] or four [2] separate digital programmable outputs: open collector transistor usable for pulse, frequency, or alarm settings.

- Volumetric Pulse
- Flow Rate (Frequency)
- Hardware Alarm
- High/Low Flow Alarms
- Empty Pipe
- Directional Indication
- Range Indication

- Maximum switching voltage: 40 VDC
- Maximum switching current: 100mA
- Maximum switching frequency: 1250 Hz
- Insulation from other secondary circuits: 500V

OPTIONAL OUTPUTS:

- Modbus [2]
- Smart Output (Sensus or Itron)

ENGINEERING UNITS:

Cubic Meter; Cubic Centimeter; Milliliter; Liter; Cubic Decimeter; Decaliter; Hectoliter; Cubic Inches; US Gallons; Imperial Gallons; Cubic Feet; Kilo Cubic Feet; Standard Barrel; Oil Barrel; US Kilogallon; Ten Thousands of Gallons; Imperial Kilogallon; Acre Feet; Megagallon; Imperial Megagallon; Hundred Cubic Feet, Megaliters

STANDARDS:

- Die Cast Aluminum Converter: IP67
- Panel Mount Converter: IP65

CERTIFICATIONS:

- Safety: Listed by CSA to 61010-1:
- Certified by CSA to UL 61010-1 and
- CSA C22.2 No. 61010-1-04 (Wall Mount Only)
- CE: Compliant (Converter Only)

ELECTRICAL CONNECTORS:

Converter: Compression gland seals for 0.125" to 0.375" Diameter round cable.

GALVANIC ISOLATION:

All inputs / outputs are galvanically isolated from power supply up to 500V

CONVERTER ENCLOSURE:

- IP67 Die Cast Aluminum (Panel Mount is IP65)
- 5.76" H x 5.76" W x 6.73" D
- (14.6 cm. H x 14.6 cm. W x 17 cm D)

ENVIRONMENTAL:

- Pressure / Temperature Limits:
- Electronics: Operating and storage temperature:
- -4˚ to 140˚ F (-20˚ to 60˚ C)
- Sensor is continuously submersible (IP68), with a standard quick-connect cable to 6 ft., and optional strain relief at 30 ft.

KEYPAD AND DISPLAY:

Can be used to access and change set-up parameters using three membrane keys and an LCD display

M-SERIES OPTIONS FORWARD AND BIDIRECTIONAL:

RS485 Modbus Protocol

1: Available with Single 4-20mA only. Forward flow only.
2: Available with Single or Dual 4-20mA.

Note regarding cable length: McCrometer recommends minimizing cable length. Electromagnetic flow meters may have unfavorable signal strength to noise ratio in electrically noisy environments. Longer lengths of cable increase the likelihood of interferance. In those cases where the meter's signal must be transmitted a long distance, or where the environment may be particularly noisy, we suggest using the converter's analog output(s). That allows locating the converter as close as possible to the metering location.

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10.0 RETURNING A UNIT FOR REPAIR

If the unit needs to be returned to the factory for repair, please do the following:

- Prior to calling for a return authorization number, determine the model number, serial number (located inside the front panel of converter), and reason for return.
- Call the McCrometer Customer Service Department at 1-800-220-2279 and ask for a Return Authorization (RA) number.
- Ship the meter in the original packaging, if possible. Do not ship manuals, power cords, or other parts with your unit unless required for repair.
- Please make sure the meter is clean and free from foreign debris prior to shipping.
- Write the RA number on the outside of the shipping box. All return shipments should be insured.
- Address all shipments to:

  McCrometer, Inc.
  RMA #
  3255 W. Stetson Avenue
  Hemet, CA 92545

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11.0 TROUBLESHOOTING GUIDE

Problem	Troubleshooting Steps
Not getting expected 4-20mA output	• Ensure the wiring is firmly connected on the 4-20mA output terminals • Verify resistor removed from terminal block • Verify the FS1 setting in the Quick Start menu is set to the correct value, matches PLC/SCADA value • Measure output on the 4-20mA terminals and compare it to the calculated current value
Curr. Loop Open Alarm	• Ensure the wiring is firmly connected on the 4-20mA output terminals • If the 4-20mA output is not being used, ensure the 4-20mA terminals have a load resistor installed • Remove the wires from the 4-20mA terminals and measure the current output direct
Excitation Fail (0800) Alarm	• Ensure the wiring is firmly connected • Disconnect the coil wires from the converter and check their resistance with a standard multi-meter. Contact the factory for the proper value for the sensor. • Ensure the wiring is firmly connected to any PreAmp being used.

Noisy Input Alarm	• Verify there is a jumper on correct terminals:
	  • 15 - 18 for Ultra Mag, FPI Mag 395L, and SPI Mag
	  • 18 - 19 for FPI Mag 394L
	• Verify the converter ground is to earth ground
	• Check for damaged cable between the sensor and converter

Empty Pipe Alarm	• Increase threshold to 250.
	• Confirm the pipe is full. If pipe is always full, turn off EP Detect
	• Verify there is a jumper on correct terminals:
	  • 15 - 18 for Ultra Mag, FPI Mag 395L, and SPI Mag
	  • 18 - 19 for FPI Mag 394L
	• Check that sensor is properly grounded
	• Conduct a bucket test to confirm the EP Threshold value is set correctly. Consult the factory for assistance.
	• Check for damaged cable between the sensor and converter

Unstable Flow Readings	• Check installation straight run requirements are men • Check grounding connections • Check power circuit. What other devices are on the circruit • Install dedicated ground circuit
Menu Not Accessible	• Confirm the password being used is 000002 • Verify dip switches in the back panel next to the terminals 1 and 2 are both down.
Rate Of Flow Report Is Not As Expected	• Confirm the unit is programmed correctly by requesting a program setting report from the factory.

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APPENDIX 1.0 UNITS OF MEASURE

The tables below show the units of measure available for selection.

U.S. Standard	
in3	Cubic Inches
Gal	U.S. Gallons
IGL	Imperial Gallons
ft3	Cubic Feet
kf3	Thousands of Cubic Feet
bbl	Standard Barrels
BBL	Oil Barrels
KGL	Kilo Gallons
ttG	Ten Thousands of Gallons
IKG	Imperial Kilo Gallons
kf3	Kilo Cubic Feet
Aft	Acre Feet
MGL	Mega Gallons
IMG	Imperial Mega Gallons

Metric	
ml	Milliliters
cm3	Cubic Centimeters
l	Liters
dm3	Cubic Decimeter
dal	Decaliter
hl	Hectoliter
m3	Cubic Meter
ML	Megaliter

Time	
s	Seconds
m	Minutes
h	Hours
d	Days

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APPENDIX 2.0 CONVERSION TABLES

Table of Decimal Equivalents

Fraction	Decimal
1/8	.125
1/4	.25
3/8	.375
1/2	.5
5/8	.625
3/4	.75
7/8	.875

Table of Conversions

Multiply	By	To Get
Centimeters	0.3937	Inches
Centimeters	0.03281	Feet
Inches	25.4	Millimeters
Feet	30.48	Centimeters
Square Feet	144.0	Square Inches
Square Inches	0.006944	Square Feet
Cubic Inches	0.0005787	Cubic Feet
Cubic Feet	7.481	Gallons
Cubic Feet	1728.0	Cubic Inches
Cubic Feet	0.02832	Cubic Meters
Cubic Feet	28.32	Liters
Cubic Meters	35.31	Cubic Feet
Cubic Meters	264.2	Gallons
US Gallons	3.785	Liters
US Gallons	0.1337	Cubic Feet
US Gallons	0.003785	Cubic Meters
US Gallons	.8326748	Imperial Gallons
Liters	0.2642	Gallons
˚F = (˚C x 9/5) + 32	˚C (˚F - 32) x 5/9	

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Buyer shall report any claimed defect in writing to McCrometer immediately upon discovery and in any event, within the warranty period. McCrometer shall, at its sole option, repair the equipment or furnish replacement equipment or parts thereof, at the original delivery point.

McCrometer shall not be liable for costs of removal, reinstallation, or gaining access. If Buyer or others repair, replace, or adjust equipment or parts without McCrometer prior written approval, McCrometer is relieved of any further obligation to Buyer under this Article with respect to such equipment.

No equipment furnished by McCrometer shall be deemed to be defective by reason of normal wear and tear, failure to resist erosive or corrosive action of any fluid or gas (unless otherwise specified in Quotations/ Purchase Order Specifications), Buyer's direct or indirect failure (or the failure of its agents or contractors) to properly store, install, operate, or maintain the equipment in accordance with good industry practices or specific recommendations of McCrometer, or Buyer's failure to provide complete and accurate information to McCrometer concerning the operational application of the equipment.

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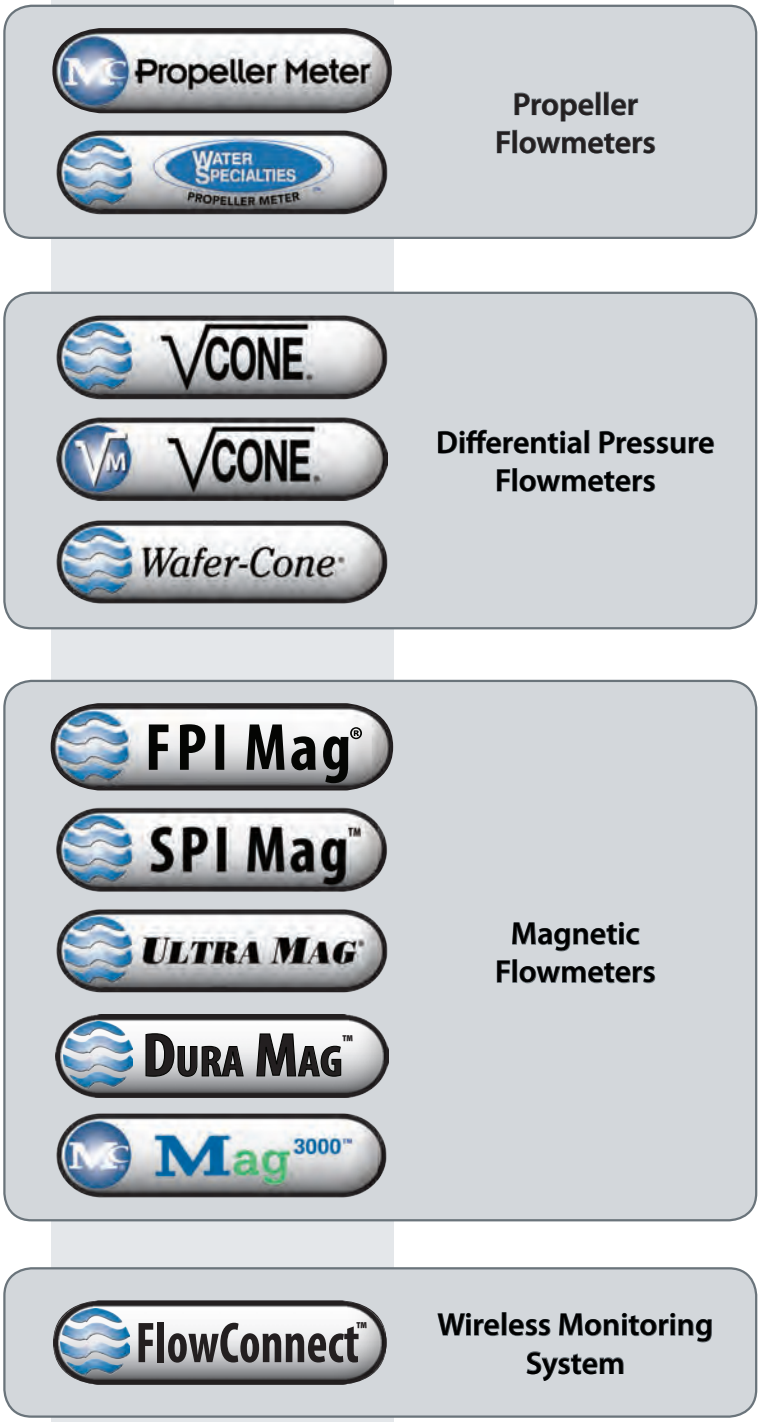

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McCROMETER

FPI Mag®

CONFIGURATION SHEET

Model 394L Bidirectional and 395L Forward Flow with Converter

FPI Mag® Sensor

Converter

The FPI Mag® (Full Profile Insertion) Electromagnetic Flow Meter is the only hot tap full profile insertion flow meter available on the market. The FPI Mag installs without service interruption making it ideal for retrofits, upgrades and maintenance projects and sites never metered before. The hot tap installation significantly reduces installation time eliminating the need to de-water lines or cut pipe.

The multi-electrode sensor delivers an accurate measurement of the full pipe profile rivaling the performance of a full-bore mag meter. The repeatable, stable measurement across the entire flow profile compensates for variable flow profiles, including swirl and turbulent conditions.

The FPI Mag is the industry's most economical flow metering solution offering unbeatable value in the cost of installation and ownership reducing installed costs by more than 45 percent in medium and large line sizes. The compact insertion design fits in confined spaces and offers complete accessibility. The flow meter can be removed in pipes under pressure for easy inspection, cleaning, calibrating, or verification. Installation costs are reduced by eliminating the need for heavy equipment and extensive manpower.

The innovative flow meter comes pre-calibrated from McCrometer's NIST traceable Calibration Lab and requires no recalibration in the field. With no moving parts and a single-piece design, the FPI Mag's sensor contains nothing to wear or break and is generally immune to clogging by sand, grit, or other debris. The electrodes are encased in a heavy-duty 316 stainless steel sensor body for maximum structural integrity and coated with a NSF certified 3M™ fusion-bonded epoxy coating for operational longevity.

MUNICIPAL WATER AND WASTEWATER

The FPI Mag Full Profile Insertion mag meter supports the following water and wastewater treatment applications:

Water

- Distribution
- Effluent
- Pumping Stations
- UV Dosing
- Filter Balancing and Backwash
- Wells & Booster Stations

Wastewater

- Effluent
- Recycle/Reclaim

The FPI Mag is ideal for chilled water in campus style facilities, hospitals, airports, hotels, casinos, etc.

INDUSTRIAL FACILITIES

The FPI Mag is also suitable for a variety of industrial facilities: power plants (including cogeneration), paper mills, chemical & petrochemical plants, metals & mining, and food & beverage.

Applications Include

- Cooling Water
- Fire Water
- Feed Water
- Raw Water
- Inlet to Surge Basin
- Effluent Wastewater

Benefits:

- **Hot Tap Installation** - No service interruption
- **Accurate** – Measures the full flow profile
- **Lower Cost** – Installed savings more than 45%
- **Robust** – No moving parts to wear or break
- **Versatile** – Great for plant maintenance, up grades and retrofits
- **Accessible** – Insertion design provides easy access
- **Virtually No Maintenance** – No field calibration required

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TEL: 951-652-6811 • 800-220-2279 • FAX: 951-652-3078 Printed In The U.S.A. Lit. # 30121-75 Rev. 1.4 / 09-16

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McCROMETER

FPI Mag®

CONFIGURATION SHEET

Model 394L Bidirectional and 395L Forward Flow with Converter

DESCRIPTION
The full pipe averaging flow meter comes complete with Mounting Hardware, AC Converter with Single or Dual 4-20mA output, 20 Feet of Dual Submersible Cables with quick connects at sensor, Stainless Steel Body, 316 Stainless Steel Electrodes, NSF Approved Fusion Bonded Epoxy Coating, 2" Stainless Steel Ball Valve (minimum of 1-7/8" port I.D.), 2" x Close Stainless Steel Nipple, 2-Year Warranty.

MEASUREMENT
Volumetric flow in filled flow conduits 4" (100 mm) to 138" (3,500 mm) utilizing insertable electromagnetic averaging sensor. Flow indication in English Standard or Metric units.

FLOW MEASUREMENT
Method: Electromagnetic
Calibrated Accuracy for Forward and Bidirectional Sensors:
± 0.5% from 1 f/s to max velocity (on next page)
± 1% for battery powered converter
Linearity: 0.3% of Range
Repeatability: 0.2% of Reading
395L sensor: forward flow measurement and reverse flow indication.
394L sensor: bidirectional flow measurement.

POWER SOURCE
AC: 90-265 VAC / 45-66 Hz (20 W/25 VA)
DC: 10-35 VDC (21 W)
Battery: Estimated five year life span. *
Solar panel option available.
AC, DC, or battery must be specified at time of ordering.

* Battery life dependent on application. Estimated life based on factory standard settings.

MATERIALS
Fusion bonded epoxy (NSF 61 approved) coated 316 stainless steel
Insertion Hardware: 316 Stainless Steel
Compression Seal: Silicone Rubber
Sensor Electrodes: 316 Stainless Steel

STANDARD OUTPUTS:
Single[1] *or Dual*[2] 4-20mA Outputs: Galvanically isolated and fully programmable for zero and full scale (0-21mA rangability)

Two[1] or *Four*[2] separate digital programmable outputs: open collector transistor usable for pulse, frequency, or alarm settings.

- Volumetric Pulse
- Flow Rate (Frequency)
- Hardware Alarm
- High/Low Flow Alarms
- Empty Pipe
- Directional Indication
- Range Indication

Maximum switching voltage: 40 VDC
Maximum switching current: 100mA
Maximum switching frequency: 1250 Hz
Insulation from other secondary circuits: 500V

OPTIONAL OUTPUTS:
- Profibus[1]
- HART[1]
- Modbus[2]
- Smart Output™ (Sensus or Itron)

[1] Available with *Single* 4-20mA only. Forward flow only.
[2] Available with *Single or Dual* 4-20mA.
Not available with battery powered

ISOLATION
All inputs / outputs are galvanically isolated from power supply up to 500 V

ENGINEERING UNITS
Cubic Meter; Cubic Centimeter; Milliliter; Liter; Cubic Decimeter; Decaliter; Hectoliter; Cubic Inches; US Gallons; Imperial Gallons; Cubic Feet; Kilo Cubic Feet; Standard Barrel; Oil Barrel; US Kilogallon; Ten Thousands of Gallons; Imperial Kilogallon; Acre Feet; Megagallon; Imperial Megagallon; Hundred Cubic Feet, Megaliters

CONDUCTIVITY
Minimum conductivity of 5µS/cm

CONVERTER ENCLOSURE
IP67 Die Cast Aluminum
5.75" H x 5.75" W x 6.69" D (14.6 cm H x 14.6 cm W x 17 cm D)

ELECTRICAL CONNECTIONS
Sensor: Quick-Connect (IP68)
Converter: Compression gland seals for 0.125" to 0.375" diameter round cable.

RATINGS
IP68 Submersible Sensor (details below)
IP67 Die Cast Aluminum Converter

CERTIFICATIONS AND APPROVALS
Safety: Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 and CSA C22.2 No.61010-1-04 *
ISO 9001:2008 certified quality management system
CE: Certified (Converter Only)
* Panel Mount and Battery Converter is not CSA approved

ENVIRONMENTAL
Sensor: Flow temperate range 14° to 140° F (-10° to 77° C) up to 250 PSI
Sensor is continuously submersible (IP68), with a standard quick-connect cable to 6 ft., and optional strain relief at 30 ft.
Electronics: Operating and storage temperature:
-4° to 140° F (-20° to 60° C)

SYSTEM OPTIONS FORWARD AND BIDIRECTIONAL
- Hastelloy® Electrodes
- DC Power
- Sun Shield
- Extended Warranties
- Extension to hardware clearance
- Sensor Insertion Tool
- Additional sensor cable (forward flow 500' max, bidirectional flow 200' max, battery powered 50' max)
- Annual Verification / Calibration
- Stainless Steel ID Tag

KEYPAD AND DISPLAY
Can be used to access and change set-up parameters using three membrane keys and an LCD display

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McCROMETER

FPI Mag®

CONFIGURATION SHEET

Model 394L Bidirectional and 395L Forward Flow
with Converter

Pipe Size (Nominal)	Pipe ID Range		Flow Ranges (GPM Standard)		Standard Program Defaults[1]	Minimum Clearance Required During Installation[2]	Velocity Range[3] (f/s)
	Min Pipe ID	Max Pipe ID	Min (GPM)[1]	Max (GPM)[1]	20mA		
S = Standard (Available in Pipe Sizes 4" - 24" as shown in table below) / **C** = Custom (Available in Pipe Sizes 4" - 138") Standard Length Hardware and Installation Clearance Dimensions are based on a 4" Maximum Height Coupling and Pipe Schedule Standard							
4"	3.63	4.99	12	1280	600 GPM	51"	0.3 - 32
6"	5.00	6.99	26	2800	1300 GPM	51"	0.3 - 32
8"	7.00	8.99	47	5000	2350 GPM	55"	0.3 - 32
10"	9.00	10.99	80	8000	4000 GPM	55"	0.3 - 32
12"	11.00	12.99	110	11000	5500 GPM	59"	0.3 - 32
14"	13.00	14.99	150	15000	7500 GPM	59"	0.3 - 32
16"	15.00	16.75	190	20000	9500 GPM	59"	0.3 - 32
18"	16.76	18.80	240	26000	12000 GPM	63"	0.3 - 32
20"	18.81	20.99	300	28000	15000 GPM	63"	0.3 - 28
22"	21.00	22.49	400	30000	20000 GPM	67"	0.3 - 25
24"	22.50	25.99	410	33000	20500 GPM	67"	0.3 - 23
30"	26.00	31.99	600	44000	30000 GPM	71.25"	0.3 - 20
36"	32.00	37.99	1000	48000	50 KGPM	77.25"	0.3 - 15
42"	38.00	43.99	1300	56000	65 KGPM	83.25"	0.3 - 13
48"	44.00	49.99	1700	62000	85 KGPM	89.25"	0.3 - 11
54"	50.00	55.99	2200	79000	110 KGPM	95.25"	0.3 - 11
60"	56.00	61.99	2600	97000	130 KGPM	101.25"	0.3 - 11
66"	62.00	67.99	3200	106000	160 KGPM	107.25"	0.3 - 10
72"	68.00	73.99	3800	127000	190 KGPM	113.25"	0.3 - 10
78"-138"	74.00	138.00	Available - Call Factory at 1-800-220-2279				

[1] Default totalizer units measured as KGAL.

[2] Hardware clearance after installation for all sizes is 28".

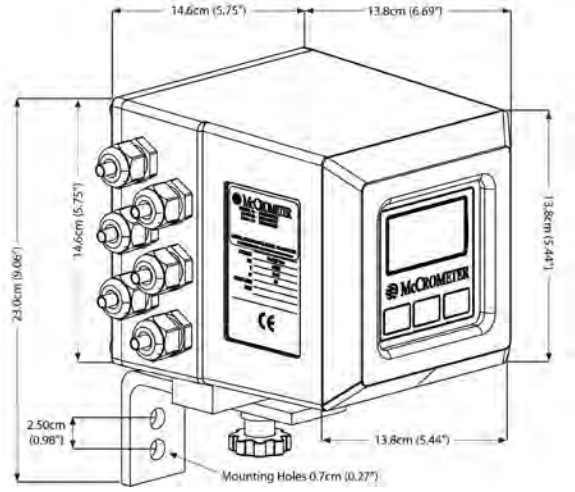
[3] Temperature range is 14° - 170° F, max pressure is 250 psi.

! Required Information

At the time of ordering, please be prepared to provide the following information:

1. Pipe ID and Pipe OD
2. Unit of Measure (US Gallons is Default)
3. Maximum pressure
4. FPI Specification Data Sheet for custom length sensors

Consult factory if any chemicals are in use.



Converter Dimensions

Panel Mount Converter Also Available

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McCROMETER

SPI Mag™

Single Profile Insertion Flow Meter

Ideal for Clean or Dirty Water Flow Measurement

Highly Cost-Effective Flow Solution

SPI Mag™

SPI Mag™

Key SPI Mag Specs in Brief *

The SPI Mag Insertion Flow Meter provides a highly cost-effective solution for the accurate measurement of liquid flow in closed conduit, pressurized pipe applications. The SPI measures forward flow only and is suitable for line sizes from 2 to 96 inches. The SPI can be easily re-located to various line sizes.

- **Proven electromagnetic technology based on Faraday's Law**
- **Debris shedding, self-cleaning sensor eliminates costly maintenance**
- **Cost is independent of line size**
- **Easy Hot Tap Installation - no interruption of flow process**

The SPI Mag is suitable for municipal water and wastewater applications including:

- **Wastewater:** Effluent, Waste Activated Sludge (WAS), Return Activated Sludge (RAS), Reclaim / Recycle
- **Clean Water:** Raw Water Intake, Clear Wells

The SPI Mag also reliably measures flow in many types of industrial flow processes involving conductive fluids such as potable water, slurries, sludge, cooling water, and pulp stock.

M-SERIES CONVERTER

The SPI Mag utilizes our pre-programmed M-Series Converter*:

- Curve-fitting algorithm to improve accuracy
- Dual 4-20 mA analog outputs
- RS485 port for easy connection to DCS
- 8 line graphical LCD display
- 3 key touch programming
- Rugged enclosure meets IP67

**See data sheet for complete specs and order information*

The SPI Mag is available with the following specs:

- **Range:** Nominal pipe size availability
- **Accuracy:** ±2% of reading ± 0.03 ft/s (± 0.009 m/s) zero stability from 0.3 to 32 ft/s velocity range (0.09 to 10m/s)
- **Pipe Sizes:** 2 - 96 inches (50 mm - 2,400 mm)
- Reverse flow indication

** See data sheet for complete specs and order information*

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3255 West Stetson Avenue, Hemet, CA 92545 USA
Phone 800 220-2279 | 951 652-6811 | Fax 951 652-3078

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City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

Benton Harbor Water Plant and Utility Services Departments

Date: May 19, 2020

To: Ernie Sarikipato, Michael Bolf, Brandon Onan, Eric Oswald, and Brian Thurston

From: Mike O'Malley, Water Superintendent

CC: Ellis Mitchell, City Manager

RE: MI 0600 Benton Harbor ACO Corrosion Control Treatment Response

DWEHD Order No. AACO-399-07-2019

2.6 Submit a proposal for optimal corrosion control treatment or a corrosion control study to the DWMAD, no later than April 31, 2019.

This project was completed by March 21, 2019 when corrosion protection treatment began.

City of Benton Harbor First Amended Administrative Consent Order AACO-399-07-2019

2.18 **Not later than September 30, 2020**, the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

I have done a great deal of investigation regarding Lead in the Benton Harbor Water System. I have also sought out firms that may be able to provide a Corrosion Control Study.

During my investigation, I did a thorough comparison to lead and copper test results dating back to 2018 and into all of 2019. That comparison yielded a much better picture of Orthopolyphosphate treatment with Carus 8600 treatment that has been applied to the Benton Harbor Community water supply since March 26, 2019.

The comparison showed:

- The June 2019 1st draw results showed a reduction of Lead results compared to the massive 2018 pool of 13 out of 16 locations where the lead level dropped; an 81% reduction.
- The June 2019 5th draw results compared to the 2018 pool even better; 14 out of 16 locations dropped; an 87.5% reduction.
- The December 2019 1st draw & 5th draw were reduced 85% & 100% respectively.
- The overall table showed an 83% decrease in lead values.

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

The results of this comparison are far more impressive that the former comparison offered by EGLE in its February 2020 order to change treatment chemical and increase the dose. There was not enough time available from December 2019 monitoring period and the letter sent in February 2020 to analyze all the available data. That decision was made by EGLE by only comparing the June & December data, which had significantly less available data points to compare.

A copy of the comparison is attached in a separate form as part of this scan.

This revised comparison paints a bit more of the apparent effectiveness of Carus 8600 Orthopolyphosphate in reducing lead results in homes in Benton Harbor. The Corrosion Specialist during this entire time was Elhorn Engineering, led by Todd Lucks, Vice President of Elhorn. The former representative Mike Enlow has since retired and Elhorn Engineering went through a bit of an organizational change.

When the change from EGLE letter in February 2020 where the City was demanded to alter its treatment to a more aggressive Orthopolyphosphate and a doubling of the dose for treatment, Todd Lucks came nearly immediately to the water plant to assist us in the change out. At that time he also changed out the coupon rack with new and sent the coupons for analysis.

EGLE agreed to a phone conference with a different Corrosion Control Specialist Dr. David Cronwell, because I was very worried about this change in treatment with little supporting documentation. Dr. Cronwell eased My fears by saying there is no health effects to worry about with the new corrosion treatment.

After all of my efforts, I believe that we the skill and integrity to provide the City of Benton Harbor with a good corrosion protection plan going forward. And sought and received a quotation for a corrosion treatment study. I also believe that the Carus Corporation's corrosion protection products have performed well in Benton Harbor and understand that the Carus distribution system is solely to Elhorn Engineering. And further more Carus provides outstanding support to Elhorn Engineering and the City of Benton Harbor.

I am certain that the ACO regarding a Corrosion Study be accepted by the City and given to the State EGLE as the City's response. It will take nearly a month to iron out all the details. So the target date should be June 30 2020.

City Manager, Ellis Mitchell has already approved the Purchase Order for Elhorn Engineering.

Sincerely

Mike O'Malley _____ Date: 5/29/20

Benton Harbor Water Operator IN Charge

BENTON·HARBOR
PORT·OF·OPPORTUNITIES

City of Benton Harbor
200 East Wall Street
Benton Harbor, Michigan 49022

2.18 **Not later than September 30, 2020,** the City shall have a qualified third-party consultant submit to EGLE, for review and approval, a corrosion control study proposal, in accordance with the February 13, 2020, letter EGLE issued to the City.

The City of Benton Harbor intends to hire Elhorn Engineering to initiate another corrosion control study. The proposal is attached and needs to go through the typical Accounts Payable system here in Benton Harbor. We expect the project will start well before the September 30, 2020

ELHORN COMPANY
Consultants & Operations
Water Treatment Specialists

City of Benton Harbor Water Treatment Plant
200 East Wall Street
Benton Harbor, MI 49022
Mr. Mike O'Malley

RE: Corrosion Study

Mr. O'Malley,

This letter is concerning the cost to implement a critical corrosion control study for the City of Benton Harbor Water Treatment Plant. A complete detailed outline will be presented in the near future; however, the scope of the project will be focused on long term corrosion control treatment. We have harvested lead & galvanized service line materials from the City of Benton Harbor Water distribution system to be used to create testing loops. These loops will be installed at the City of Benton Harbor Water Treatment Plant for the purpose of determining optimum corrosion control in accordance with EPA optimum corrosion control guidance manual.

The cost to make the test loops, install the test loops, startup, instruction on operation & development of sample frequency will be exactly $1600.00 to the City of Benton Harbor. In a effort to keep cost at a minimum for the City of Benton Harbor this study will be jointly accomplished by Elhorn Company and Carus Corporation to provide all products to be tested, complete water analysis & lab services, the City of Benton Harbor to provide the source water, daily supervision, daily testing and sample collection according to the developed schedule.

Elhorn Company looks forward to being of service to the City of Benton Harbor and continue to provide over 40 years of experience in the municipal water treatment business!

Thank You,

Todd E. Luks
President

Office & Plant Location 889 Eden Road Mason, MI 48854
517-676-3786 phone 517-676-3788 fax

Lab Code	Lead 1st Draw	June 2019 lead 1st draw	Diff 18 to 0619	June 2019 lead 5th draw	Diff 18 to 0619	Dec 2019 Lead Result 1st Draw	dif 18 1219	dif 0619 to 1219	Dec 2019 Lead Result 5th Draw	dif 18 1219	dif 0619 to 1219
BHFree 67	34.0	14.00	20.00	12.00	22.00	9.2	24.8	4.80	6.3	27.7	5.70
BHFEA 45	56.0	35.00	21.00	22.00	34.00	25	31.0	10.00	18	38.0	4.00
BHEAM 138	62	22.00	40.00	24.00	38.00	23	39.0	-1.00	9.4	52.6	14.60
BHM1	5.8	3.00	2.80	2.00	3.80	4.4	1.4	-1.40	3.9	1.9	-1.90
BHFree 33	18.0	4.00	14.00	2.00	16.00						
BHFEA 52	21.0	14.00	7.00	18.00	3.00	0	21.0	14.00	0	21.0	18.00
BHFEA 12	30.0					33	-3.0		21	9.0	-21.00
BHFree 93	5.0	29.00	-24.00	59.00	-54.00						
BHFEA 23	12.0					4	8.0		3	9.0	-3.00
BHFEA 18	16.0	21.00	-5.00	13.00	3.00	10	6.0	11.00	12	4.0	1.00
BHFree 20	41.0	15.00	26.00	6.00	35.00						
BH33	4.4	1.00	3.40	1.00	3.40						
BH8	4.4	13.00	-8.60	5.00	-0.60						
BHFEA 7	27.0	23.00	4.00	8.00	19.00	19	39.0		40	18.0	
BHFEA 20	55.0	0.00	55.00	0.00	55.00	10	17.0	13.00	7.8	19.2	0.20
BHFree 22	17.0	12.00	5.00	12.00	5.00						
BHFree 86	5.0										
BH48	33	12.00	21.00	17.00	16.00	9.3	-4.3		1.8	3.2	
aBH14	5.5	2.00	3.50	3.00	2.50	8.6	24.4	3.40	5.3	27.7	11.70
						2	3.5	0.00	5	0.5	-2.00

Counts	2018 samples	June 19 samples 1st Draw	June 19 5th draw	Dec 19 1st Draw	Dec 19 5th Draw
	20	16	16	13	9 13 11

	June 2019 1st draw	June 2019 5th draw	December 2019 1st draw	December 2019 5th Draw
Reduction in 1st drawlead compared to 2018	13	14	11	13
Increase in 1st draw Lead compared to 2018	3	2	2	0
Percentage samples decrease	81.25%	87.50%		
Percentage samples increase	18.75%	12.50%		
difference 0619 to 1219 reduction			7	7
difference 0619 to 1219 increase			2	4
Percentage samples decrease				63.64%
Percentage samples increase				36.36%
Percentage Decrease to all periods	83.33%			
Percentage increase to all periods	16.67%			

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** Month/Year **July-19**

F1-S1 **F1-S2**

Water Plant Classification

Berrien
County

Signature of Operator-in-Charge

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.5398	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	257.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.14	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.45	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.69%	Percent of Treated Water

Chemical Data

Chlorine on hand:	38885	lb.	Est. supply:	131	days
Primary Coagulant (Alum (Al3+)) on hand:	42495	lb.	Est. supply:	114	days
Cost of All Chemicals per Million Gallons:	$67.57	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	32.3742	Avg	1.0785645	Max	1.2337	Min	0.9288

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **July-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.55	0.30	0.72		0	0.00	244	3.49	57	0.81	301	4.23	2.45	1.59	1.78
2	0.39	0.29	0.75		0	0.00	247	3.38	30	0.41	277	3.51	1.76	1.57	1.75
3	0.55	0.30	0.80		0	0.00	248	3.38	30	0.41	278	4.09	2.28	1.63	1.81
4	0.56	0.37	0.82		0	0.00	243	3.34	54	0.74	297	4.35	1.09	3.05	3.26
5	0.00	0.34	0.69		0	0.00	229	3.29	27	0.39	256	3.94	2.11	1.63	1.83
6	0.00	0.30	0.70		0	0.00	222	3.40	19	0.29	241	3.27	1.55	1.52	1.72
7	0.00	0.49	0.60		0	0.00	241	3.27	14	0.19	255	3.92	2.31	1.43	1.61
8	0.00	0.34	0.53		0	0.00	252	3.29	19	0.25	271	3.39	1.66	1.57	1.73
9	0.00	0.41	0.52		0	0.00	254	3.33	19	0.25	273	4.15	2.47	1.51	1.68
10	0.00	0.26	0.37		0	0.00	237	3.30	40	0.56	277	3.70	2.04	1.47	1.66
11	0.40	0.28	0.39	0.71	0	0.00	245	3.37	21	0.29	266	3.28	1.75	1.36	1.53
12	0.51	0.30	0.58		0	0.00	290	3.81	32	0.42	322	4.87	3.02	1.69	1.85
13	0.58	0.24	0.66		0	0.00	248	3.36	51	0.69	299	4.14	1.28	2.65	2.86
14	0.32	0.24	0.74		0	0.00	249	3.50	30	0.42	279	3.99	2.31	1.51	1.68
15	0.20	0.32	0.74		0	0.00	266	3.59	24	0.32	290	4.39	2.95	1.32	1.44
16	0.17	0.44	0.63		0	0.00	288	3.73	22	0.28	310	4.48	3.13	1.25	1.35
17	0.54	0.52	0.57	0.61	0	0.00	312	3.94	33	0.42	345	4.17	2.75	1.30	1.42
18	0.47	0.51	0.66		0	0.00	323	4.10	38	0.48	361	4.90	3.36	1.41	1.54
19	0.00	0.23	0.73		0	0.00	342	4.01	35	0.41	377	4.71	3.16	1.38	1.55
20	0.42	0.25	0.69		0	0.00	357	4.56	62	0.79	419	5.55	3.95	1.42	1.60
21	0.00	0.30	0.82		0	0.00	282	3.98	84	1.19	366	4.67	3.15	1.35	1.52
22	0.51	0.31	0.69		0	0.00	314	4.19	108	1.44	422	5.58	3.77	1.63	1.81
23	0.00	0.39	0.73		0	0.00	361	4.42	87	1.07	448	6.35	3.99	2.16	2.36
24	0.52	0.34	0.77	0.72	0	0.00	323	4.34	81	1.09	404	5.90	3.45	2.19	2.45
25	0.00	0.27	0.76		0	0.00	338	4.34	82	1.05	420	5.32	2.60	2.51	2.72
26	0.52	0.33	0.81		0	0.00	350	4.31	49	0.60	399	5.80	3.81	1.80	1.99
27	0.49	0.29	0.71		0	0.00	326	4.32	56	0.74	382	5.59	2.98	2.37	2.61
28	0.51	0.24	0.63		0	0.00	332	4.29	0	0.00	332	5.34	3.68	1.49	1.66
29	0.48	0.26	0.62		0	0.00	337	3.27	35	0.34	372	5.12	3.56	1.39	1.56
30	0.47	0.26	0.55		0	0.00	415	4.96	31	0.37	446	5.71	4.18	1.36	1.53
31	0.37	0.29	0.59		0	0.00	336	4.72	21	0.30	357	5.03	3.42	1.43	1.61
Tot.							8,807		1,234		10,342				
Avg.	0.31	0.32	0.67	0.68	0.00	0.00	290.50	3.79	42.33	0.56	332.83	4.61	2.75	1.68	1.86
Max	0.58	0.52	0.82	0.72	0.00	0.00	415.00	4.96	108.00	1.44	448.00	6.35	4.18	3.05	3.26
Min.	0.00	0.23	0.37	0.61	0.00	0.00	222.00	3.27	0.00	0.00	241.00	3.27	1.09	1.25	1.35

WSSN 0600 City of Benton Harbor Month/Year July-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	1.0450	311.00	1.57	2.20	4.20	0.25	3	0.04	0.04	3	0.04	0.04	6	0	0
2	1.0900	322.00	1.55	1.90	2.30	0.19	3	0.04	0.06	3	0.03	0.04	6	0	0
3	1.0950	323.00	1.55	1.90	2.80	0.18	3	0.04	0.04	3	0.03	0.03	6	0	0
4	1.0850	320.00	1.55	2.50	4.40	0.16	3	0.02	0.02	3	0.03	0.03	6	0	0
5	1.0375	303.00	1.54	1.70	2.70	0.17	3	0.03	0.03	3	0.03	0.04	6	0	0
6	0.9750	298.00	1.64	1.20	1.20	0.13	3	0.02	0.02	3	0.03	0.03	6	0	0
7	1.1000	323.00	1.54	6.20	7.60	0.18	3	0.02	0.02	3	0.02	0.03	6	0	0
8	1.1450	337.00	1.55	2.60	3.10	0.14	3	0.02	0.02	3	0.02	0.03	6	0	0
9	1.1400	340.00	1.57	2.70	3.00	0.14	3	0.02	0.02	3	0.02	0.03	6	0	0
10	1.0725	331.00	1.62	3.50	6.40	0.18	3	0.04	0.04	3	0.03	0.03	6	0	0
11	1.0850	323.00	1.57	3.10	4.50	0.17	3	0.03	0.04	3	0.03	0.04	6	0	0
12	1.1375	373.00	1.73	2.60	3.50	0.17	3	0.03	0.04	3	0.03	0.04	6	0	0
13	1.1025	317.00	1.51	2.70	3.50	0.16	3	0.02	0.02	3	0.03	0.04	6	0	0
14	1.0625	304.00	1.51	2.20	3.40	0.17	3	0.02	0.03	3	0.02	0.03	6	0	0
15	1.1050	309.00	1.47	2.20	3.20	0.14	3	0.02	0.02	3	0.03	0.04	6	0	0
16	1.1525	344.00	1.57	1.90	2.20	0.19	3	0.03	0.03	3	0.03	0.04	6	0	0
17	1.1825	351.00	1.56	1.70	2.00	0.20	3	0.02	0.02	3	0.04	0.05	6	0	0
18	1.1750	352.00	1.58	1.40	1.80	0.17	3	0.02	0.02	3	0.03	0.03	6	0	0
19	1.2746	415.00	1.71	2.90	5.50	0.22	3	0.03	0.03	3	0.03	0.03	6	0	0
20	1.1699	416.00	1.87	5.60	7.30	0.22	3	0.03	0.03	3	0.03	0.03	6	0	0
21	1.0575	291.00	1.45	1.50	2.00	0.18	3	0.03	0.04	3	0.03	0.04	6	0	0
22	1.1200	308.00	1.45	2.60	3.20	0.17	3	0.02	0.02	3	0.03	0.05	6	0	0
23	1.2182	440.00	1.90	6.30	7.50	0.21	3	0.03	0.03	3	0.04	0.04	6	0	0
24	1.1100	330.00	1.56	1.60	1.70	0.13	3	0.02	0.03	3	0.03	0.03	6	0	0
25	1.1625	347.00	1.57	1.70	1.90	0.18	3	0.03	0.04	3	0.03	0.04	6	0	0
26	1.2125	361.00	1.57	1.40	1.70	0.13	3	0.03	0.06	3	0.03	0.03	6	0	0
27	1.1275	337.00	1.57	1.50	1.50	0.14	3	0.02	0.02	3	0.03	0.03	6	0	0
28	1.1550	345.00	1.57	1.50	1.60	0.14	3	0.02	0.02	3	0.03	0.03	6	0	0
29	1.5398	324.00	1.11	1.70	1.90	0.18	3	0.03	0.04	3	0.04	0.04	6	0	0
30	1.2499	431.00	1.81	5.90	9.90	0.21	3	0.05	0.07	3	0.04	0.04	6	0	0
31	1.0625	318.00	1.57	2.50	3.10	0.13	3	0.04	0.04	3	0.03	0.03	6	0	0
Total	35.2474	10544.00					93			93			186	0	0
Avg.	1.1370	340.13	1.58	2.61	3.57	0.17		0.03	0.03		0.03		Total	Total	Total
Max	1.5398	440.00	1.90	6.30	9.90	0.25		0.05	0.07		0.04	0.05	6	0	0
Min.	0.9750	291.00	1.11	1.20	1.20	0.13		0.02	0.02		0.02				

WSSN 0600 | MONTH/YEAR | July-19 | PAGE 4

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
D	pH													
A														
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	7.9	160	150	111	100	49	50	37	36	17	15		
2	8.0	8.1	152	148	108	102	44	46	40	42	13	11		
3	7.9	8.0	148	144	108	102	40	42	37	36	14	13	19.0	23.0
4	8.0	8.1	150	144	110	105	40	39	37	36	14	13		
5	8.0	8.0	154	146	109	101	45	45	36	35	16	14		
6	7.9	8.0	142	146	114	102	28	44	38	39	12	12		
7	8.1	7.9	138	136	107	104	31	32	39	41	10	8		
8	8.0	8.0	142	134	106	105	36	29	46	46	6	5	16.0	20.5
9	8.0	8.1	144	142	109	105	35	37	38	37	12	12		
10	8.0	8.1	150	144	109	103	41	41	38	38	14	12		
11	8.1	8.1	150	140	114	105	36	35	35	34	15	13		
12	8.1	8.1	150	142	109	102	41	40	37	36	14	13		
13	8.1	8.1	148	144	108	105	40	39	36	35	14	14		
14	8.1	8.1	154	142	114	102	40	40	37	35	15	13	19.5	22.5
15	8.2	8.2	144	142	105	109	39	33	37	39	13	11	18.5	21.5
16	8.3	8.2	146	136	104	104	42	32	41	38	11	10		
17	8.3	8.2	142	134	112	105	30	29	38	36	12	11		
18	8.1	8.2	134	138	113	107	21	31	42	43	7	7		
19	8.3	8.3	146	140	118	108	28	32	42	41	10	9		
20	8.1	8.0	154	152	111	111	43	41	38	37	15	15		
21	8.1	8.0	158	150	113	106	45	44	38	37	16	14	18.5	23.5
22	8.1	8.1	150	144	109	105	41	39	36	37	15	13		
23	8.0	8.1	154	146	111	105	43	41	37	36	15	14		
24	8.0	7.9	136	132	108	102	28	30	37	36	11	10	20.5	23.5
25	8.1	8.0	146	138	107	103	39	35	36	34	14	13		
26	8.1	7.8	136	130	108	102	28	28	38	41	10	7		
27	8.3	8.2	136	138	108	105	28	33	39	41	9	9		
28	8.2	8.2	138	134	112	105	26	29	39	35	10	11		
29	8.1	8.1	150	144	109	104	41	40	36	34	15	14		
30	8.2	8.2	160	146	114	101	46	45	37	35	17	15		
31	8.1	8.1	136	136	107	108	29	28	37	38	11	10		
Avg.	8.1	8.1	147.1	141.5	109.9	104.2	37.1	37.4	38.1	37.5	12.9	11.7	18.7	22.4
Max	8.3	8.3	160.0	152.0	118.0	111.0	49.0	50.0	46.0	46.0	17.0	15.0	20.5	23.5
Min.	7.9	7.8	134.0	130.0	104.0	100.0	21.0	28.0	35.0	34.0	6.0	5.0	16.0	20.5

DISTRIBUTION SYSTEM MONITORING WSSN 0600 July-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11	1.07		1.01	0.81	0.71		0.71			
12										
13										
14										
15										
16										
17	1.33		0.89	1.02	0.71		0.66			
18										
19										
20										
21										
22										
23										
24	1.04		1.05	1.00	0.58		0.94			
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	0.90	1.33	0.58
Total number of check samples	0600			
Total number of positive check samples	0600			

WSSN 0600 MONTH/YEAR July-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1			1	A	39	1	14	16.5	1.1126	51	1.80	1.23
2			1	A	54	1	15	15.5	1.2394	43	1.37	1.51
3			1	A	68	0	15	16.5	1.0664	45	1.68	1.28
4			1	A	52	1	13	16.0	1.0816	46	1.67	1.05
5			1	A	60	0	15	15.0	1.0202	42	1.64	
6			1	A	34	0	14	16.5	1.1568	39	1.34	1.11
7			1	A	31	1	12	12.0	0.9966	39	1.54	1.27
8			1	A	80	0	12	15.0	1.2567	46	1.46	0.93
9			1	A	60	0	13	14.0	1.0346	47	1.78	1.49
10			1	A	142	0	15	14.0	1.1580	48	1.64	1.26
11			1	A	44	1	18	15.0	1.2646	44	1.37	1.85
12			1	A	70	0	14	16.5	1.0404	49	1.86	1.24
13			1	A	30	0	15	15.5	1.1384	47	1.64	1.07
14			1	A	30	0	19	16.5	1.0943	56	2.03	1.12
15			1	A	20	0	16	18.0	1.0139	44	1.71	1.81
16			1	A	15	0	21	18.0	1.0866	33	1.20	1.23
17	1.22	ch	1	A	51	1	22	23.0	1.2972	35	1.07	0.39
18	1.12	ss	1	A	38	0	18	20.0	1.1643	65	2.22	1.42
19	1.10	bz	1	A	83	3	24	20.0	1.2436	52	1.64	1.83
20			1	A	24	0	21	22.0	1.1714	53	1.77	1.23
21			1	A	99	0	20	21.5	1.2308	50	1.59	1.44
22			1	A	61	0	12	21.0	1.1781	49	1.65	1.24
23			1	A	61	0	11	16.0	1.1181	20	0.71	0.61
24	1.40	ch	1	A	18	0	12	15.0	1.0750	13	0.48	1.48
25	1.22	w	1	A	66	0	13	14.0	1.2338	0	0.00	0.43
26	1.13	bs	1	A	52	0	15	14.0	1.0808	12	0.44	1.39
27	1.19	ss	1	A	29	1	19.0	15.0	1.0542	0	0.01	0.13
28	0.86	bz	1	A	43	0	9.0	12.0	0.9600	42	1.71	1.01
29			1	A	55	0	8.7	8.5	1.1489	42	1.45	
30			1	A	32	0	8.5	9.5	0.7089	45	2.53	0.88
31			1	A	159	3	19.0	21.0	1.1239	50	1.75	1.17
Totals									34.5501	1246.0		
AVG.	1.16		1	A	55	0	15	16	1.1145	40.2	1.43	1.17
Max	1.40				159	3	24	23	1.2972	65.4	2.53	1.85
Min	0.86				15	0	9	9	0.7089	0.1	0.00	0.13

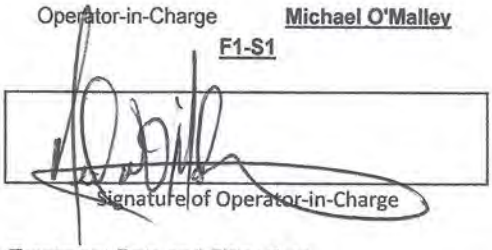
MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** Month/Year **May-19**

F1-S1 **F1-S2**



Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.115	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	182.50	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.00	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.98	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.86%	Percent of Treated Water

Chemical Data

Chlorine on hand:	31815	lb.	Est. supply:	167	days
Primary Coagulant (Alum (Al3+)) on hand:	42495	lb.	Est. supply:	102	days
Cost of All Chemicals per Million Gallons:	$66.68	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month?	NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	
Did POE disinfectant residual fall below 0.2 ppm during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	
Was minimum C*T credit achieved for the entire month?	YES
If no, indicate on a separate sheet the date(s) not achieved.	
Was continuous POE chlorine residual monitoring equipment off-line during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	

Distribution	Total	28.25652	Avg	0.9396705	Max	1.181429	Min	0.797596

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
Calculated Distribution OPP 70/30 Carus 33% feed and residuals on Bacti/OPP Page

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **May-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.57	0.42	0.73	0.73	0	0.00	228	3.22	15	0.21	243	4.15	2.15	1.80	2.00
2	0.57	0.36	0.75		0	0.00	216	3.29	40	0.61	256	4.08	1.98	1.89	2.10
3	0.56	0.41	0.73		0	0.00	214	3.47	20	0.32	234	4.09	2.07	1.79	2.02
4	0.61	0.44	0.61		0	0.00	219	3.56	17	0.28	236	4.11	2.24	1.63	1.87
5	0.56	0.41	0.69		0	0.00	208	3.57	18	0.31	226	4.19	2.24	1.69	1.95
6	0.58	0.37	0.67		0	0.00	246	3.54	18	0.26	264	3.82	2.01	1.61	1.81
7	0.55	0.40	0.68		0	0.00	234	3.48	20	0.30	254	3.90	1.82	1.87	2.08
8	0.61	0.41	0.75	0.61	0	0.00	211	3.41	29	0.47	240	3.89	2.01	1.68	1.88
9	0.57	0.23	0.54		0	0.00	208	3.34	19	0.30	227	3.34	1.31	1.82	2.03
10	0.55	0.41	0.73		0	0.00	223	3.29	39	0.58	262	3.91	1.27	2.41	2.64
11	0.71	0.43	0.71		0	0.00	208	3.13	16	0.24	224	3.45	1.66	1.58	1.79
12	0.51	0.40	0.62		0	0.00	216	3.28	16	0.24	232	3.42	1.75	1.48	1.67
13	0.44	0.27	0.65		0	0.00	213	3.33	22	0.34	235	3.73	1.77	1.74	1.96
14	0.55	0.39	0.67		0	0.00	244	3.28	94	1.26	338	4.27	1.80	2.22	2.47
15	0.57	0.36	0.74		0	0.00	240	3.28	29	0.40	269	4.22	2.17	1.88	2.05
16	0.53	0.39	0.58	0.57	0	0.00	262	3.51	48	0.64	310	4.67	1.82	2.61	2.85
17	0.57	0.37	0.72		0	0.00	270	3.67	22	0.30	292	4.42	2.50	1.73	1.92
18	0.57	0.32	0.81		0	0.00	281	3.77	23	0.31	304	5.69	3.92	1.58	1.77
19	0.70	0.35	0.86		0	0.00	239	3.76	29	0.46	268	4.30	2.31	1.81	1.99
20	0.58	0.38	0.84		0	0.00	265	3.77	49	0.70	314	5.00	2.28	2.50	2.72
21	0.49	0.42	0.84		0	0.00	246	3.80	24	0.37	270	4.35	2.08	2.06	2.27
22	0.47	0.36	0.75		0	0.00	257	3.76	31	0.45	288	4.79	2.84	1.75	1.95
23	0.52	0.25	0.78	0.72	0	0.00	240	3.52	25	0.37	265	4.63	2.73	1.70	1.90
24	0.59	0.15	0.62		0	0.00	249	3.53	46	0.65	295	4.86	2.51	2.16	2.35
25	0.70	0.27	0.82		0	0.00	228	3.43	33	0.50	261	4.38	2.10	2.06	2.28
26	0.59	0.27	0.79		0	0.00	199	3.27	17	0.28	216	3.82	2.14	1.49	1.68
27	0.75	0.30	0.84		0	0.00	221	3.36	22	0.33	243	3.76	2.17	1.41	1.59
28	0.61	0.29	0.77		0	0.00	241	3.47	30	0.43	271	4.08	2.38	1.61	1.70
29	0.55	0.28	0.73	0.79	0	0.00	240	3.51	24	0.35	264	4.04	2.28	1.60	1.76
30	0.66	0.35	0.76	0.00	0	0.00	242	3.61	27	0.40	269	4.21	2.26	1.76	1.95
31	0.52	0.04	0.81		0	0.00	237	3.62	29	0.44	266	4.10	2.07	1.85	2.03
Tot.							7,017		876		8,136				
Avg.	0.58	0.35	0.73	0.57	0.00	0.00	233.60	3.47	28.73	0.42	262.33	4.19	2.15	1.83	2.03
Max	0.75	0.44	0.86	0.79	0.00	0.00	281.00	3.80	94.00	1.26	338.00	5.69	3.92	2.61	2.85
Min.	0.44	0.15	0.54	0.00	0.00	0.00	199.00	3.13	15.00	0.21	216.00	3.34	1.27	1.41	1.59

WSSN 0600 City of Benton Harbor Month/Year May-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	1.0575	327.00	1.63	1.90	3.10	0.32	3	0.09	0.12	3	0.08	0.10	6	0	0
2	0.9800	307.00	1.65	2.90	3.30	0.34	3	0.07	0.07	3	0.07	0.08	6	0	0
3	0.9200	280.00	1.60	1.80	2.10	0.30	3	0.08	0.09	3	0.07	0.07	6	0	0
4	0.9175	281.00	1.61	1.90	3.50	0.22	3	0.07	0.07	3	0.07	0.08	6	0	0
5	0.8700	267.00	1.61	1.80	3.60	0.22	3	0.07	0.09	3	0.07	0.07	6	0	0
6	1.0375	328.00	1.35	1.30	1.50	0.30	3	0.08	0.10	3	0.08	0.09	6	0	0
7	1.0050	315.00	1.65	2.90	5.60	0.33	3	0.08	0.09	3	0.09	0.11	6	0	0
8	0.9250	293.00	1.67	1.30	1.50	0.30	3	0.09	0.11	3	0.06	0.07	6	0	0
9	0.9300	288.00	1.63	1.60	1.90	0.30	3	0.08	0.11	3	0.09	0.10	6	0	0
10	1.0125	318.00	1.65	2.20	3.90	0.31	3	0.07	0.09	3	0.09	0.11	6	0	0
11	0.9925	290.00	1.54	2.00	3.60	0.39	3	0.09	0.11	3	0.08	0.09	6	0	0
12	0.9825	309.00	1.65	1.80	3.00	0.26	3	0.07	0.09	3	0.07	0.08	6	0	0
13	0.9550	298.00	1.64	1.20	2.10	0.22	3	0.07	0.07	3	0.08	0.08	6	0	0
14	1.1100	343.00	1.63	1.10	1.40	0.24	3	0.07	0.08	3	0.07	0.08	6	0	0
15	1.0916	341.00	1.64	1.50	2.60	0.30	3	0.07	0.08	3	0.08	0.10	6	0	0
16	1.1150	409.00	1.93	2.10	2.80	0.36	3	0.08	0.08	3	0.08	0.08	6	0	0
17	1.0975	343.00	1.64	1.90	2.90	0.47	3	0.09	0.10	3	0.08	0.09	6	0	0
18	1.1118	342.00	1.62	2.20	2.40	0.35	3	0.08	0.08	3	0.08	0.08	6	0	0
19	0.9500	292.00	1.62	2.50	3.10	0.35	3	0.07	0.08	3	0.07	0.08	6	0	0
20	1.0500	330.00	1.65	2.50	3.00	0.33	3	0.07	0.09	3	0.07	0.07	6	0	0
21	0.9675	301.00	1.64	1.10	1.80	0.25	3	0.07	0.07	3	0.07	0.07	6	0	0
22	1.0200	310.00	1.60	2.30	3.50	0.27	3	0.07	0.07	3	0.08	0.09	6	0	0
23	1.0175	308.00	1.59	2.90	5.00	0.29	3	0.08	0.09	3	0.06	0.07	6	0	0
24	1.0525	320.00	1.60	2.50	2.80	0.32	3	0.08	0.09	3	0.07	0.07	6	0	0
25	0.9925	296.00	1.57	3.10	5.20	0.28	3	0.07	0.08	3	0.07	0.08	6	0	0
26	0.9075	268.00	1.57	1.80	2.50	0.24	3	0.07	0.08	3	0.06	0.07	6	0	0
27	0.9825	298.00	1.60	1.30	1.70	0.16	3	0.04	0.04	3	0.02	0.03	6	0	0
28	1.0375	312.00	1.58	1.70	2.00	0.17	3	0.03	0.05	3	0.02	0.02	6	0	0
29	1.0200	308.00	1.59	1.60	1.90	0.15	3	0.02	0.02	3	0.03	0.06	6	0	0
30	1.0000	312.00	1.64	1.10	1.20	0.15	3	0.02	0.02	3	0.02	0.03	6	0	0
31	0.9775	310.00	1.67	1.10	1.50	0.14	3	0.02	0.03	3	0.02	0.03	6	0	0
Total	31.0859	9644.00					93			93			186	0	0
Avg.	1.0028	311.10	1.62	1.90	2.77	0.28		0.07	0.08		0.07		Total	Total	Total
Max	1.1150	409.00	1.93	3.10	5.60	0.47		0.09	0.12		0.09	0.11	6	0	0
Min.	0.8700	267.00	1.35	1.10	1.20	0.14		0.02	0.02		0.02				

WSSN 0600 | MONTH/YEAR | May-19 |

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness		Total Alkalinity		Non-Carb. Hardness		Calcium		Magnesium		Chloride	
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	7.9	8.0	166	156	111	105	55	51	44	42	14	13		
2	8.0	8.0	166	156	116	104	50	52	43	41	14	13		
3	8.1	8.1	156	150	121	109	35	41	43	41	12	12		
4	8.1	8.1	164	158	104	112	60	46	45	42	13	13		
5	8.1	8.1	156	148	111	109	45	39	45	46	11	8		
6	8.2	8.0	170	164	113	101	57	63	43	41	15	15		
7	8.0	8.0	174	168	118	104	56	64	42	40	17	17		
8	8.0	7.9	164	156	110	105	54	51	42	40	15	14		
9	7.9	8.0	158	152	115	105	43	47	42	41	13	12		
10	8.0	8.0	164	152	118	108	46	44	40	39	16	13	20.5	23.5
11	7.9	8.0	166	154	118	108	48	46	42	40	16	13		
12	7.9	8.0	164	156	115	110	49	46	42	40	15	14		
13	8.1	8.0	154	152	112	109	42	43	50	47	7	8	19.5	21.5
14	8.1	8.1	158	152	112	109	46	43	42	41	13	12		
15	8.0	8.0	166	142	122	109	44	33	51	43	9	8		
16	8.0	8.0	170	158	121	111	49	47	42	40	16	14		
17	8.0	8.1	182	162	134	113	48	49	45	40	17	15		
18	8.0	8.0	160	156	119	120	41	36	46	46	11	10		
19	8.1	7.9	162	160	124	122	38	38	46	44	11	12		
20	8.2	8.1	178	170	125	116	53	54	43	42	17	16		
21	8.0	7.8	162	154	122	119	40	35	47	46	11	9	20.5	22.5
22	8.0	8.0	170	162	115	114	55	48	43	41	15	15		
23	7.9	8.0	168	164	114	110	54	54	43	44	15	13		
24	8.2	8.0	174	166	117	111	57	55	43	42	16	15		
25	8.0	8.0	172	162	117	111	55	51	43	41	16	15	20.5	23.5
26	8.1	8.1	166	158	115	110	51	48	44	42	14	13		
27	8.2	8.3	158	156	122	118	36	38	45	43	11	12	20.0	22.5
28	8.2	8.2	156	158	123	116	33	42	45	45	11	11		
29	8.0	8.1	152	148	115	113	37	35	46	44	9	9		
30	8.1	8.1	158	152	116	114	42	38	42	46	13	9		
31	8.2	8.1	152	148	113	109	39	39	49	47	9	7		
Avg.	8.0	8.0	164.5	156.7	117.2	110.8	47.3	45.9	44.0	42.3	13.4	12.4	20.2	22.7
Max	8.2	8.3	182.0	170.0	134.0	122.0	60.0	64.0	51.0	47.0	17.0	17.0	20.5	23.5
Min.	7.9	7.8	152.0	142.0	104.0	101.0	33.0	33.0	40.0	39.0	7.0	8.0	19.5	21.5

WSSN 0600 MONTH/YEAR May-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	RAW		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	No. of	Colilert	No. of	Colilert			TEMP.	TEMP.				
A	Samples	P/A	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T					Raw	Tap			To	Lbs PO4	Treatment	Residual
E									Distribution		mg/L	mg/L
1			1	A	44	0	8	8.0	0.8733	39	1.77	1.80
2			1	A	19	0	8	8.0	0.9377	39	1.65	1.80
3			1	A	34	0	8	9.0	0.8540	39	1.81	1.10
4			1	A	42	1	8	9.5	1.2263	30	0.97	1.20
5			1	A	25	1	8	9.0	0.8045	38	1.86	
6			1	A	19	0	8	8.5	1.0308	35	1.33	1.14
7			1	A	63	1	8	8.0	0.9711	37	1.51	1.31
8			1	A	38	0	7	8.5	0.9200	41	1.76	1.08
9			1	A	33	1	8	8.0	1.0134	34	1.31	1.16
10			1	A	0	0	9	8.0	1.0009	44	1.76	0.82
11			1	A	46	1	8	8.5	0.9705	29	1.17	1.22
12			1	A	38	0	8	8.5	1.0114	41	1.59	1.28
13			1	A	71	0	8	9.0	0.7560	36	1.89	0.80
14			1	A	46	1	9	10.0	1.1814	37	1.25	1.00
15			1	A	58	0	9	9.0	0.8256	37	1.79	0.80
16			1	A	53	0	9	9.0	0.9910	37	1.48	1.20
17			1	A	55	0	10	8.5	0.9851	37	1.48	1.25
18			1	A	64	8	8	10.0	0.7976	35	1.74	1.18
19			1	A	45	8	12	11.0	0.9296	38	1.62	1.14
20			1	A	23	0	13	10.0	0.9375	18	0.78	0.28
21			1	A	41	1	11	12.0	0.9257	4	0.16	0.11
22			1	A	30	0	11	11.0	0.8983	9	0.41	1.43
23			1	A	59	0	11	10.5	0.8535	20	0.93	1.03
24			1	A	58	0	13	11.5	0.9068	13	0.57	1.31
25			1	A	33	0	12	11.5	0.8899	33	1.45	1.14
26			1	A	112	18	13	12.5	0.8437	32	1.48	1.12
27			1	A	78	0	13.5	14.0	0.9646	33	1.35	1.15
28			1	A	63	0	9.0	12.0	0.9910	35	1.41	1.14
29			1	A	51	0	8.7	8.5	0.9759	34	1.39	
30			1	A	24	0	8.5	9.5	0.9535	41	1.69	1.50
31			1	A	46	0	13.0	14.0	0.9690	44	1.81	1.32
Totals									29.1900	1019.1		
AVG.			1	A	46	1	9	10	0.9416	32.9	1.38	1.11
Max					112	18	14	14	1.2263	44.4	1.89	1.80
Min					0	0	7	8	0.7560	3.7	0.16	0.11

MI0600 DMR May 2019 6/7/19

MI 0600 Distribution Monitoring Report MI 0600 DMR

DISTRIBUTION SYSTEM MONITORING WSSN 0600 May-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1	1.01		1.06	0.87	1.10		0.55			
2										
3										
4										
5										
6										
7										
8	0.61		1.31	1.20	1.27		0.95			
9										
10										
11										
12										
13										
14										
15										
16	0.86		1.01	1.12	1.04		1.08			
17										
18										
19										
20										
21										
22										
23	0.96		1.02	1.18	0.77		0.63			
24										
25										
26										
27										
28										
29	0.81		0.91	1.01	0.49		0.69			
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

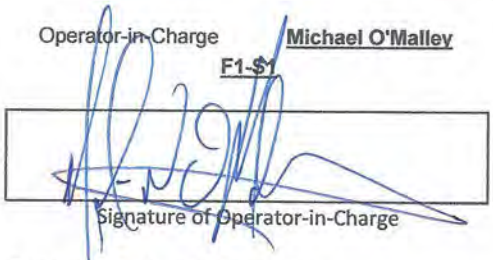
Total number of routine distribution samples analyzed	0600	25		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	0.94	1.31	0.49
Total number of check samples	0600			
Total number of positive check samples	0600			

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1



Signature of Operator-in-Charge

Month/Year **April-19** F1-S2

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.145	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	257.25	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.98	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.40	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.89%	Percent of Treated Water

Chemical Data

Chlorine on hand:	27775	lb.	Est. supply:	371 days
Primary Coagulant (Alum (Al3+)) on hand:	90947	lb.	Est. supply:	93 days
Cost of All Chemicals per Million Gallons:	$67.29	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	89	89
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	26.890474	Avg	0.9254891	Max	1.06516	Min	0.79744

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
Page 6 modified to show Calculated Distribution Flows and Corrosion Control Treatment

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **April-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.65	0.25	0.63		0	0.00	148	2.19	22	0.33	170	2.90	1.01	1.70	1.89
2	0.61	0.19	0.63		0	0.00	275	4.55	111	1.84	386	6.12	3.48	2.39	2.64
3	0.51	0.31	0.69	0.56	0	0.00	354	5.09	4	0.06	358	5.92	4.23	1.42	1.69
4	0.39	0.27	0.69		0	0.00	290	3.94	7	0.09	297	4.89	2.83	1.84	2.06
5	0.39	0.33	0.59		0	0.00	293	4.26	5	0.07	298	4.59	2.39	1.99	2.20
6	0.59	0.25	0.53		0	0.00	234	3.92	20	0.34	254	4.02	1.59	2.19	2.43
7	0.50	0.28	0.63		0	0.00	253	3.86	8	0.12	261	4.25	1.91	2.11	2.34
8	0.52	0.28	0.42		0	0.00	224	3.54	14	0.22	238	3.87	1.08	2.54	2.79
9	0.60	0.21	0.57		0	0.00	221	3.34	0	0.00	221	3.63	1.47	1.94	2.16
10	0.84	0.36	0.42	0.53	0	0.00	231	3.42	0	0.00	231	3.75	1.77	1.75	1.98
11	0.60	0.26	0.47		0	0.00	223	3.44	0	0.00	223	3.59	1.77	1.63	1.82
12	0.76	0.23	0.42		0	0.00	216	3.32	0	0.00	216	3.21	1.26	1.74	1.95
13	0.56	0.37	0.58		0	0.00	245	3.53	20	0.29	265	4.13	2.12	1.88	2.01
14	0.57	0.39	0.63		0	0.00	199	3.60	18	0.33	217	3.51	1.61	1.73	1.90
15	0.51	0.33	0.62		0	0.00	258	3.55	17	0.23	275	3.85	1.95	1.68	1.90
16	0.65	0.32	0.74		0	0.00	230	3.52	21	0.32	251	4.17	2.21	1.75	1.96
17	0.45	0.55	0.74		0	0.00	246	3.64	15	0.22	261	4.35	2.53	1.62	1.82
18	0.69	0.36	0.74	0.65	0	0.00	259	3.99	54	0.83	313	5.22	3.41	1.60	1.81
19	0.61	0.39	0.86		0	0.00	226	3.53	13	0.20	239	3.86	2.09	1.62	1.77
20	0.53	0.35	0.83		0	0.00	199	3.59	17	0.31	216	3.93	2.22	1.55	1.71
21	0.60	0.40	0.84		0	0.00	231	3.56	22	0.34	253	4.02	2.11	1.71	1.91
22	0.49	0.35	0.78		0	0.00	231	3.58	19	0.29	250	3.75	1.80	1.67	1.95
23	0.67	0.26	0.70		0	0.00	242	3.55	16	0.23	258	4.83	2.94	1.70	1.89
24	0.55	0.40	0.80	0.76	0	0.00	282	3.68	16	0.21	298	4.36	2.60	1.56	1.76
25	0.53	0.43	0.77		0	0.00	261	3.66	10	0.14	271	4.22	2.46	1.61	1.76
26	0.65	0.50	0.83		0	0.00	253	3.67	12	0.17	265	4.41	2.46	1.76	1.95
27	0.56	0.34	0.66		0	0.00	218	3.57	48	0.79	266	4.75	2.16	2.37	2.59
28	0.74	0.23	0.65		0	0.00	217	3.41	26	0.41	243	3.83	1.78	1.84	2.05
29	0.52	0.40	0.74		0	0.00	217	3.31	14	0.21	231	3.74	1.65	1.89	2.09
30	0.45	0.28	0.81		0	0.00	229	3.34	13	0.19	242	3.82	1.79	1.87	2.03
Tot.							7,057		540		7,767				
Avg.	0.58	0.33	0.67	0.63	0.00	0.00	240.17	3.64	18.73	0.29	258.90	4.18	2.16	1.82	2.03
Max	0.84	0.55	0.86	0.76	0.00	0.00	354.00	5.09	111.00	1.84	386.00	6.12	4.23	2.54	2.79
Min.	0.39	0.19	0.42	0.53	0.00	0.00	148.00	2.19	0.00	0.00	170.00	2.90	1.01	1.42	1.69

WSSN 0600 City of Benton Harbor Month/Year April-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	1.0100	329.00	1.71	4.10	4.40	0.51	3	0.07	0.08	3	0.07	0.08	6	0	0
2	0.9028	317.00	1.85	10.00	11.60	1.10	3	0.07	0.08	3	0.08	0.08	5	0	0
3	1.0375	330.00	1.67	5.10	5.90	0.84	3	0.08	0.10	3	0.10	0.10	3	0	0
4	1.1000	297.00	1.42	4.60	4.70	0.70	3	0.08	0.09	3	0.11	0.11	6	0	0
5	1.0275	323.00	1.65	3.00	4.80	0.55	3	0.07	0.07	3	0.08	0.08	6	0	0
6	0.8900	281.00	1.91	2.10	2.50	0.52	3	0.10	0.11	3	0.10	0.11	6	0	0
7	0.9775	302.00	1.63	2.00	2.60	0.46	3	0.11	0.16	3	0.09	0.09	6	0	0
8	0.9450	292.00	1.63	2.40	3.60	0.43	3	0.08	0.09	3	0.07	0.08	6	0	0
9	0.9875	310.00	1.65	2.00	2.10	0.45	3	0.08	0.08	3	0.08	0.09	6	0	0
10	1.0075	316.00	1.65	3.10	3.70	0.47	3	0.07	0.08	3	0.08	0.08	6	0	0
11	0.9675	282.00	1.53	2.10	2.60	0.39	3	0.07	0.07	3	0.09	0.10	6	0	0
12	0.9725	294.00	1.59	2.80	5.30	0.95	3	0.09	0.09	3	0.12	0.16	6	0	0
13	1.0350	324.00	1.65	4.40	4.80	0.48	3	0.06	0.06	3	0.07	0.08	6	0	0
14	0.8250	261.00	1.66	1.90	2.00	0.41	3	0.07	0.07	2	0.10	0.10	4	0	0
15	1.0850	337.00	1.63	3.20	3.60	0.44	3	0.06	0.07	3	0.07	0.09	6	0	0
16	0.9750	309.00	1.67	6.70	9.70	0.61	3	0.06	0.06	3	0.08	0.08	6	0	0
17	1.0075	322.00	1.68	5.20	8.60	0.64	3	0.08	0.09	3	0.09	0.10	6	0	0
18	0.9700	303.00	1.64	4.30	4.80	0.48	3	0.08	0.09	3	0.09	0.11	6	0	0
19	0.9550	298.00	1.64	5.70	6.00	0.55	3	0.06	0.06	3	0.07	0.08	6	0	0
20	0.8275	260.00	1.65	4.70	6.70	0.42	3	0.06	0.06	3	0.07	0.07	6	0	0
21	0.9675	301.00	1.64	2.80	3.40	0.37	3	0.06	0.07	3	0.07	0.07	6	0	0
22	0.9625	301.00	1.65	3.40	3.70	0.35	3	0.06	0.06	3	0.07	0.08	6	0	0
23	1.0175	317.00	1.64	3.90	5.00	0.48	3	0.07	0.08	3	0.08	0.08	6	0	0
24	1.1450	356.00	1.64	2.20	2.60	0.38	3	0.08	0.09	3	0.09	0.11	6	0	0
25	1.0650	332.00	1.64	1.80	2.60	0.26	3	0.07	0.07	3	0.07	0.07	6	0	0
26	1.0300	321.00	1.64	3.60	5.10	0.29	3	0.06	0.06	3	0.08	0.09	6	0	0
27	0.9125	290.00	1.67	3.30	5.70	0.37	3	0.07	0.07	3	0.06	0.07	6	0	0
28	0.9500	304.00	1.68	3.30	5.60	0.26	3	0.08	0.09	3	0.07	0.07	6	0	0
29	0.9775	303.00	1.63	2.50	4.30	0.22	3	0.06	0.06	3	0.07	0.07	6	0	0
30	1.0250	325.00	1.67	2.00	2.90	0.26	3	0.07	0.07	3	0.07	0.08	6	0	0
31															
Total	29.5578	9237.00					90			89			174	0	0
Avg.	0.9853	307.90	1.65	3.61	4.70	0.49		0.07	0.08		0.08		Total	Total	Total
Max	1.1450	356.00	1.91	10.00	11.60	1.10		0.11	0.16		0.12	0.16	6	0	0
Min.	0.8250	260.00	1.42	1.80	2.00	0.22		0.06	0.06		0.06				

WSSN 0600 | MONTH/YEAR | April-19 |

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
D	pH													
A														
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	7.9	7.9	188	176	122	117	66	59	49	44	16	16		
2	7.9	8.0	212	192	163	119	49	73	47	52	23	15		
3	8.0	7.8	172	176	133	139	39	37	49	54	12	10	22.0	24.0
4	8.2	8.0	178	170	141	128	37	42	51	50	12	11		
5	7.9	7.9	170	176	121	127	49	49	53	59	9	7		
6	8.1	8.0	186	190	124	131	62	59	46	48	17	17		
7	8.2	8.1	172	168	129	127	43	41	51	51	11	10		
8	8.0	8.0	186	178	126	124	60	54	50	47	15	15		
9	8.1	8.1	190	178	138	128	52	50	50	47	16	15		
10	8.2	8.1	190	192	125	126	65	66	49	50	17	17		
11	7.8	7.8	186	192	125	122	61	70	46	51	17	16		
12	7.9	8.0	164	176	110	117	54	59	42	49	14	13	19.0	24.0
13	8.2	8.1	182	158	147	119	35	39	55	50	11	8		
14	8.2	7.9	174	164	135	122	39	42	58	53	7	8	20.5	23.0
15	8.1	8.0	164	158	131	129	33	29	51	50	9	8		
16	8.1	8.0	178	168	137	128	41	40	53	50	11	11		
17	8.0	8.0	192	174	139	124	53	50	50	46	17	14		
18	8.0	8.0	194	180	137	128	57	52	51	47	16	15		
19	8.0	8.0	186	174	139	128	47	46	55	51	12	12		
20	8.2	8.2	182	172	138	133	44	39	59	58	8	7		
21	8.1	8.1	172	176	121	129	51	47	47	54	13	10	21.5	26.0
22	8.2	8.0	164	164	124	123	40	41	47	49	11	10		
23	8.1	8.0	174	168	135	124	39	44	55	55	9	7		
24	8.1	8.0	162	166	119	125	43	41	45	46	12	12		
25	8.2	7.9	154	158	119	124	35	34	46	54	10	6		
26	8.1	8.2	174	164	119	120	55	44	57	51	8	9		
27	8.1	8.0	174	166	123	112	51	54	42	40	17	16		
28	8.2	8.0	170	164	121	114	49	50	43	42	15	15	18.5	22.0
29	8.0	7.9	152	154	113	114	39	40	46	47	9	9	18.5	21.0
30	8.1	8.0	164	146	112	111	52	35	46	46	12	8		
Avg.	8.1	8.0	176.9	171.3	128.9	123.7	48.0	47.5	49.6	49.7	12.9	11.6	20.0	23.3
Max	8.2	8.2	212.0	192.0	163.0	139.0	66.0	73.0	59.0	59.0	23.0	17.0	22.0	26.0
Min.	7.8	7.8	152.0	146.0	110.0	111.0	33.0	29.0	42.0	40.0	7.0	6.0	18.5	21.0

WSSN 0600 MONTH/YEAR April-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS DISTRIBUTION METER; CORROSION CONTROL FEED OPP

	RAW		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	No. of	Colilert	No. of	Colilert			TEMP.	TEMP.				
A	Samples	P/A	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T					Raw	Tap			To	Lbs PO4	Treatment	Residual
E									Distribution		mg/L	mg/L
1			1	A	55	0	4	5.5	0.8742	6	0.57	
2			1	A	29	0	5	5.0	0.9413	13	1.16	
3			1	A	51	0	5	6.0	0.9030	12	1.11	
4			1	A	75	2	6	7.0	0.9069	12	1.11	
5			1	A	67	0	5	7.0	0.9684	12	1.05	1.57
6			1	A	65	0	6	5.5	0.9443	11	0.99	1.43
7			1	A	61	0	6	7.0	0.9163	13	1.15	1.71
8			1	A	34	0	6	6.0	0.9184	13	1.20	0.29
9			1	A	69	0	7	6.5	0.9078	12	1.11	0.29
10			1	A	36	1	6	7.0	0.9203	14	1.24	0.43
11			1	A	34	3	6	7.0	0.9260	12	1.10	1.00
12			1	A	57	1	6	6.5	1.0049	14	1.20	1.14
13			1	A	23	0	6	7.0	0.9567	13	1.10	1.29
14			1	A	24	0	8	8.0	0.9222	12	1.06	1.86
15			1	A	29	3	7	8.0	1.0652	14	1.12	0.57
16			1	A	76	2	8	9.0	0.8992	13	1.24	1.29
17			1	A	25	0	7	7.5	0.8961	12	1.16	1.00
18			1	A	17	0	8	8.0	0.8944	14	1.27	2.00
19			1	A	65	0	9	9.5	0.9240	12	1.12	1.14
20			1	A	58	0	8	9.5	0.8195	12	1.27	1.29
21			1	A	32	0	8	9.0	0.9384	12	1.11	0.57
22			1	A	17	0	8	10.0	0.9943	14	1.22	1.57
23			1	A	29	0	9	9.5	0.7974	10	1.07	0.57
24			1	A	38	0	8	9.0	1.0202	13	1.09	0.29
25			1	A	29	0	8	9.0	0.9578	14	1.20	0.57
26			1	A	30	4	8	9.0	0.8971	12	1.14	0.71
27			1	A	30	0	7.8	8.0	0.8358	11	1.11	2.43
28			1	A	23	0	9.0	12.0	0.9462	14	1.23	2.14
29			1	A	21	1	8.7	8.5	0.9230	12	1.13	1.43
30			1	A	75	1	8.5	9.5	0.9453	14	1.22	1.71
TOTAL								TOTALS	27.7647	373		
AVG.			1	A	42	1	7	8	0.9255	12	1.13	1.16
Max					76	4	9	12	1.0652	14	1.27	2.43
Min					17	0	4	5	0.7974	6	0.57	0.29

DISTRIBUTION SYSTEM MONITORING WSSN 0600 April-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3	1.00		0.80	1.11	1.16		1.29			
4										
5										
6										
7										
8										
9										
10	1.29		1.34	1.17	0.92		1.42			
11										
12										
13										
14										
15										
16										
17										
18	0.94		0.66	0.84	1.13		0.82			
19										
20										
21										
22										
23										
24	0.82		1.16	0.49	0.87		0.77			
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	20		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.00	1.42	0.49
Total number of check samples	0600			
Total number of positive check samples	0600			

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** Month/Year **August-19**

F1-S1 **F1-S2**

Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.2133	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	251.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.10	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.89	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.35%	Percent of Treated Water

Chemical Data

Chlorine on hand:	38885	lb.	Est. supply:	244	days
Primary Coagulant (Alum (Al3+)) on hand:	102862	lb.	Est. supply:	119	days
Cost of All Chemicals per Million Gallons:	$76.21	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	0
Percent of filter confluence samples > 0.3 NTU:	0%	#DIV/0!
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	30.9438	Avg	1.0364258	Max	1.1536	Min	0.8373

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **August-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.56	0.44	0.65		0	0.00	352	4.74	38	0.51	390	4.91	3.33	1.40	1.58
2	0.62	0.35	0.71	0.71	0	0.00	337	4.72	37	0.52	374	5.53	3.67	1.68	1.86
3	0.56	0.35	0.82		0	0.00	373	4.71	24	0.30	397	5.14	3.16	1.84	1.98
4	0.47	0.38	0.75		0	0.00	353	4.92	24	0.33	377	5.32	3.41	1.70	1.91
5	0.52	0.29	0.76		0	0.00	384	4.90	37	0.47	421	6.00	3.95	1.82	2.05
6	0.43	0.26	0.82		0	0.00	384	4.98	29	0.38	413	7.36	5.22	1.98	2.14
7	0.54	0.29	0.74		0	0.00	368	5.05	58	0.80	426	5.90	3.79	1.90	2.11
8	0.55	0.22	0.67		0	0.00	378	5.11	41	0.55	419	5.99	4.06	1.84	1.93
9	0.53	0.14	0.62		0	0.00	284	3.94	71	0.99	355	5.23	3.09	1.96	2.14
10	0.56	0.23	0.62		0	0.00	450	5.54	84	1.03	534	8.21	5.85	2.19	2.36
11	0.62	0.20	0.61		0	0.00	376	5.31	46	0.65	422	5.73	4.05	1.50	1.68
12	0.57	0.09	0.47		0	0.00	385	5.31	37	0.51	422	5.95	4.27	1.56	1.68
13	0.42	0.11	0.52		0	0.00	400	5.32	37	0.49	437	5.68	4.01	1.55	1.67
14	0.44	0.17	0.49		0	0.00	408	5.34	32	0.42	440	6.32	4.38	1.77	1.94
15	0.41	0.26	0.72		0	0.00	421	5.35	29	0.37	450	6.34	4.41	1.81	1.93
16	0.49	0.26	0.70	0.75	0	0.00	385	5.30	22	0.30	407	6.42	4.63	1.69	1.79
17	0.56	0.20	0.74		0	0.00	384	5.33	35	0.49	419	5.92	4.00	1.74	1.92
18	0.64	0.22	0.80		0	0.00	372	5.51	37	0.55	409	6.22	4.26	1.78	1.96
19	0.54	0.22	0.75		0	0.00	403	5.51	72	0.98	475	6.32	4.31	1.80	2.01
20	0.53	0.26	0.74		0	0.00	421	5.99	68	0.97	489	6.83	5.24	1.42	1.59
21	0.48	0.16	0.70		0	0.00	449	5.88	56	0.73	505	7.68	5.85	1.67	1.83
22	0.57	0.36	0.77	0.87	0	0.00	440	5.83	50	0.66	490	7.17	5.50	1.48	1.67
23	0.54	0.42	0.59		0	0.00	448	5.88	39	0.51	487	6.37	4.81	1.36	1.56
24	0.41	0.26	0.57		0	0.00	423	5.82	39	0.54	462	7.19	5.20	1.84	1.99
25	0.57	0.31	0.62		0	0.00	420	5.77	42	0.58	462	7.43	5.46	1.80	1.97
26	0.52	0.37	0.69		0	0.00	401	5.53	43	0.59	444	6.44	4.28	1.98	2.16
27	0.54	0.30	0.77		0	0.00	402	5.53	33	0.45	435	6.11	4.02	1.91	2.09
28	0.50	0.26	0.65	0.65	0	0.00	401	5.52	38	0.52	439	7.22	4.99	2.04	2.23
29	0.56	0.23	0.73		0	0.00	392	5.47	34	0.47	426	5.92	3.73	2.00	2.19
30	0.68	0.18	0.67		0	0.00	399	5.43	37	0.50	436	5.93	4.01	1.72	1.92
31	0.57	0.22	0.62		0	0.00	392	5.49	19	0.27	411	6.45	4.49	1.82	1.96
Tot.							11,833		1,250		13,473				
Avg.	0.53	0.26	0.68	0.75	0.00	0.00	393.10	5.32	42.30	0.57	435.40	6.29	4.37	1.76	1.93
Max	0.68	0.44	0.82	0.87	0.00	0.00	450.00	5.99	84.00	1.03	534.00	8.21	5.85	2.19	2.36
Min.	0.41	0.09	0.47	0.65	0.00	0.00	284.00	3.94	22.00	0.30	355.00	4.91	3.09	1.36	1.56

WSSN 0600 City of Benton Harbor Month/Year August-19

COAGULATION PARAMETERS

D A T E	MIL. GAL. TREAT.	Dry Al2(SO3)4 Pounds Add	ALUM as Al3+ mg/l	TURBIDITY UNITS RAW Avg.	RAW Max.	Applied Avg.	# sample	FILTERED NORTH Avg.	FILTERED NORTH Max.	# Samples	FILTERED SOUTH Avg.	FILTERED SOUTH Max.	2 Hour Compliance Periods # of Periods	#of Periods >.30NTU North	#of Periods >.30NTU South
1	1.1075	321.00	1.52	1.70	2.60	0.17	3	0.03	0.04	0	0.03	0.04	3	0	0
2	1.0650	327.00	1.62	1.10	1.20	0.16	3	0.04	0.04	0	0.03	0.03	3	0	0
3	1.1832	393.00	1.75	2.00	2.20	0.21	3	0.05	0.07	0	0.05	0.08	3	0	0
4	1.0700	320.00	1.57	1.10	1.30	0.15	3	0.02	0.02	0	0.02	0.02	3	0	0
5	1.1705	345.00	1.55	1.10	1.20	0.17	3	0.02	0.03	0	0.03	0.04	3	0	0
6	1.1500	344.00	1.58	1.10	1.30	0.16	3	0.05	0.08	0	0.06	0.09	3	0	0
7	1.0875	327.00	1.58	1.70	2.60	0.16	3	0.03	0.03	0	0.03	0.04	3	0	0
8	1.1050	317.00	1.51	2.40	3.40	0.28	3	0.03	0.04	0	0.03	0.03	3	0	0
9	1.0750	315.00	1.54	3.20	4.80	0.23	3	0.03	0.04	0	0.03	0.03	3	0	0
10	1.2133	382.00	1.66	3.40	5.80	0.21	3	0.04	0.04	0	0.03	0.04	3	0	0
11	1.0575	303.00	1.51	1.70	2.60	0.16	3	0.04	0.04	0	0.03	0.03	3	0	0
12	1.0825	325.00	1.58	0.99	1.10	0.14	3	0.02	0.02	0	0.03	0.03	3	0	0
13	1.1225	337.00	1.58	1.20	1.30	0.13	3	0.02	0.02	0	0.03	0.03	3	0	0
14	1.1400	340.00	1.57	1.70	1.80	0.17	3	0.02	0.03	0	0.02	0.03	3	0	0
15	1.1750	350.00	1.57	1.60	1.90	0.14	3	0.03	0.04	0	0.02	0.03	3	0	0
16	1.0850	320.00	1.55	1.50	1.50	0.16	3	0.03	0.03	0	0.03	0.03	3	0	0
17	1.0750	298.00	1.46	1.80	2.40	0.20	3	0.04	0.05	0	0.04	0.05	3	0	0
18	1.0075	278.00	1.45	1.90	2.30	0.21	3	0.05	0.07	0	0.06	0.08	3	0	0
19	1.0925	308.00	1.48	1.90	2.50	0.32	3	0.07	0.08	0	0.08	0.08	3	0	0
20	1.0500	316.00	1.58	1.80	2.00	0.25	3	0.07	0.08	0	0.08	0.08	3	0	0
21	1.1400	341.00	1.57	1.30	1.40	0.20	3	0.07	0.07	0	0.07	0.08	3	0	0
22	1.1275	332.00	1.55	1.70	2.00	0.21	3	0.07	0.08	0	0.07	0.08	3	0	0
23	1.1375	344.00	1.59	1.30	1.80	0.19	3	0.07	0.08	0	0.08	0.09	3	0	0
24	1.0850	323.00	1.57	0.69	0.72	0.15	3	0.07	0.07	0	0.08	0.09	3	0	0
25	1.0875	326.00	1.58	0.70	0.87	0.15	3	0.06	0.07	0	0.07	0.07	3	0	0
26	1.0825	316.00	1.58	0.99	1.50	0.18	3	0.07	0.09	0	0.08	0.08	3	0	0
27	1.0850	319.00	1.55	0.92	1.20	0.20	3	0.07	0.09	0	0.08	0.09	3	0	0
28	1.0850	317.00	1.54	1.30	1.40	0.17	3	0.07	0.07	0	0.08	0.08	3	0	0
29	1.0700	314.00	1.54	2.10	2.40	0.20	3	0.06	0.07	0	0.08	0.09	3	0	0
30	1.0975	336.00	1.61	2.20	2.70	0.21	3	0.07	0.07	0	0.08	0.08	3	0	0
31	1.0650	321.00	1.59	1.40	1.70	0.16	3	0.07	0.07	0	0.07	0.07	3	0	0
Total	34.1770	10155.00					93			0			93	0	0
Avg.	1.1025	327.58	1.56	1.60	2.05	0.19		0.05	0.06		0.05		Total	Total	Total
Max	1.2133	393.00	1.75	3.40	5.80	0.32		0.07	0.09		0.08	0.09	3	0	0
Min.	1.0075	278.00	1.45	0.69	0.72	0.13		0.02	0.02		0.02				

WSSN 0600 | MONTH/YEAR | August-19 |

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
D	pH													
A														
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	8.1	154	146	108	103	46	43	38	36	15	14	20.5	24.0
2	7.9	8.0	158	152	112	103	46	49	38	36	16	15		
3	8.0	8.0	148	136	112	104	36	32	43	42	10	7		
4	8.3	8.1	138	132	112	105	26	27	42	42	8	7		
5	8.2	8.2	142	136	111	107	31	29	39	38	11	11		
6	8.2	8.1	138	134	112	106	26	28	40	42	9	7		
7	8.0	8.0	154	148	109	106	45	42	37	36	15	14		
8	8.2	8.1	166	154	122	105	44	49	42	37	15	15		
9	8.0	8.1	160	152	114	108	46	44	38	37	16	15		
10	8.1	8.1	156	148	113	108	43	40	38	36	15	14	19.0	24.5
11	8.0	8.1	154	148	113	109	41	39	37	35	15	15		
12	8.3	8.2	138	136	114	107	24	29	38	38	11	10	19.5	23.0
13	8.1	8.1	142	144	108	107	34	37	46	47	6	6		
14	8.2	8.0	156	148	110	107	46	41	38	36	15	14		
15	8.2	8.1	146	150	110	107	36	43	43	45	9	9		
16	8.1	8.1	142	140	108	107	34	33	40	41	10	9		
17	8.2	8.1	176	162	119	105	57	57	16	41	44	15		
18	8.1	8.2	166	152	119	107	47	45	42	38	15	14		
19	8.1	8.1	178	162	117	110	61	52	45	41	16	15	22.0	26.0
20	8.2	8.1	182	172	123	115	59	57	45	43	17	16		
21	8.2	7.9	152	164	118	122	34	42	43	46	11	12	23.0	25.5
22	8.3	8.2	168	156	129	116	39	40	43	42	15	13		
23	8.2	8.3	146	154	110	119	36	35	43	47	9	9		
24	8.2	8.2	146	152	106	109	40	43	43	44	9	10		
25	8.1	8.1	146	150	107	108	39	42	42	43	10	10		
26	8.1	8.0	162	152	107	103	55	49	38	37	16	15		
27	8.0	8.1	160	150	109	104	51	46	38	38	15	14		
28	7.9	8.0	160	150	112	105	48	45	39	38	15	14	19.5	23.5
29	8.1	8.0	160	152	112	105	48	47	41	40	14	13		
30	8.0	8.1	164	152	114	107	50	45	41	40	15	13		
31	8.3	8.2	150	148	111	110	39	38	43	43	10	10	17.5	21.5
Avg.	8.1	8.1	155.3	149.5	113.0	107.8	42.3	41.7	39.9	40.1	13.9	12.2	20.6	24.4
Max	8.3	8.3	182.0	172.0	129.0	122.0	61.0	57.0	46.0	47.0	44.0	16.0	23.0	26.0
Min.	7.9	7.9	138.0	132.0	106.0	103.0	24.0	27.0	16.0	35.0	6.0	6.0	19.0	23.0

WSSN 0600 MONTH/YEAR August-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1	0.93		1	A	37	1	11	18.5	1.0648	45	1.65	0.93
2	1.09		1	A	38	0	11	16.5	1.0361	60	2.29	1.09
3	1.76		1	A	63	0	11	15.0	1.1908	54	1.78	1.76
4	1.81		1	A	36	0	12	14.0	1.0207	63	2.45	1.81
5	1.46		1	A	72	2	16	14.0	1.0793	53	1.94	1.46
6	1.37		1	A	57	0	20	14.0	0.8780	49	2.23	1.37
7	1.26	City Hall	1	A	35	1	15	16.5	1.1242	49	1.72	1.26
8	1.55	Wolfs	1	A	75	1	17	16.5	1.1085	50	1.80	1.55
9	1.38	Bait Shed	1	A	49	1	20	19.0	1.0720	47	1.73	1.38
10	1.13	Sunny Spot	1	A	57	7	19	19.5	1.0250	58	2.23	1.13
11	1.58	B&Z	1	A	79	5	21	20.0	1.1539	52	1.78	1.58
12	1.05		1	A	33	2	20	20.0	1.0956	59	2.13	1.05
13	1.68		1	A	82	0	18	21.0	1.2011	55	1.82	1.68
14	1.48		1	A	52	0	15	20.0	1.1027	58	2.06	1.48
15	1.31		1	A	73	1	17	19.0	1.1239	50	1.77	1.31
16	1.16	City Hall	1	A	151	1	16	18.0	0.9962	54	2.13	1.16
17	1.39	Wolfs	1	A	135	1	21	18.0	1.1031	50	1.80	1.39
18	1.53	Bait Shed	1	A	141	2	22	19.6	1.0346	52	2.00	1.53
19	1.70	Sunny Spot	1	A	90	0	23	21.0	1.1761	57	1.90	1.70
20	1.76	B&Z	1	A	63	3	23	22.5	1.1212	58	2.06	1.76
21	1.34		1	A	57	0	23	23.0	1.0327	54	2.07	1.34
22	1.48	City Hall	1	A	98	0	23	23.0	1.0599	57	2.11	1.48
23	1.20	Wolfs	1	A	58	1	13	23.0	1.2048	58	1.90	1.20
24	1.26	Bait Shed	1	A	79	1	11	19.0	1.0087	26	1.04	1.26
25	1.41	Sunny Spot	1	A	88	2	10	17.0	0.9760	64	2.59	1.41
26	1.36	B&Z	1	A	42	0	11	14.5	1.0714	44	1.62	1.36
27	2.28	City Hall	1	A	69	0	12.3	13.5	1.1192	44	1.54	2.28
28	1.47	Wolfs	1	A	99	0	9.0	12.0	0.9586	48	2.00	1.47
29	1.61	Bait Shed	1	A	95	0	8.7	8.5	1.1374	55	1.90	1.61
30	1.25	Sunny Spot	1	A	54	0	8.5	9.5	1.1473	46	1.57	1.25
31	1.67	B&Z	1	A	97	0	19.0	18.0	1.0019	48	1.88	1.67
Totals									33.4256	1614.6		
AVG.	1.46		1	A	74	1	16	18	1.0782	52.1	1.93	1.46
Max	2.28				151	7	23	23	1.2048	63.8	2.59	2.28
Min	1.05				33	0	9	9	0.8780	26.4	1.04	1.05

DISTRIBUTION SYSTEM MONITORING WSSN 0600 August-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5										
6										
7	0.86		1.15	0.70	1.25		0.92			
8										
9										
10										
11										
12										
13										
14										
15										
16	1.26		1.09	1.17	1.01		0.71			
17										
18										
19										
20										
21										
22	0.72		0.54	0.60	0.60		0.91			
23										
24										
25										
26										
27										
28	1.19		1.16	1.18	0.88		0.81			
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

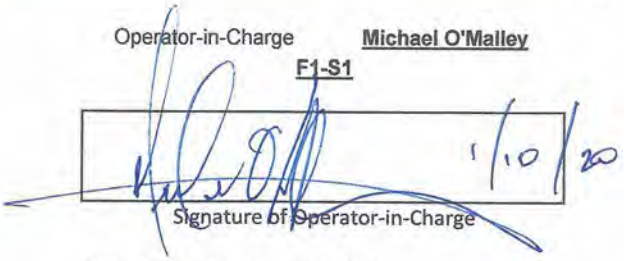
Total number of routine distribution samples analyzed	0600	20		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	0.94	1.26	0.54
Total number of check samples	0600			
Total number of positive check samples	0600			

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** **F1-S1**



Signature of Operator-in-Charge

Month/Year **December-19** **F1-S2**

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1125	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	185.25	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.98	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.23	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.82%	Percent of Treated Water

Chemical Data

Chlorine on hand:	42420	lb.	Est. supply:	201	days
Primary Coagulant (Alum (Al3+)) on hand:	52027	lb.	Est. supply:	143	days
Cost of All Chemicals per Million Gallons:	$66.41	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **If yes**, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	NO
Did POE disinfectant residual fall below 0.2 ppm during the month? **If yes**, indicate date(s) and duration on a separate sheet.	NO
Was minimum C*T credit achieved for the entire month? **If no**, indicate on a separate sheet the date(s) not achieved.	YES
Was continuous POE chlorine residual monitoring equipment off-line during the month? **If yes**, indicate date(s) and duration on a separate sheet.	NO

Distribution	Total	28.2086	Avg	0.9353806	Max	1.0808	Min	0.8288

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **December-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.58	0.32	0.85		0	0.00	202	3.37	16	0.27	218	4.13	2.35	1.62	1.78
2	0.69	0.29	0.79		0	0.00	242	3.44	13	0.18	255	3.85	2.13	1.56	1.72
3	0.54	0.20	0.86		0	0.00	258	3.55	25	0.34	283	4.27	2.52	1.63	1.75
4	0.55	0.37	0.88	0.73	0	0.00	238	3.82	26	0.42	264	4.22	2.40	1.69	1.82
5	0.48	0.19	0.79		0	0.00	262	3.91	32	0.48	294	4.45	2.65	1.69	1.80
6	0.58	0.25	0.81		0	0.00	289	3.88	29	0.39	318	4.98	3.18	1.66	1.80
7	0.53	0.30	0.79		0	0.00	238	3.94	29	0.48	267	4.81	2.86	1.81	1.95
8	0.54	0.25	0.81		0	0.00	262	3.90	28	0.42	290	4.65	2.67	1.85	1.98
9	0.47	0.26	0.80		0	0.00	242	3.91	21	0.34	263	4.24	2.42	1.65	1.82
10	0.54	0.32	0.82		0	0.00	258	3.98	28	0.43	286	4.31	2.35	1.78	1.96
11	0.52	0.23	0.75		0	0.00	278	3.91	36	0.51	314	4.67	2.77	1.80	1.90
12	0.55	0.32	0.80	0.73	0	0.00	278	3.93	34	0.48	312	4.55	2.62	1.64	1.93
13	0.48	0.39	0.84		0	0.00	288	3.91	35	0.47	323	4.46	2.41	1.73	2.05
14	0.51	0.32	0.85		0	0.00	245	3.92	29	0.46	274	4.37	2.62	1.50	1.75
15	0.60	0.29	0.79		0	0.00	270	3.92	29	0.42	299	4.83	3.01	1.51	1.82
16	0.48	0.37	0.82		0	0.00	249	4.04	33	0.54	282	4.28	2.35	1.76	1.93
17	0.55	0.31	0.80		0	0.00	272	3.83	28	0.39	300	4.53	2.82	1.54	1.71
18	0.53	0.22	0.75	0.75	0	0.00	227	3.63	24	0.38	251	4.25	2.31	1.77	1.94
19	0.44	0.29	0.80		0	0.00	264	3.60	49	0.67	313	4.75	2.00	2.55	2.75
20	0.40	0.33	0.79		0	0.00	215	3.61	20	0.34	235	4.04	2.07	1.79	1.97
21	0.23	0.34	0.78		0	0.00	231	3.78	27	0.44	258	4.54	2.73	1.66	1.81
22	0.49	0.31	0.69		0	0.00	236	3.70	22	0.34	258	4.25	2.41	1.46	1.84
23	0.64	0.22	0.72		0	0.00	220	3.69	17	0.29	237	3.78	1.93	1.68	1.85
24	0.47	0.33	0.75		0	0.00	247	3.67	19	0.28	266	4.03	2.06	1.73	1.97
25	0.46	0.15	0.61		0	0.00	225	3.70	20	0.33	245	4.41	2.34	1.88	2.07
26	0.41	0.09	0.63	0.61	0	0.00	219	3.35	31	0.47	250	4.20	1.95	2.08	2.25
27	0.56	0.17	0.63		0	0.00	198	3.17	20	0.32	218	3.44	1.19	2.05	2.25
28	0.59	0.10	0.69		0	0.00	185	3.00	17	0.28	202	3.24	1.25	1.82	1.99
29	0.60	0.27	0.72		0	0.00	194	3.01	27	0.42	221	3.66	1.29	2.19	2.37
30	0.42	0.27	0.78		0	0.00	212	3.25	26	0.40	238	3.71	1.81	1.67	1.90
31	0.47	0.31	0.77		0	0.00	205	3.13	23	0.35	228	3.88	1.94	1.68	1.94
Tot.				-			7,247		797		8,262				
Avg.	0.51	0.27	0.77	0.71	0.00	0.00	241.47	3.68	26.33	0.40	267.80	4.26	2.32	1.76	1.95
Max	0.69	0.39	0.88	0.75	0.00	0.00	289.00	4.04	49.00	0.67	323.00	4.98	3.18	2.55	2.75
Min.	0.23	0.09	0.61	0.61	0.00	0.00	185.00	3.00	13.00	0.18	202.00	3.24	1.19	1.46	1.71

WSSN 0600 City of Benton Harbor Month/Year December-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.8950	246.00	1.45	15.30	24.00	1.60	3	0.07	0.08	3	0.07	0.08	6	0	0
2	1.0500	306.00	1.53	23.70	31.60	2.40	3	0.07	0.07	3	0.07	0.08	6	0	0
3	1.0850	324.00	1.57	23.30	26.70	1.70	3	0.08	0.09	3	0.08	0.10	6	0	0
4	0.9300	287.00	1.62	14.50	15.40	2.60	3	0.09	0.10	3	0.10	0.13	6	0	0
5	1.0000	316.00	1.66	12.90	16.60	1.70	3	0.08	0.09	3	0.09	0.12	6	0	0
6	1.1125	344.00	1.49	10.70	14.30	1.80	3	0.09	0.09	3	0.08	0.10	6	0	0
7	0.9025	280.00	1.63	17.20	18.00	2.70	3	0.09	0.10	3	0.10	0.12	6	0	0
8	1.0025	309.00	1.62	11.60	13.90	2.40	3	0.08	0.10	3	0.07	0.08	6	0	0
9	0.9250	278.00	1.58	9.50	11.10	2.10	3	0.08	0.09	3	0.08	0.08	6	0	0
10	0.9675	300.00	1.63	8.80	9.00	1.30	3	0.07	0.08	3	0.08	0.09	6	0	0
11	1.0625	327.00	1.62	7.40	8.20	1.30	3	0.08	0.09	3	0.07	0.07	6	0	0
12	1.0550	329.00	1.64	5.80	7.00	1.40	3	0.08	0.09	3	0.07	0.08	6	0	0
13	1.1000	336.00	1.61	5.60	8.20	1.40	3	0.07	0.07	3	0.06	0.07	6	0	0
14	0.9325	279.00	1.57	3.50	4.30	0.99	3	0.08	0.09	3	0.08	0.09	6	0	0
15	1.0275	311.00	1.59	4.10	4.40	1.40	3	0.07	0.08	3	0.08	0.08	6	0	0
16	0.9200	291.00	1.66	4.70	8.80	1.20	3	0.09	0.10	3	0.10	0.11	6	0	0
17	1.0600	322.00	1.60	5.20	8.90	1.40	3	0.08	0.10	3	0.10	0.12	6	0	0
18	0.9325	196.00	1.11	6.20	10.00	1.60	3	0.11	0.13	3	0.13	0.14	6	0	0
19	1.0950	359.00	1.72	9.00	11.50	1.80	3	0.08	0.10	3	0.09	0.10	6	0	0
20	0.8900	303.00	1.79	10.40	17.50	2.20	3	0.09	0.11	3	0.09	0.09	6	0	0
21	0.9125	270.00	1.56	4.50	5.90	1.30	3	0.07	0.07	3	0.10	0.10	6	0	0
22	0.9525	296.00	1.64	2.30	2.40	1.10	3	0.08	0.10	3	0.13	0.13	6	0	0
23	0.8900	273.00	1.61	3.80	6.10	1.00	3	0.07	0.07	3	0.14	0.18	6	0	0
24	1.0050	309.00	1.62	3.20	4.70	1.10	3	0.07	0.08	3	0.14	0.17	6	0	0
25	0.9075	275.00	1.59	3.00	5.10	0.95	3	0.07	0.08	3	0.12	0.15	6	0	0
26	0.9750	299.00	1.59	5.20	12.10	0.84	3	0.08	0.08	3	0.16	0.19	6	0	0
27	0.9325	279.00	1.57	1.60	2.10	0.72	3	0.07	0.08	3	0.14	0.17	6	0	0
28	0.9200	283.00	1.62	12.20	30.80	0.83	3	0.07	0.09	3	0.12	0.13	6	0	0
29	0.9625	289.00	1.58	3.90	8.80	0.78	3	0.09	0.09	3	0.17	0.17	6	0	0
30	0.9750	294.00	1.59	4.80	7.40	0.84	3	0.08	0.11	3	0.18	0.19	6	0	0
31	0.9775	303.00	1.63	3.80	4.80	0.69	3	0.07	0.08	3	0.12	0.12	6	0	0
Total	30.3550	9213.00					93			93			186	0	0
Avg.	0.9792	297.19	1.59	8.31	11.60	1.46		0.08	0.09		0.10		Total	Total	Total
Max	1.1125	359.00	1.79	23.70	31.60	2.70		0.11	0.13		0.18	0.19	6	0	0
Min.	0.8900	196.00	1.11	1.60	2.10	0.69		0.07	0.07		0.06				

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total		Total		Non-Carb.							
			Hardness		Alkalinity		Hardness		Calcium		Magnesium		Chloride	
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	8.0	156	160	111	105	45	55	40	43	14	13		
2	8.1	8.0	182	156	131	105	51	51	46	42	16	13	18.0	21.5
3	8.2	8.1	168	152	133	114	35	38	47	45	12	10		
4	8.2	8.1	178	158	132	111	46	47	57	47	9	10		
5	8.0	7.6	156	160	121	123	35	37	47	51	9	8		
6	8.2	8.2	160	162	121	121	39	41	47	51	10	9		
7	8.0	7.8	166	160	119	114	47	46	52	51	9	8		
8	8.2	8.1	172	158	140	117	32	41	55	47	9	10		
9	8.2	7.9	184	162	146	122	38	40	63	53	6	7		
10	8.1	8.0	146	150	114	126	32	24	44	48	9	7		
11	8.0	7.9	146	164	113	121	33	43	40	46	11	12		
12	8.2	7.9	176	164	129	118	47	46	58	57	8	5		
13	8.1	8.0	162	156	131	117	31	39	51	53	8	6	22.0	25.5
14	8.2	8.2	148	158	117	122	31	36	46	51	8	7		
15	8.2	8.1	178	160	142	122	36	38	59	52	7	7		
16	8.1	8.0	174	170	128	121	46	49	45	46	15	13		
17	8.0	8.0	176	180	120	123	56	57	45	48	16	15		
18	8.0	8.1	192	188	123	118	69	70	46	47	18	17		
19	8.0	8.0	204	172	135	117	69	55	54	46	17	14		
20	8.0	8.0	208	176	147	125	61	51	54	47	18	14	23.0	25.5
21	8.1	8.0	182	172	143	132	39	40	58	55	9	9		
22	8.2	8.2	152	156	121	133	31	23	47	51	8	7		
23	8.1	7.9	170	164	141	129	29	35	52	51	10	9	23.0	25.5
24	8.2	8.1	176	162	142	127	34	35	53	51	11	9		
25	8.0	8.0	184	176	127	121	57	55	46	45	17	16		
26	8.0	8.1	184	186	132	121	52	65	46	47	17	17		
27	8.0	8.1	180	174	124	122	56	52	44	42	17	17		
28	8.0	7.9	184	180	119	115	65	65	47	46	16	16		
29	8.0	8.1	178	168	132	116	46	52	45	43	16	15		
30	8.1	8.1	144	150	119	119	25	31	47	49	6	7	22.0	23.5
31	8.2	8.0	140	156	106	117	34	39	42	46	8	10		
Avg.	8.1	8.0	172.2	165.1	128.4	119.9	43.8	45.2	49.4	48.4	11.9	10.9	21.6	24.3
Max	8.2	8.2	208.0	188.0	147.0	133.0	69.0	70.0	63.0	57.0	18.0	17.0	23.0	25.5
Min.	8.0	7.6	144.0	150.0	111.0	105.0	25.0	23.0	40.0	42.0	6.0	5.0	18.0	21.5

WSSN 0600 MONTH/YEAR December-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1			1	A	115	0	7	8.0	0.7882	49	2.47	1.53
2			1	A	161	0	6	7.5	0.9898	50	2.00	1.54
3			1	A	150	1	7	8.0	0.9884	48	1.93	1.44
4	1.43	City Hall	1	A	165	0	7	8.0	0.9338	46	1.94	1.44
4	1.40	Wolfs	1	A	178	0	7	8.0	0.9870	48	1.91	1.48
4	1.40	Bait Shed	1	A	115	0	7	8.0	0.9534	37	1.54	1.56
4	1.59	Sunny Spot	1	A	142	0	6	8.0	0.8288	49	2.35	1.41
4	1.22	B & Z	1	A	119	0	6	8.0	0.9310	48	2.03	1.63
9			1	A	111	0	6	9.0	0.9268	50	2.12	1.56
10			1	A	87	0	6	7.0	0.9898	53	2.13	1.57
11			1	A	96	0	6	8.0	1.0038	59	2.31	1.51
12	2.49	City Hall	1	A	79	1	5	7.0	1.0234	63	2.45	1.49
12	1.46	Wolfs	1	A	64	0	5	7.0	1.0808	59	2.17	1.53
12	1.59	B & Z	1	A	26	0	5	7.0	0.9366	55	2.30	0.00
12	1.52	Bait Shed	1	A	49	1	4	7.0	0.9240	60	2.57	1.50
12	1.32	Sunny Spot	1	A	61	1	4	5.5	0.9828	58	2.33	1.54
17			1	A	113	0	4	5.5	0.9884	59	2.36	1.57
18	1.60	City Hall	1	A	139	1	5	5.0	0.8820	62	2.76	1.61
18	1.41	Wolfs	1	A	156	0	4	5.0	0.9828	21	0.84	1.44
18	1.52	Bait Shed	1	A	108	0	3	5.0	0.8694	50	2.26	1.62
18	1.52	Sunny Spot	1	A	101	0	4	6.0	0.8484	53	2.47	1.52
18	1.36	B & Z	1	A	146	1	4	6.0	0.9072	45	1.98	1.54
23			1	A	28	0	4	5.0	0.9366	48	2.01	1.47
24			1	A	61	2	4	6.0	0.9842	51	2.07	1.42
25			1	A	57	0	4	4.5	0.8302	49	2.32	1.53
26	1.31	City Hall	1	A	45	0	5	4.5	0.8890	53	2.35	1.68
26	1.30	Wolfs	1	A	41	0	4.7	5.0	0.9450	45	1.88	1.27
26	1.51	Bait Shed	1	A	72	0	5.5	5.5	0.9296	49	2.10	1.55
26	1.52	Sunny Spot	1	A	58	1	5.5	5.5	0.9002	50	2.18	1.61
26	1.30	B & Z	1	A	65	0	6.0	7.0	0.9576	47	1.94	1.47
31			1		46	0	5.0	6.0	0.8778	53	2.37	1.51
Totals									28.9968	1564.7		
AVG.	1.49		1	A	95	0	5	6	0.9354	50.5	2.13	1.47
Max	2.49				178	2	7	9	1.0808	63.3	2.76	1.68
Min	1.22				26	0	3	5	0.7882	20.9	0.84	0.00

DISTRIBUTION SYSTEM MONITORING WSSN 0600 December-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4	1.25		1.18	0.91			0.92			
5										
6										
7										
8										
9										
10										
11										
12	1.26		1.21	1.08	0.96		0.99			
13										
14										
15										
16										
17										
18	1.03		1.12	1.26	1.12		0.63			
19										
20										
21										
22										
23										
24										
25										
26	1.57		1.58	1.34	1.55		0.78			
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	19		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.14	1.58	0.63
Total number of check samples	0600			
Total number of positive check samples	0600			

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: CITY OF BENTON HARBOR

WSSN:600

Operator-in-Charge **Michael O'Malley**
F1-S1

Signature of Operator-in-Charge

Month/Year **January-19**
F1-S2

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.4059	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	273.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.06	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.40	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.39%	Percent of Treated Water

Chemical Data

Chlorine on hand:	38380	lb.	Est. supply:	102 days
Primary Coagulant (Alum (Al3+)) on hand:	32566	lb.	Est. supply:	116 days
Cost of All Chemicals per Million Gallons:	$70.97	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	5
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **If yes**, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	NO
Did POE disinfectant residual fall below 0.2 ppm during the month? **If yes**, indicate date(s) and duration on a separate sheet.	NO
Was minimum C*T credit achieved for the entire month? **If no**, indicate on a separate sheet the date(s) not achieved.	YES
Was continuous POE chlorine residual monitoring equipment off-line during the month? **If yes**, indicate date(s) and duration on a separate sheet.	NO

Distribution	Total	30.48468	Avg	1.0162826	Max	1.39556	Min	0.82812

Remarks: Data developed to re-determine Water Distributed to System Max days during water main break of 4" about 7 days.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **January-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.49	0.31	0.62		0	0.00	216	3.72	48	0.83	264	3.86	2.06	1.61	1.80
2	0.52	0.24	0.41		0	0.00	257	4.06	49	0.77	306	4.90	3.01	1.65	1.89
3	0.62	0.32	0.56		0	0.00	268	4.81	44	0.79	312	5.62	3.74	1.58	1.88
4	0.54	0.29	0.56		0	0.00	301	4.75	50	0.79	351	5.05	3.13	1.68	1.92
5	0.57	0.13	0.60		0	0.00	250	4.12	52	0.86	302	5.36	3.51	1.67	1.85
6	0.58	0.34	0.65		0	0.00	282	4.01	51	0.73	333	5.00	3.20	1.62	1.80
7	0.54	0.19	0.62		0	0.00	307	4.36	52	0.74	359	5.63	3.62	1.81	2.01
8	0.67	0.22	0.66		0	0.00	275	4.53	48	0.79	323	5.58	3.62	1.77	1.96
9	0.42	0.29	0.61	0.63	0	0.00	275	3.90	56	0.79	331	5.31	2.80	2.30	2.51
10	0.44	0.33	0.57		0	0.00	263	4.03	47	0.72	310	5.11	2.92	1.99	2.19
11	0.49	0.18	0.60		0	0.00	255	4.43	47	0.82	302	4.78	2.72	1.81	2.06
12	0.48	0.28	0.56		0	0.00	267	4.04	47	0.71	314	5.13	2.91	1.95	2.22
13	0.48	0.26	0.64		0	0.00	229	4.13	44	0.79	273	4.54	2.51	1.77	2.03
14	0.39	0.36	0.65		0	0.00	272	3.85	55	0.78	327	4.92	2.81	1.92	2.11
15	0.51	0.38	0.70		0	0.00	282	3.99	52	0.74	334	5.64	3.63	1.83	2.01
16	0.55	0.30	0.73		0	0.00	271	3.81	53	0.75	324	5.22	3.40	1.63	1.82
17	0.59	0.44	0.83		0	0.00	278	4.55	59	0.97	337	5.71	4.00	1.53	1.71
18	0.65	0.42	0.82		0	0.00	315	4.45	50	0.71	365	5.14	3.36	1.61	1.78
19	0.44	0.21	0.70		0	0.00	273	4.38	47	0.75	320	5.38	3.31	1.79	2.07
20	0.44	0.25	0.71		0	0.00	296	4.36	42	0.62	338	5.35	3.35	1.80	2.00
21	0.54	0.33	0.68		0	0.00	277	4.25	43	0.66	320	5.34	3.18	1.95	2.16
22	0.45	0.27	0.65		0	0.00	316	4.76	43	0.65	359	5.62	3.56	1.85	2.06
23	0.66	0.45	0.73	0.68	0	0.00	323	4.44	47	0.65	370	5.11	2.81	2.10	2.30
24	0.54	0.37	0.77		0	0.00	367	3.95	54	0.58	421	4.50	2.26	2.03	2.24
25	0.48	0.34	0.67		0	0.00	339	3.60	55	0.58	394	4.51	2.25	2.04	2.26
26	0.45	0.22	0.61		0	0.00	321	3.46	49	0.53	370	4.73	2.30	2.21	2.43
27	0.59	0.39	0.70		0	0.00	240	3.32	43	0.60	283	3.53	1.10	2.22	2.43
28	0.53	0.25	0.70		0	0.00	298	3.17	12	0.13	310	3.41	1.38	1.78	2.03
29	0.00	0.20	0.56	0.54	0	0.00	264	3.23	27	0.33	291	3.68	1.61	1.73	2.07
30	0.00	0.18	0.46		0	0.00	273	3.18	29	0.34	302	3.78	1.72	1.95	2.06
31	0.00	0.21	0.51		0	0.00	285	3.36	23	0.27	308	4.01	1.67	2.05	2.34
Tot.							8,519		1,370		10,153				
Avg.	0.49	0.29	0.64	0.62	0.00	0.00	281.67	4.06	46.50	0.68	328.17	4.91	2.86	1.84	2.06
Max	0.67	0.45	0.83	0.68	0.00	0.00	367.00	4.81	59.00	0.97	421.00	5.71	4.00	2.30	2.51
Min.	0.00	0.13	0.41	0.54	0.00	0.00	216.00	3.17	12.00	0.13	264.00	3.41	1.10	1.53	1.71

WSSN 0600 City of Benton Harbor Month/Year January-19

COAGULATION PARAMETERS

D A T E	MIL. GAL. TREAT.	Dry Al2(SO3)4 Pounds Add	ALUM as Al3+ mg/l	TURBIDITY UNITS RAW Avg.	RAW Max.	Applied Avg.	# sample	FILTERED NORTH Avg.	FILTERED NORTH Max.	# Samples	FILTERED SOUTH Avg.	FILTERED SOUTH Max.	2 Hour Compliance Periods # of Periods	#of Periods >.30NTU North	#of Periods >.30NTU South
1	0.8675	289.00	1.75	6.90	7.40	0.30	3	0.06	0.07	3	0.06	0.07	6	0	0
2	0.9450	308.00	1.71	8.20	10.10	0.34	3	0.06	0.07	2	0.07	0.08	5	0	0
3	0.8312	270.00	1.71	7.50	7.70	0.79	3	0.08	0.09	0	0.07	0.07	3	0	0
4	0.9450	337.00	1.88	8.20	8.70	0.77	3	0.06	0.06	0	0.09	0.10	3	0	0
5	0.9051	293.00	1.70	9.00	14.10	0.66	3	0.08	0.08	0	0.07	0.07	3	0	0
6	1.0500	333.00	1.47	7.60	8.40	0.69	3	0.07	0.08	0	0.06	0.07	3	0	0
7	1.0500	341.00	1.71	7.10	8.50	0.64	3	0.08	0.10	0	0.07	0.07	3	0	0
8	0.9071	310.00	1.80	7.20	10.60	0.50	3	0.07	0.08	0	0.07	0.08	3	0	0
9	1.0519	299.00	1.50	7.20	7.70	0.42	3	0.08	0.08	0	0.06	0.07	3	0	0
10	0.9750	327.00	1.76	8.30	9.20	0.55	3	0.07	0.08	0	0.06	0.06	3	0	0
11	0.8600	268.00	1.64	7.30	7.90	0.63	3	0.07	0.08	0	0.07	0.09	3	0	0
12	0.9870	297.00	1.58	6.40	9.50	0.55	3	0.07	0.08	0	0.07	0.08	3	0	0
13	0.8280	277.00	1.76	6.40	9.50	0.42	3	0.06	0.06	0	0.06	0.07	3	0	0
14	1.0560	352.00	1.75	5.80	7.60	0.46	3	0.07	0.09	0	0.07	0.08	3	0	0
15	1.0550	321.00	1.60	7.00	9.10	0.81	3	0.07	0.07	0	0.07	0.08	3	0	0
16	1.0612	340.00	1.69	8.30	11.60	0.63	3	0.06	0.07	0	0.07	0.07	3	0	0
17	0.9114	295.00	1.70	5.00	5.50	0.48	3	0.07	0.08	0	0.08	0.09	3	0	0
18	1.0556	350.00	1.74	8.30	12.00	0.57	3	0.07	0.07	0	0.07	0.08	3	0	0
19	0.9300	252.00	1.43	7.40	7.50	0.66	3	0.07	0.09	0	0.07	0.07	3	0	0
20	1.0125	313.00	1.63	8.70	11.60	0.55	3	0.07	0.07	0	0.07	0.08	3	0	0
21	0.9720	303.00	1.64	6.60	6.90	0.59	3	0.07	0.07	0	0.07	0.08	3	0	0
22	0.9900	330.00	1.75	8.00	10.90	0.72	3	0.07	0.09	0	0.07	0.08	3	0	0
23	1.0858	324.00	1.57	10.00	18.50	0.66	3	0.07	0.08	0	0.08	0.09	3	0	0
24	1.3860	485.00	1.84	14.70	20.60	1.40	3	0.10	0.14	0	0.10	0.13	3	0	0
25	1.4059	341.00	1.28	12.40	12.70	0.13	3	0.07	0.08	0	0.08	0.09	3	0	0
26	1.3839	457.00	1.28	10.20	15.40	0.93	3	0.07	0.08	0	0.11	0.14	3	0	0
27	1.0777	353.00	1.72	7.00	8.30	0.60	3	0.07	0.07	0	0.09	0.12	3	0	0
28	1.4014	431.00	1.62	7.90	9.50	1.00	3	0.07	0.08	0	0.12	0.16	3	0	0
29	1.2195	384.00	1.66	13.10	15.50	1.00	3	0.07	0.07	0	0.18	0.29	3	0	0
30	1.2820	353.00	1.45	14.40	21.60	1.10	3	0.07	0.08	0	0.11	0.14	3	0	0
31	1.2678	356.00	1.48	5.70	6.60	1.50	3	0.06	0.07	0	0.11	0.15	3	0	0
Total	32.7565	10289.00					93			5			98	0	0
Avg.	1.0567	331.90	1.64	8.32	10.67	0.68	93	0.07	0.08		0.08		Total	Total	Total
Max	1.4059	485.00	1.88	14.70	21.60	1.50		0.10	0.14		0.18	0.29	6	0	0
Min.	0.8280	252.00	1.28	5.00	5.50	0.13		0.06	0.06		0.06				

WSSN 0600

MONTH/YEAR January-19

CITY OF BENTON HARBOR CHEMICAL ANALYSES

D A T E	pH		Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	7.9	7.9	170	174	113	119	57	55	51	46	11	15		
2	7.9	7.8	162	164	133	118	29	46	55	53	6	8		
3	8.1	8.0	178	154	129	121	49	33	55	50	10	7		
4	8.0	8.0	192	168	129	124	63	44	63	53	9	9		
5	8.0	8.0	186	178	125	118	61	60	46	43	17	17		
6	8.0	8.0	186	176	125	118	61	58	51	47	14	14		
7	7.9	7.9	180	168	127	116	53	52	43	42	17	16		
8	7.8	7.8	178	168	123	116	55	52	45	42	17	16	24.5	26.5
9	7.9	7.8	168	158	112	106	56	52	45	43	14	12		
10	7.9	7.9	168	160	122	113	46	47	43	44	15	12		
11	7.9	7.9	162	164	120	117	42	47	47	50	11	10		
12	8.1	7.7	172	164	132	116	40	48	47	45	13	13	17.0	21.0
13	7.9	7.9	148	154	111	114	37	40	47	46	7	9		
14	7.9	7.8	166	158	119	109	47	49	43	43	14	12		
15	7.9	7.8	210	160	145	107	65	53	55	42	18	14		
16	7.9	7.9	190	184	137	122	53	62	45	43	19	18		
17	7.9	7.7	184	180	116	123	68	57	44	45	18	17		
18	7.9	8.0	184	190	127	122	57	68	44	45	18	19	19.5	22.5
19	7.9	7.9	154	156	119	123	35	33	45	44	10	11	20.5	24.0
20	7.9	7.9	176	172	114	119	62	53	46	46	15	14		
21	7.8	7.8	168	170	112	117	56	53	47	49	12	12		
22	7.9	7.8	164	152	134	112	30	40	55	51	6	6		
23	7.8	7.7	180	166	132	115	48	51	50	45	14	13		
24	7.8	7.8	176	172	120	121	56	51	46	45	15	15		
25	8.0	7.9	174	168	124	118	50	50	45	43	15	15		
26	7.9	7.9	170	164	128	118	42	46	41	44	17	13		
27	8.0	7.9	184	168	127	117	57	51	45	42	17	16	21.5	24.0
28	7.9	7.9	158	156	118	114	40	42	47	46	10	10	23.0	24.5
29	7.9	7.8	172	162	127	121	45	41	51	46	11	12		
30	7.9	7.8	146	142	109	116	37	26	49	47	6	6		
31	7.9	7.7	148	152	119	109	29	43	49	49	6	7		
Avg.	7.9	7.9	173.5	165.7	123.6	117.0	49.9	48.7	47.9	45.7	13.2	12.7	21.0	23.8
Max	8.1	8.0	210.0	190.0	145.0	124.0	68.0	68.0	63.0	53.0	19.0	19.0	24.5	26.5
Min.	7.8	7.7	146.0	142.0	109.0	106.0	29.0	26.0	41.0	42.0	6.0	6.0	17.0	21.0

WSSN 0600 MONTH/YEAR January-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

DATE	RAW No. of Samples	RAW Colilert P/A	PLANT TAP No. of Samples	PLANT TAP Colilert P/A	Standard Plate Count Raw	Standard Plate Count Tap	Raw TEMP. 'C	Tap TEMP. 'C	COLOR ___True ___Appar. Raw	COLOR Tap	ODOR ___Cold ___60'C Raw	ODOR Tap
1			1	A	53	0	4	5.5				
2			1	A	93	0	5	8.0				
3			1	A	218	1	4	9.0				
4			1	A	156	0	5	8.0				
5			1	A	119	0	4	5.5				
6			1	A	114	0	5	5.5				
7			1	A	90	0	5	5.5				
8			1	A	82	0	5	5.5				
9			1	A	80	0	4	5.5				
10			1	A	67	0	4	5.5				
11			1	A	54	0	4	7.0				
12			1	A	56	0	4	7.0				
13			1	A	290	13	4	7.0				
14			1	A	110	0	3	4.5				
15			1	A	65	0	3	4.6				
16			1	A	85	0	4	4.5				
17			1	A	83	0	3	4.5				
18			1	A	58	0	3	4.5				
19			1	A	38	0	3	6.0				
20			1	A	34	20	3	6.0				
21			1	A	81	1	2	5.0				
22			1	A	341	2	2	4.5				
23			1	A	76	1	2	3.0				
24			1	A	77	0	2	2.5				
25			1	A	72	0	2	2.5				
26			1	A	61	0	2	2.5				
27			1	A	60	0	1.7	2.5				
28			1	A	46	0	9.0	12.0				
29			1	A	30	0	8.7	8.5				
30			1	A	55	0	8.5	9.5				
31			1	A	131	0	3.0	5.0				
AVG.			1	A	96	1	4	6				
Max					341	20	9	12				
Min					30	0	2	3				

DISTRIBUTION SYSTEM MONITORING

WSSN 0600

January-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5										
6										
7										
8										
9	1.21		1.34	1.01	0.89		1.10			
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	1.17		1.41	1.72	1.27		0.72			
24										
25										
26										
27										
28										
29	0.93		1.23	1.36	1.45		1.39			
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15	
Total number of positive routine distribution samples	0600		
Total number of routine distribution samples required	0600	10	Max / Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.21	1.72 / 0.72
Total number of check samples	0600		
Total number of positive check samples	0600		

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** Month/Year **June-19**

F1-S1 **F1-S2**

Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.3399	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	245.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.04	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.91	Gallons Per Square Feet per Minute
Average Wash Water Use:	12.40%	Percent of Treated Water

Chemical Data

Chlorine on hand:	49490	lb.	Est. supply:	246	days
Primary Coagulant (Alum (Al3+)) on hand:	65133	lb.	Est. supply:	163	days
Cost of All Chemicals per Million Gallons:	$66.09	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	90	90
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month?	NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	
Did POE disinfectant residual fall below 0.2 ppm during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	
Was minimum C*T credit achieved for the entire month?	YES
If no, indicate on a separate sheet the date(s) not achieved.	
Was continuous POE chlorine residual monitoring equipment off-line during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	

Distribution	Total	29.15056	Avg	1.002112	Max	1.14064	Min	0.90952

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **June-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l											TAP	
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use				
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.57	0.31	0.77		0	0.00	239	3.64	27	0.41	266	4.35	2.25	1.91	2.10
2	0.67	0.23	0.84		0	0.00	232	3.65	25	0.39	257	4.16	2.27	1.73	1.89
3	0.52	0.32	0.73		0	0.00	237	3.56	54	0.81	291	4.66	2.51	1.96	2.15
4	0.48	0.26	0.76		0	0.00	228	3.45	22	0.33	250	3.79	2.05	1.54	1.74
5	0.57	0.19	0.65	0.78	0	0.00	236	3.52	32	0.48	268	3.93	2.20	1.54	1.73
6	0.67	0.26	0.81		0	0.00	241	3.54	58	0.85	299	4.37	2.33	1.85	2.04
7	0.54	0.33	0.82		0	0.00	247	3.53	51	0.73	298	4.20	2.41	1.60	1.79
8	0.56	0.24	0.79		0	0.00	229	3.47	36	0.55	265	4.08	2.22	1.67	1.86
9	0.61	0.41	0.77		0	0.00	226	3.45	28	0.43	254	4.14	2.54	1.42	1.60
10	0.50	0.33	0.81		0	0.00	226	3.52	24	0.37	250	4.00	2.10	1.71	1.90
11	0.62	0.36	0.76		0	0.00	242	3.50	28	0.40	270	4.13	2.33	1.59	1.80
12	0.57	0.31	0.72		0	0.00	248	3.50	27	0.38	275	4.10	1.87	2.01	2.23
13	0.55	0.28	0.69	0.67	0	0.00	248	3.52	23	0.33	271	4.22	2.52	1.56	1.70
14	0.54	0.32	0.75		0	0.00	275	3.82	28	0.39	303	4.73	3.06	1.52	1.67
15	0.58	0.30	0.81		0	0.00	280	3.85	29	0.40	309	4.49	2.82	1.52	1.67
16	0.65	0.34	0.86		0	0.00	294	4.04	29	0.40	323	5.30	3.84	1.28	1.46
17	0.54	0.23	0.80		0	0.00	274	4.03	36	0.53	310	4.45	2.65	1.59	1.80
18	0.51	0.29	0.81		0	0.00	276	3.91	46	0.65	322	4.56	2.38	1.98	2.18
19	0.58	0.19	0.68	0.77	0	0.00	275	3.91	63	0.90	338	4.86	2.43	2.24	2.43
20	0.45	0.36	0.82		0	0.00	260	3.72	28	0.40	288	4.00	2.21	1.63	1.79
21	0.58	0.34	0.80		0	0.00	256	3.61	29	0.41	285	4.29	2.36	1.74	1.93
22	0.38	0.35	0.78		0	0.00	252	3.59	26	0.37	278	3.93	2.09	1.65	1.84
23	0.51	0.37	0.72		0	0.00	229	3.51	53	0.81	282	4.17	1.50	2.47	2.67
24	0.56	0.47	0.73		0	0.00	248	3.45	13	0.18	261	3.75	2.08	1.51	1.67
25	0.43	0.42	0.75		0	0.00	244	3.53	20	0.29	264	3.83	1.97	1.72	1.86
26	0.45	0.34	0.84		0	0.00	247	3.49	21	0.30	268	4.07	2.42	1.47	1.65
27	0.57	0.46	0.76		0	0.00	251	3.48	22	0.30	273	3.80	2.03	1.55	1.77
28	0.39	0.30	0.83		0	0.00	306	3.41	25	0.28	331	4.33	2.57	1.55	1.76
29	0.58	0.27	0.75		0	0.00	263	3.61	9	0.12	272	3.74	2.10	1.47	1.64
30	0.58	0.37	0.77		0	0.00	234	3.43	17	0.25	251	3.93	2.18	1.59	1.75
31															
Tot.							7,304		902		8,472				
Avg.	0.54	0.32	0.77	0.74	0.00	0.00	251.43	3.61	30.97	0.45	282.40	4.21	2.34	1.69	1.87
Max	0.67	0.47	0.86	0.78	0.00	0.00	306.00	4.04	63.00	0.90	338.00	5.30	3.84	2.47	2.67
Min.	0.38	0.19	0.65	0.67	0.00	0.00	226.00	3.41	9.00	0.12	250.00	3.74	1.50	1.28	1.46

WSSN 0600 City of Benton Harbor Month/Year June-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS												
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.9800	308.00	1.65	1.40	1.70	0.16	3	0.02	0.02	3	0.02	0.02	6	0	0
2	0.9500	296.00	1.64	1.20	1.70	0.13	3	0.03	0.04	3	0.02	0.02	6	0	0
3	0.9925	307.00	1.63	2.20	3.20	0.21	3	0.04	0.07	3	0.05	0.06	6	0	0
4	0.9875	296.00	1.58	1.30	2.40	0.17	3	0.06	0.07	3	0.05	0.05	6	0	0
5	1.0000	302.00	1.59	1.80	2.90	0.23	3	0.05	0.06	3	0.05	0.06	6	0	0
6	1.0150	305.00	1.57	1.90	2.70	0.29	3	0.05	0.05	3	0.04	0.05	6	0	0
7	1.0450	311.00	1.57	2.40	4.40	0.20	3	0.04	0.05	3	0.05	0.07	6	0	0
8	0.9850	268.00	1.43	2.00	3.00	0.16	3	0.05	0.06	3	0.05	0.05	6	0	0
9	0.9775	288.00	1.55	1.20	1.70	0.25	3	0.05	0.06	3	0.05	0.07	6	0	0
10	0.9575	290.00	1.59	1.80	2.90	0.18	3	0.03	0.04	3	0.02	0.03	6	0	0
11	1.0325	309.00	1.57	1.80	2.70	0.15	3	0.02	0.03	3	0.03	0.03	6	0	0
12	1.0575	317.00	1.58	2.20	2.50	0.21	3	0.03	0.04	3	0.02	0.02	6	0	0
13	1.0525	320.00	1.60	5.80	8.70	0.21	3	0.02	0.02	3	0.03	0.02	6	0	0
14	1.0750	324.00	1.59	6.50	7.90	0.22	3	0.02	0.03	3	0.03	0.03	6	0	0
15	1.0850	326.00	1.58	6.50	7.40	0.45	3	0.02	0.03	3	0.03	0.04	6	0	0
16	1.0875	328.00	1.59	2.30	2.50	0.20	3	0.02	0.02	3	0.03	0.05	6	0	0
17	1.0150	305.00	1.58	3.10	4.90	0.20	3	0.05	0.06	3	0.06	0.06	6	0	0
18	1.0550	313.00	1.56	2.90	5.10	0.20	3	0.04	0.05	3	0.04	0.05	6	0	0
19	1.0500	316.00	1.58	3.20	5.20	0.15	3	0.03	0.03	3	0.03	0.04	6	0	0
20	1.0425	311.00	1.57	2.50	4.60	0.14	3	0.04	0.04	3	0.03	0.04	6	0	0
21	1.0600	320.00	1.59	2.40	2.70	0.21	3	0.04	0.04	3	0.03	0.04	6	0	0
22	1.0475	316.00	1.59	2.60	4.60	0.16	3	0.03	0.04	3	0.03	0.04	6	0	0
23	0.9750	290.00	1.56	2.00	3.10	0.16	3	0.03	0.04	3	0.03	0.03	6	0	0
24	1.0725	328.00	1.61	1.50	1.90	0.14	3	0.03	0.03	3	0.03	0.03	6	0	0
25	1.0325	321.00	1.64	2.10	2.80	0.17	3	0.03	0.03	3	0.03	0.03	6	0	0
26	1.0575	322.00	1.64	1.30	1.90	0.12	3	0.03	0.03	3	0.02	0.02	6	0	0
27	1.0775	328.00	1.60	1.30	1.50	0.12	3	0.03	0.03	3	0.02	0.02	6	0	0
28	1.3399	406.00	1.59	5.00	7.60	0.21	3	0.03	0.03	3	0.02	0.02	6	0	0
29	1.0875	341.00	1.65	1.80	3.20	0.13	3	0.03	0.04	3	0.03	0.04	6	0	0
30	1.0175	301.00	1.56	1.50	2.50	0.14	3	0.02	0.03	3	0.02	0.02	6	0	0
31															
Total	31.2099	9413.00					90			90			180	0	0
Avg.	1.0403	313.77	1.59	2.52	3.66	0.19		0.03	0.04		0.03		Total	Total	Total
Max	1.3399	406.00	1.65	6.50	8.70	0.45		0.06	0.07		0.06	0.07	6	0	0
Min.	0.9500	268.00	1.43	1.20	1.50	0.12		0.02	0.02		0.02				

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness		Total Alkalinity		Non-Carb. Hardness		Calcium		Magnesium		Chloride	
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	8.1	150	142	116	109	34	33	44	41	10	10		
2	8.1	8.1	136	138	114	113	22	25	42	42	7	8		
3	8.0	8.1	164	154	115	106	49	48	41	39	15	14		
4	7.9	8.1	162	152	117	108	45	44	40	38	15	14		
5	8.0	8.0	166	150	117	105	49	45	43	39	14	13		
6	8.1	8.1	168	152	123	109	45	43	42	39	15	13		
7	7.9	8.0	168	160	120	113	48	47	42	39	16	15	18.0	21.5
8	8.0	8.0	158	154	113	111	45	43	39	38	15	15		
9	8.0	8.1	160	154	114	110	46	44	39	38	15	16		
10	8.1	7.9	136	134	114	112	22	22	46	45	5	5	20.5	22.0
11	8.1	8.1	152	146	113	112	39	34	43	41	11	11		
12	8.2	8.2	148	146	124	110	24	36	45	43	9	9		
13	8.2	8.1	148	144	117	112	31	32	42	40	11	11		
14	8.2	8.1	156	146	121	113	35	33	42	41	12	11		
15	8.2	8.1	168	150	131	115	37	35	46	46	13	9		
16	8.2	8.3	150	156	110	119	40	37	38	43	13	12		
17	8.0	8.1	152	154	107	111	45	43	38	39	14	14	21.0	24.0
18	8.0	8.1	154	148	115	106	39	42	37	38	15	13		
19	8.0	8.0	152	148	108	105	44	43	38	38	14	13		
20	8.0	8.0	156	150	110	105	46	45	37	36	16	15		
21	8.0	8.1	154	146	109	102	45	44	38	37	14	13		
22	8.1	8.1	158	146	111	101	47	45	37	36	16	14		
23	8.1	8.1	148	144	110	104	38	40	36	37	14	13	19.0	23.0
24	8.1	8.1	142	138	117	106	25	32	41	38	10	10	19.5	22.0
25	8.1	8.1	138	136	113	104	25	32	42	39	8	6		
26	8.1	8.0	134	142	108	107	26	35	38	46	9	7		
27	8.1	8.1	142	136	106	103	36	33	37	36	12	11		
28	8.1	8.1	130	126	108	103	22	23	38	38	9	7		
29	8.2	8.1	138	132	108	101	30	31	39	36	10	10		
30	8.2	8.0	136	136	109	102	27	34	41	44	8	6		
31														
Avg.	8.1	8.1	150.8	145.3	113.9	107.9	36.9	37.4	40.4	39.7	12.2	11.3	19.6	22.5
Max	8.2	8.3	168.0	160.0	131.0	119.0	49.0	48.0	46.0	46.0	16.0	16.0	21.0	24.0
Min.	7.9	7.9	130.0	126.0	106.0	101.0	22.0	22.0	36.0	36.0	5.0	5.0	18.0	21.5

WSSN 0600 MONTH/YEAR June-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				Tap
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1			1	A	70	1	15	14.0	0.9128	38	1.65	1.32
2			1	A	29	2	14	14.0	0.9212	39	1.65	1.27
3			1	A	28	0	10	13.5	0.9324	39	1.64	1.29
4			1	A	30	0	10	12.5	0.9856	41	1.63	1.31
5	0.92	CH	1	A	0	0	13	12.0	1.0178	41	1.60	1.35
6	1.18	CH	1	A	40	1	13	12.5	1.0220	39	1.53	1.33
7	1.08	bt	1	A	44	2	12	13.0	1.0598	41	1.52	1.26
8	1.25	SS	1	A	35	0	11	12.5	0.9702	38	1.55	1.44
9	0.84	BZ	1	A	51	0	11	12.0	0.9156	38	1.62	1.19
10			1	A	69	0	13	14.5	0.9324	15	0.62	1.32
11			1	A	64	0	11	14.0	0.9758	43	1.74	1.22
12	1.08	CH	1	A	79	0	14	14.0	1.0024	43	1.69	1.28
13	1.06	CH	1	A	97	0	16	14.0	0.9576	45	1.84	1.24
14	1.21	W	1	A	48	0	15	14.0	0.9562	46	1.90	1.31
15	0.75	BS	1	A	75	3	17	16.0	1.0276	40	1.56	1.32
16	1.09	SS	1	A	32	2	17	16.0	0.9095	42	1.81	1.48
17	0.79	BZ	1	A	61	0	16	15.5	1.0392	51	1.93	1.18
18			1	A	52	0	16	16.5	1.0538	35	1.33	1.71
19	1.17	W	1	A	47	1	16	16.0	1.0384	53	2.01	1.30
20	1.18	CH	1	A	34	1	15	16.0	1.0758	53	1.94	1.05
21	1.49	BS	1	A	51	1	14	15.5	0.9923	48	1.89	1.38
22	1.22	BZ	1	A	62	3	14	15.0	1.0546	45	1.70	1.67
23	1.37	SS	1	A	73	1	14	14.5	1.0086	20	0.78	0.18
24			1	A	50	0	15	16.0	1.0392	52	1.96	0.37
25			1	A	41	0	17	16.0	1.0297	51	1.95	1.30
26			1	A	80	1	18	17.0	0.9826	44	1.78	1.76
27			1	A	26	0	17.0	17.0	1.0713	56	2.07	1.34
28			1	A	45	0	9.0	12.0	1.1406	40	1.38	1.34
29			1	A	74	0	8.7	8.5	1.0854	49	1.79	1.43
30			1	A	39	0	8.5	9.5	0.9528	45	1.88	1.43
31												
Total									30.0634	1,266.4		
AVG.	1.11		1	A	51	1	14	14	1.0021	42	1.66	1.28
Max	1.49				97	3	18	17	1.1406	56	2.07	1.76
Min	0.75				0	0	9	9	0.9095	15	0.62	0.18

DISTRIBUTION SYSTEM MONITORING WSSN 0600 June-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5	0.97		1.10	0.87	1.18		1.72			
6										
7										
8										
9										
10										
11										
12										
13	0.56		1.07	0.84	0.80		0.45			
14										
15										
16										
17										
18										
19	0.81		0.95	0.48	0.71		0.80			
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600	0		
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	0.89	1.72	0.45
Total number of check samples	0600	0		
Total number of positive check samples	0600	0		

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** **F1-S1**

Signature of Operator-in-Charge

Month/Year **March-19** **F1-S2**

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.2664	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	199.75	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.07	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.93	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.76%	Percent of Treated Water

Chemical Data

Chlorine on hand:	31815	lb.	Est. supply:	168	days
Primary Coagulant (Alum (Al3+)) on hand:	42495	lb.	Est. supply:	92	days
Cost of All Chemicals per Million Gallons:	$66.79	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	92	88
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	30.70932	Avg	1.0343368	Max	1.24356	Min	0.82712

Fluoride resumed 3/5/2019 after the Saturator to Day Tank Pump was fixed 3/4/2019
Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
I do not have this report ready for details of OPP treatment. I should soon.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **March-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l											TAP	
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use				
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.00	0.00	0.00		0	0.00	340	4.12	21	0.25	361	3.98	2.12	1.58	1.86
2	0.00	0.00	0.00		0	0.00	304	3.94	48	0.62	352	4.37	1.92	2.20	2.45
3	0.00	0.00	0.00		0	0.00	229	3.26	31	0.44	260	4.19	2.31	1.68	1.88
4	0.00	0.00	0.00	Pump tested & feed resumed	0	0.00	213	3.58	21	0.35	234	3.34	1.41	1.73	1.93
5	0.51	0.31	0.27		0	0.00	265	3.61	41	0.56	306	3.67	1.57	1.91	2.10
6	0.66	0.39	0.53		0	0.00	248	3.43	27	0.37	275	3.57	1.73	1.69	1.84
7	0.64	0.49	0.58		0	0.00	242	2.97	37	0.45	279	3.73	1.69	1.84	2.04
8	0.57	0.59	0.75		0	0.00	248	3.31	59	0.79	307	4.36	1.64	2.50	2.72
9	0.50	0.46	0.69		0	0.00	265	3.43	24	0.31	289	3.94	2.24	1.51	1.70
10	0.63	0.43	0.67		0	0.00	237	3.48	32	0.47	269	3.91	2.11	1.60	1.80
11	0.58	0.42	0.63		0	0.00	227	3.18	27	0.38	254	3.83	2.10	1.53	1.73
12	0.65	0.43	0.64		0	0.00	231	3.07	36	0.48	267	3.24	1.30	1.74	1.94
13	0.56	0.44	0.59	0.54	0	0.00	229	2.95	35	0.45	264	3.56	1.69	1.67	1.87
14	0.39				0	0.00	254	2.99	21	0.25	275	3.70	1.82	1.66	1.88
15	0.40	0.25	0.40		0	0.00	241	3.23	14	0.19	255	3.37	1.75	1.33	1.62
16	0.48	0.26	0.55		0	0.00	251	3.22	27	0.35	278	4.00	2.31	1.51	1.69
17	0.36	0.31	0.55		0	0.00	212	3.18	25	0.38	237	3.77	2.25	1.24	1.52
18	0.53	0.33	0.57		0	0.00	255	3.51	35	0.48	290	4.18	2.44	1.48	1.74
19	0.39	0.24	0.64		0	0.00	257	3.47	32	0.43	289	4.25	2.24	1.81	2.01
20	0.42	0.25	0.55	0.45	0	0.00	251	3.32	26	0.34	277	3.77	1.88	1.67	1.89
21	0.58	0.20	0.60		0	0.00	236	3.36	23	0.33	259	4.22	2.33	1.68	1.89
22	0.65	0.30	0.62		0	0.00	216	3.07	70	1.00	286	4.29	1.92	2.14	2.37
23	0.60	0.39	0.74		0	0.00	185	2.86	30	0.46	215	3.58	1.49	1.88	2.09
24	0.66	0.42	0.75		0	0.00	170	2.74	33	0.53	203	3.66	1.56	1.88	2.10
25	0.46	0.31	0.67		0	0.00	196	2.84	20	0.29	216	3.20	0.42	2.59	2.78
26	0.56	0.27	0.66		0	0.00	217	2.85	21	0.28	238	3.65	1.98	1.53	1.67
27	0.44	0.30	0.60		0	0.00	216	3.10	27	0.39	243	3.96	2.02	1.72	1.94
28	0.39	0.29	0.63		0	0.00	235	3.19	25	0.34	260	4.06	2.18	1.72	1.88
29	0.40	0.25	0.60		0	0.00	202	2.99	22	0.33	224	3.61	1.72	1.63	1.89
30	0.59	0.34	0.59		0	0.00	183	3.06	29	0.49	212	3.79	2.02	1.51	1.77
31	0.60	0.28	0.59		0	0.00	190	2.93	38	0.59	228	3.72	1.52	1.97	2.20
Tot.							6,905		936		8,202				
Avg.	0.45	0.30	0.52	0.50	0.00	0.00	235.17	3.24	30.63	0.43	265.80	3.83	1.87	1.74	1.95
Max	0.66	0.59	0.75	0.54	0.00	0.00	340.00	4.12	70.00	1.00	361.00	4.37	2.44	2.59	2.78
Min.	0.00	0.00	0.00	0.45	0.00	0.00	170.00	2.74	14.00	0.19	203.00	3.20	0.42	1.24	1.52

WSSN 0600 City of Benton Harbor Month/Year March-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	1.2311	355.00	1.52	6.20	6.40	2.20	3	0.10	0.13	3	0.11	0.13	6	0	0
2	1.1512	471.00	2.15	6.80	10.30	1.30	3	0.10	0.11	2	0.09	0.10	5	0	0
3	1.0500	331.00	1.66	6.60	8.60	0.64	3	0.10	0.12	0	0.10	0.13	3	0	0
4	0.8875	340.00	2.02	9.20	13.70	0.78	3	0.10	0.12	3	0.09	0.11	6	0	0
5	1.0950	341.00	1.64	3.60	4.00	0.71	3	0.10	0.11	3	0.09	0.09	6	0	0
6	1.0800	384.00	1.66	4.30	7.40	0.56	3	0.11	0.12	3	0.10	0.12	6	0	0
7	1.2166	486.00	2.10	3.20	3.40	0.55	3	0.11	0.13	3	0.10	0.14	6	0	0
8	1.1200	325.00	1.53	2.70	3.10	0.68	3	0.09	0.10	3	0.09	0.10	6	0	0
9	1.1541	370.00	1.69	2.70	4.20	0.93	3	0.14	0.17	3	0.16	0.18	6	0	0
10	1.0180	338.00	1.75	2.60	2.90	0.53	3	0.11	0.12	3	0.11	0.15	6	0	0
11	1.0650	340.00	1.68	1.90	3.00	0.47	3	0.08	0.09	3	0.13	0.15	6	0	0
12	1.1250	369.00	1.73	2.60	4.80	0.50	3	0.07	0.07	3	0.11	0.15	6	0	0
13	1.1600	360.00	1.63	1.40	2.50	0.38	3	0.08	0.10	3	0.13	0.14	6	0	0
14	1.2664	403.00	1.67	2.80	3.90	1.10	3	0.09	0.13	3	0.19	0.23	6	0	0
15	1.1130	315.00	1.49	4.50	5.50	1.30	3	0.08	0.11	3	0.22	0.23	6	0	0
16	1.1619	362.00	1.64	4.20	4.70	0.94	3	0.09	0.09	3	0.08	0.08	6	0	0
17	0.9950	319.00	1.69	1.70	2.10	0.46	3	0.06	0.07	3	0.07	0.08	6	0	0
18	1.0850	345.00	1.67	2.00	2.70	0.48	3	0.06	0.07	3	0.07	0.08	6	0	0
19	1.1050	353.00	1.68	2.90	3.60	0.64	3	0.06	0.06	3	0.08	0.08	6	0	0
20	1.1300	359.00	1.67	3.40	5.50	0.52	3	0.07	0.07	3	0.07	0.08	6	0	0
21	1.0475	329.00	1.65	2.40	4.00	0.51	3	0.07	0.07	3	0.07	0.07	6	0	0
22	1.0500	321.00	1.61	1.50	1.80	0.44	3	0.06	0.07	3	0.07	0.07	6	0	0
23	0.9650	291.00	1.59	1.70	2.10	0.41	3	0.07	0.08	3	0.06	0.07	6	0	0
24	0.9263	285.00	1.62	3.10	4.20	0.47	3	0.07	0.08	3	0.08	0.09	6	0	0
25	1.0300	325.00	1.66	2.80	3.60	0.44	3	0.08	0.09	3	0.08	0.10	6	0	0
26	1.1375	345.00	1.66	1.80	1.80	0.29	3	0.06	0.07	3	0.06	0.07	6	0	0
27	1.0400	325.00	1.64	2.70	2.90	0.54	3	0.08	0.08	3	0.08	0.09	6	0	0
28	1.1000	343.00	1.64	3.10	3.80	0.56	3	0.07	0.08	3	0.07	0.08	6	0	0
29	1.0100	319.00	1.66	1.80	1.80	0.40	3	0.10	0.10	2	0.10	0.10	4	0	0
30	0.8925	283.00	1.67	1.80	3.20	0.37	3	0.08	0.09	3	0.09	0.12	6	0	0
31	0.9675	300.00	1.63	1.60	2.20	0.32	3	0.08	0.08	3	0.07	0.08	6	0	0
Total	33.3761	10732.00					93			88			180	0	0
Avg.	1.0766	346.19	1.69	3.21	4.31	0.66		0.08	0.10		0.10		Total	Total	Total
Max	1.2664	486.00	2.15	9.20	13.70	2.20		0.14	0.17		0.22	0.23	6	0	0
Min.	0.8875	283.00	1.49	1.40	1.80	0.29		0.06	0.06		0.06				

WSSN 0600 | MONTH/YEAR | March-19 |

CITY OF BENTON HARBOR CHEMICAL ANALYSES

D A T E	pH Raw 29.	pH Tap 30.	Total Hardness as CaCO3 mg/l Raw 31.	Total Hardness as CaCO3 mg/l Tap 32.	Total Alkalinity as CaCO3 mg/l Raw 33.	Total Alkalinity as CaCO3 mg/l Tap 34.	Non-Carb. Hardness as CaCO3 mg/l Raw 35.	Non-Carb. Hardness as CaCO3 mg/l Tap 36.	Calcium as Ca++ mg/l Raw 37	Calcium as Ca++ mg/l Tap 38	Magnesium as Mg++ mg/l Raw 39	Magnesium as Mg++ mg/l Tap 40	Chloride as Cl- mg/l Raw 41	Chloride as Cl- mg/l Tap 42
1	7.9	7.9	182	142	151	107	31	35	55	39	11	11		
2	7.9	8.0	184	172	136	123	48	49	46	44	17	15		
3	8.1	8.0	176	190	123	126	53	64	46	49	15	17		
4	7.9	7.9	168	184	112	119	56	65	42	48	15	16	46.5	27.5
5	8.0	7.9	188	168	130	114	58	54	49	43	16	15		
6	7.9	7.9	188	178	135	124	53	54	50	47	16	15		
7	7.9	7.9	184	180	116	125	68	55	49	47	15	15		
8	7.9	7.8	206	174	127	116	79	58	59	49	15	13		
9	8.0	8.0	194	180	139	124	55	56	50	46	17	16		
10	7.9	7.9	208	210	128	129	80	81	58	55	16	18		
11	7.9	7.9	188	184	122	125	66	59	50	48	16	16		
12	7.9	7.9	188	190	124	125	64	65	51	52	15	15		
13	7.8	7.8	176	186	115	119	61	67	44	47	16	17		
14	7.9	7.8	174	170	130	119	44	51	57	50	8	11	29.0	25.5
15	7.9	7.8	164	168	119	124	45	44	51	53	9	9		
16	7.9	7.9	174	176	121	122	53	54	54	52	10	11		
17	7.8	7.9	166	172	130	118	36	54	55	51	7	11	19.0	21.5
18	8.1	7.7	182	178	124	125	58	53	47	49	15	14		
19	8.0	0.0	190	182	122	119	68	63	63	58	8	9		
20	8.0	8.0	194	190	132	126	62	64	49	48	17	17		
21	7.9	7.8	192	178	133	123	59	55	51	47	16	15		
22	7.9	7.9	186	178	129	127	57	51	49	46	16	15		
23	8.0	8.0	172	186	117	125	55	61	45	49	15	16	21.0	24.0
24	8.0	8.0	188	174	125	118	63	56	51	46	15	14		
25	8.1	7.8	146	156	112	119	34	37	46	49	7	8		
26	8.0	7.9	158	166	106	116	52	50	46	48	10	11	18.5	22.0
27	8.0	8.0	206	158	145	112	61	46	62	59	13	4		
28	8.0	8.0	174	162	133	123	41	39	47	46	14	11		
29	7.9	7.9	166	172	117	120	49	52	47	50	12	12		
30	8.0	8.0	172	182	119	128	53	54	44	48	15	15		
31	8.0	8.0	160	180	116	121	44	59	40	47	15	15		
Avg.	7.9	7.6	181.1	176.2	125.7	121.3	55.4	54.9	50.4	48.8	13.6	13.4	26.8	24.1
Max	8.1	8.0	208.0	210.0	151.0	129.0	80.0	81.0	63.0	59.0	17.0	18.0	46.5	27.5
Min.	7.8	0.0	146.0	142.0	106.0	107.0	31.0	35.0	42.0	39.0	7.0	4.0	18.5	21.5

WSSN 0600 MONTH/YEAR March-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	RAW		PLANT TAP		Standard Plate Count		Raw	Tap	COLOR		ODOR	
D	No. of	Colilert	No. of	Colilert			TEMP.	TEMP.	___True		___Cold	
A	Samples	P/A	Samples	P/A			'C	'C	___Appar.		___60'C	
T					Raw	Tap			Raw	Tap	Raw	Tap
E												
1			1	A	131	0	2	4.0				
2			1	A	43	1	2	3.0				
3			1	A	28	1	2	3.5				
4			1	A	44	1	2	2.5				
5			1	A	89	0	2	2.5				
6			1	A	69	0	2	2.5				
7			1	A	90	0	2	2.0				
8			1	A	56	0	2	2.0				
9			1	A	75	0	2	2.5				
10			1	A	72	1	2	3.0				
11			1	A	33	0	2	2.5				
12			1	A	17	1	2	2.5				
13			1	A	29	0	2	3.5				
14			1	A	20	0	4	5.0				
15			1	A	57	0	4	5.0				
16			1	A	59	0	4	7.0				
17			1	A	43	0	4	6.0				
18			1	A	77	1	4	5.0				
19			1	A	72	1	5	6.0				
20			1	A	38	0	4	4.5				
21			1	A	82	0	4	5.0				
22			1	A	37	1	4	5.0				
23			1	A	36	1	3	0.0				
24			1	A	16	0	4	4.0				
25			1	A	46	0	3	6.0				
26			1	A	29	1	3	5.5				
27			1	A	39	0	5.0	6.0				
28			1	A	56	6	9.0	12.0				
29			1	A	54	29	8.7	8.5				
30			1	A	61	2	8.5	9.5				
31			1	A	46	1	3.2	5.5				
AVG.			1	A	53	2	3	5				
Max					131	29	9	12				
Min					16	0	2	0				

DISTRIBUTION SYSTEM MONITORING WSSN 0600 March-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13	1.18		1.07	1.19	0.94		0.93			
14										
15										
16										
17										
18										
19										
20	0.93		1.15	0.34	0.96		1.00			
21										
22										
23										
24										
25										
26										
27	1.19		1.21	1.15	1.15		1.59			
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.07	1.59	0.34
Total number of check samples	0600			
Total number of positive check samples	0600			

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** Month/Year **November-19**

F1-S1 **F1-S2**

Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.0975	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	196.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.01	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.95	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.78%	Percent of Treated Water

Chemical Data

Chlorine on hand:	37875	lb.	Est. supply:	257 days
Primary Coagulant (Alum (Al3+)) on hand:	66324	lb.	Est. supply:	125 days
Cost of All Chemicals per Million Gallons:	$67.75	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	90	90
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month?	NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	
Did POE disinfectant residual fall below 0.2 ppm during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	
Was minimum C*T credit achieved for the entire month?	YES
If no, indicate on a separate sheet the date(s) not achieved.	
Was continuous POE chlorine residual monitoring equipment off-line during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	

Distribution	Total	27.6451	Avg	0.95333	Max	1.1354	Min	0.7336

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

WSSN 0600 City of Benton Harbor

Month/Year November-19

COAGULATION PARAMETERS

D A T E	MIL. GAL. TREAT.	Dry Al2(SO3)4 Pounds Add	ALUM as Al3+ mg/l	TURBIDITY UNITS RAW Avg.	RAW Max.	Applied Avg.	# ample	FILTERED NORTH Avg.	FILTERED NORTH Max.	# Samples	FILTERED SOUTH Avg.	FILTERED SOUTH Max.	2 Hour Compliance Periods # of Periods	#of Periods >.30NTU North	#of Periods >.30NTU South
1	0.9525	314.00	1.73	12.30	18.30	0.62	3	0.06	0.08	3	0.06	0.07	6	0	0
2	0.7550	230.00	1.60	18.50	20.00	1.30	3	0.07	0.07	3	0.08	0.08	6	0	0
3	1.0825	352.00	1.71	17.10	25.50	1.20	3	0.08	0.09	3	0.08	0.10	6	0	0
4	0.9775	325.00	1.75	13.30	14.10	1.10	3	0.10	0.12	3	0.10	0.12	6	0	0
5	0.9975	349.00	1.84	11.20	13.90	1.10	3	0.07	0.08	3	0.10	0.11	6	0	0
6	1.0100	313.00	1.82	8.90	11.00	1.00	3	0.10	0.11	3	0.10	0.11	6	0	0
7	1.0275	323.00	1.65	9.60	11.80	0.92	3	0.09	0.10	3	0.12	0.13	6	0	0
8	0.9675	290.00	1.58	8.80	9.40	0.88	3	0.08	0.08	3	0.09	0.10	6	0	0
9	1.0075	305.00	1.59	10.90	19.30	1.10	3	0.09	0.10	3	0.11	0.13	6	0	0
10	0.8750	277.00	1.67	7.60	11.90	1.10	3	0.09	0.10	3	0.06	0.08	6	0	0
11	1.0075	312.00	1.63	5.80	7.00	0.84	3	0.07	0.07	3	0.07	0.08	6	0	0
12	0.9500	301.00	1.67	10.10	16.20	0.84	3	0.07	0.07	3	0.07	0.07	6	0	0
13	1.0275	321.00	1.64	13.00	15.50	1.60	3	0.08	0.10	3	0.06	0.08	6	0	0
14	1.0500	322.00	1.61	13.40	26.20	2.00	3	0.12	0.12	3	0.08	0.08	6	0	0
15	1.0650	323.00	1.60	10.90	15.70	1.40	3	0.10	0.12	3	0.07	0.07	6	0	0
16	1.0800	339.00	1.65	5.20	5.60	1.20	3	0.11	0.13	3	0.08	0.08	6	0	0
17	1.0375	326.00	1.65	5.50	7.60	1.20	3	0.14	0.15	3	0.08	0.09	6	0	0
18	1.0625	322.00	1.59	4.20	4.40	1.30	3	0.12	0.13	3	0.08	0.08	6	0	0
19	0.9250	287.00	1.63	7.20	13.80	0.97	3	0.10	0.12	3	0.08	0.08	6	0	0
20	1.0975	337.00	1.62	5.90	11.40	0.99	3	0.08	0.09	3	0.07	0.09	6	0	0
21	1.0775	326.00	1.59	3.60	4.30	1.00	3	0.10	0.14	3	0.08	0.08	6	0	0
22	1.0950	333.00	1.60	7.70	9.40	0.89	3	0.08	0.08	3	0.08	0.08	6	0	0
23	1.0650	308.00	1.52	6.00	7.40	0.87	3	0.06	0.07	3	0.08	0.08	6	0	0
24	0.9875	297.00	1.58	4.90	5.00	0.66	3	0.06	0.06	3	0.08	0.09	6	0	0
25	0.9975	300.00	1.58	4.00	5.40	0.59	3	0.06	0.07	3	0.07	0.07	6	0	0
26	1.0900	322.00	1.58	3.40	4.70	0.56	3	0.06	0.07	3	0.07	0.08	6	0	0
27	1.0425	318.00	1.60	4.70	5.90	1.00	3	0.07	0.08	3	0.07	0.08	6	0	0
28	0.9350	310.00	1.74	10.60	14.40	0.80	3	0.06	0.07	3	0.05	0.06	6	0	0
29	0.9250	276.00	1.57	27.90	33.70	2.30	3	0.07	0.07	3	0.07	0.08	6	0	0
30	0.9275	314.00	1.78	19.00	26.60	2.60	3	0.08	0.09	3	0.08	0.08	6	0	0
31														0	0
Total	30.0975	9372.00					90			90			180	0	0
Avg.	1.0033	312.40	1.65	9.71	13.18	1.13		0.08	0.09		0.08		Total	Total	Total
Max	1.0975	352.00	1.84	27.90	33.70	2.60		0.14	0.15		0.12	0.13	6	0	0
Min.	0.7550	230.00	1.52	3.40	4.30	0.56		0.06	0.06		0.05				

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **November-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l											TAP	
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use				
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.47	0.14	0.77		0	0.00	210	3.29	21	0.33	231	3.61	1.75	1.70	1.86
2	0.43	0.39	0.79		0	0.00	172	3.40	14	0.28	186	3.78	2.03	1.59	1.75
3	0.51	0.27	0.78		0	0.00	266	3.67	32	0.44	298	4.16	2.49	1.51	1.67
4	0.61	0.29	0.79		0	0.00	261	3.99	40	0.61	301	4.78	3.00	1.58	1.78
5	0.44	0.25	0.76		0	0.00	285	4.27	41	0.61	326	5.31	3.64	1.51	1.67
6	0.59	0.48	0.82	0.85	0	0.00	267	3.95	25	0.37	292	4.59	2.85	1.57	1.74
7	0.48	0.29	0.85		0	0.00	282	4.10	31	0.45	313	4.73	2.68	1.91	2.05
8	0.56	0.33	0.82		0	0.00	264	4.07	18	0.28	282	4.51	2.90	1.46	1.61
9	0.51	0.29	0.80		0	0.00	263	3.90	23	0.34	286	4.50	2.65	1.66	1.85
10	0.60	0.29	0.82		0	0.00	245	4.18	33	0.56	278	4.85	2.90	1.76	1.95
11	0.40	0.27	0.81		0	0.00	250	3.70	52	0.77	302	4.59	2.50	1.91	2.09
12	0.55	0.29	0.82	0.78	0	0.00	227	3.57	38	0.60	265	4.07	2.02	1.86	2.05
13	0.50	0.26	0.79		0	0.00	235	3.41	31	0.45	266	3.92	1.98	1.77	1.94
14	0.53	0.18	0.76		0	0.00	254	3.61	34	0.48	288	4.14	2.36	1.55	1.78
15	0.60	0.16	0.71		0	0.00	261	3.66	30	0.42	291	4.16	2.36	1.58	1.80
16	0.43	0.17	0.76		0	0.00	264	3.65	36	0.50	300	4.55	2.44	1.91	2.11
17	0.55	0.23	0.71		0	0.00	254	3.65	21	0.30	275	4.26	2.49	1.58	1.77
18	0.56	0.24	0.64		0	0.00	263	3.70	55	0.77	318	4.71	2.61	1.93	2.10
19	0.52	0.15	0.63		0	0.00	222	3.58	26	0.42	248	4.13	2.14	1.81	1.99
20	0.66	0.34	0.78	0.78	0	0.00	258	3.51	28	0.38	286	3.76	1.73	1.84	2.03
21	0.50	0.39	0.85		0	0.00	254	3.52	27	0.37	281	4.53	2.53	1.82	2.00
22	0.49	0.29	0.83		0	0.00	251	3.42	28	0.38	279	4.28	2.45	1.66	1.83
23	0.50	0.36	0.87		0	0.00	244	3.42	37	0.52	281	4.54	2.56	1.75	1.98
24	0.49	0.39	0.74		0	0.00	233	3.52	19	0.29	252	3.73	2.02	1.46	1.71
25	0.47	0.40	0.79		0	0.00	236	3.53	28	0.42	264	4.07	2.12	1.79	1.95
26	0.51	0.53	0.86		0	0.00	254	3.48	25	0.34	279	4.21	2.63	1.38	1.58
27	0.52	0.24	0.78		0	0.00	249	3.57	28	0.40	277	4.27	2.73	1.38	1.54
28	0.47	0.33	0.79		0	0.00	215	3.43	14	0.22	229	3.98	2.28	1.53	1.70
29	0.50	0.17	0.82		0	0.00	209	3.37	19	0.31	228	4.12	2.20	1.75	1.92
30	0.56	0.24	0.82		0	0.00	209	3.36	21	0.34	230	4.13	2.21	1.75	1.92
Tot.							7,147		854		8,232				
Avg.	0.52	0.29	0.79	0.80	0.00	0.00	245.23	3.65	29.17	0.43	274.40	4.30	2.44	1.68	1.86
Max	0.66	0.53	0.87	0.85	0.00	0.00	285.00	4.27	55.00	0.77	326.00	5.31	3.64	1.93	2.11
Min.	0.40	0.14	0.63	0.78	0.00	0.00	172.00	3.29	14.00	0.22	186.00	3.61	1.73	1.38	1.54

WSSN 0600

MONTH/YEAR November-19

CITY OF BENTON HARBOR CHEMICAL ANALYSES

DAY	pH		Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	7.9	7.9	162	156	112	106	50	50	41	40	15	14	18.0	21.5
2	8.1	8.1	176	160	137	106	39	54	40	38	18	16		
3	8.1	8.1	196	178	131	111	65	67	54	49	15	14		
4	8.1	8.1	170	150	137	116	33	34	54	47	9	8	24.0	25.5
5	8.0	8.1	172	162	131	125	41	37	49	51	12	9		
6	8.1	7.8	186	178	123	119	63	59	45	43	18	17		
7	8.0	8.1	168	162	134	122	34	40	52	51	9	9		
8	8.1	8.1	144	146	115	119	29	27	45	46	8	8		
9	8.1	8.0	192	174	128	112	64	62	46	42	19	17		
10	8.0	8.0	184	166	138	114	46	52	44	42	18	15		
11	8.1	8.1	176	186	115	119	61	67	46	49	15	16		
12	8.0	8.1	176	180	113	114	63	66	46	49	15	14		
13	8.0	8.0	184	174	117	112	67	62	50	42	15	17		
14	8.2	7.9	182	152	154	121	28	31	63	52	6	5	23.5	24.0
15	8.1	7.9	148	158	116	119	32	39	51	52	5	7		
16	8.0	8.1	154	152	122	116	32	36	47	45	9	10		
17	8.1	8.1	168	160	129	121	39	39	51	49	10	9		
18	7.9	8.1	190	170	133	115	57	55	46	43	18	15		
19	8.0	8.1	172	176	122	120	50	56	45	48	15	16		
20	8.1	8.1	186	178	127	118	59	60	46	45	17	16		
21	8.0	8.1	196	180	138	117	58	63	51	46	17	16		
22	8.3	8.2	178	184	132	122	46	62	45	48	16	16	19.0	23.0
23	8.1	8.0	142	156	117	124	25	32	42	46	9	10		
24	8.1	8.1	162	158	122	121	40	37	47	46	11	10		
25	8.0	7.9	162	164	126	127	36	37	50	50	9	8	19.5	25.5
26	8.1	8.2	170	166	143	127	27	39	55	55	8	7		
27	8.1	8.1	198	178	138	120	60	58	51	46	17	15	19.0	23.5
28	8.0	8.1	176	188	111	120	65	68	49	51	13	15		
29	8.0	8.0	174	178	114	109	60	69	42	46	17	16		
30	7.9	8.0	170	174	115	107	55	67	41	45	17	15		
31														
Avg.	8.1	8.1	173.8	168.1	126.3	117.3	47.5	50.8	47.8	46.7	13.3	12.7	20.5	23.8
Max	8.3	8.2	198.0	188.0	154.0	127.0	67.0	69.0	63.0	55.0	19.0	17.0	24.0	25.5
Min.	7.9	7.8	142.0	146.0	111.0	106.0	25.0	27.0	40.0	38.0	5.0	5.0	18.0	21.5

WSSN 0600 MONTH/YEAR November-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1			1	A	75	0	11	12.5	0.9548	46	1.91	1.54
2			1	A	93	0	11	12.5	0.7336	50	2.68	1.45
3			1	A	119	0	11	12.0	1.0696	47	1.73	1.46
4			1	A	119	9	10	11.5	0.9394	45	1.87	1.37
5			1	A	108	0	10	12.0	0.9170	50	2.16	1.62
6	1.47	City Hall	1	A	102	0	10	10.5	0.9492	49	2.03	1.55
6	1.39	Wolfs	1	A	97	0	10	11.0	0.9884	51	2.02	1.54
6	1.58	Bait Shed	1	A	164	0	10	11.0	0.9338	53	2.24	1.48
6	1.57	Sunny Spot	1	A	95	1	8	10.0	0.9478	45	1.88	1.51
6	1.33	B & Z	1	A	102	0	8	9.5	0.8554	52	2.41	0.00
11			1	A	111	0	8	9.0	0.9828	51	2.03	1.48
12	1.52	City Hall	1	A	168	0	8	9.0	0.9716	36	1.45	1.47
12	1.34	Wolfs	1	A	109	1	7	8.5	1.0136	54	2.11	1.46
12	1.45	Bait Shed	1	A	152	0	7	9.0	1.0374	60	2.28	1.56
12	1.40	Sunny Spot	1	A	146	0	7	8.0	1.0430	54	2.05	1.56
12	1.25	B & Z	1	A	50	2	6	8.5	0.9842	58	2.32	1.47
17			1	A	74	4	7	8.0	0.9639	59	2.43	1.53
18			1	A	58	0	7	7.0	1.0080	56	2.21	1.50
19			1	A	79	0	6	6.5	0.8960	58	2.54	1.57
20	1.66	City Hall	1	A	86	0	6	7.0	1.1354	56	1.94	1.50
20	1.47	Wolfs	1	A	98	1	6	6.5	0.9268	57	2.44	1.41
20	1.51	Bait Shed	1	A	85	0	7	7.5	0.9730	19	0.79	1.47
20	1.45	Sunny Spot	1	A	98	0	7	8.0	0.9240	58	2.48	1.51
20	1.24	B & Z	1	A	72	0	7	8.0	1.0080	65	2.54	1.56
25			1	A	58	0	7	8.0	0.9688	39	1.60	1.45
26			1	A	45	12	7	8.0	0.9898	52	2.07	1.49
27			1	A	153	0	7.2	7.5	0.9688	50	2.05	1.47
28			1	A	163	0	9.0	12.0	0.8582	46	2.11	1.52
29			1	A	236	0	8.7	8.5	0.8260	44	2.11	1.52
30			1	A	95	0	8.5	9.5	0.8316	46	2.20	1.48
			1									
Totals									28.5999	1502.5		
AVG.	1.44		1	A	108	1	8	9	0.9533	50.1	2.10	1.45
Max	1.66				236	12		13	1.1354	64.6	2.68	1.62
Min	1.24				45	0	6	7	0.7336	19.4	0.79	0.00

DISTRIBUTION SYSTEM MONITORING WSSN 0600 November-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5										
6	1.47		1.15	1.00	1.06		0.53			
7										
8										
9										
10										
11										
12	1.26		1.16	0.88	1.37		0.99			
13										
14										
15										
16										
17										
18										
19										
20	1.28		1.15	1.26	1.11		0.98			
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.11	1.47	0.53
Total number of check samples	0600			
Total number of positive check samples	0600			

BNI 0600 Benton Harbor MOR October 2019 11/7/19

MONTHLY OPERATION REPORT OF THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: CITY OF BENTON HARBOR

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1

Signature of Operator-in-Charge

Month/Year **October-19** F1-S2

Water Plant Classification

Berrien County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1552	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	193.75	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.99	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.97	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.73%	Percent of Treated Water

Chemical Data

Chlorine on hand:	47470	lb.	Est. supply:	234	days
Primary Coagulant (Alum (Al3+)) on hand:	92933	lb.	Est. supply:	155	days
Cost of All Chemicals per Million Gallons:	$79.34	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month?	NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	
Did POE disinfectant residual fall below 0.2 ppm during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	
Was minimum C*T credit achieved for the entire month?	YES
If no, indicate on a separate sheet the date(s) not achieved.	
Was continuous POE chlorine residual monitoring equipment off-line during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	

Distribution	Total	27.692576	Avg	0.923167	Max	1.0796	Min	0.7748

Remarks. We have been feeding Orthopolyphosphate (OPP) 70/30 Carus 8600 33% since March 25, 2019
Averaging about 2,200 lbs per month: 221 Days so far. Started 2nd Round of Lead and Copper Sampling.

WSSN 0600 City of Benton Harbor

Month/Year October-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS												
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of Periods	#of Periods >.30NTU	#of Periods >.30NTU
T		Pounds													
E		Add												North	South
1	1.0075	292.00	1.52	2.90	3.30	0.26	3	0.06	0.06	3	0.07	0.07	6	0	0
2	0.9550	337.00	1.86	2.70	4.10	0.33	3	0.08	0.08	3	0.07	0.08	6	0	0
3	1.0425	427.00	2.15	3.80	5.70	0.25	3	0.08	0.08	3	0.08	0.08	6	0	0
4	0.9475	311.00	1.73	3.30	3.80	0.29	3	0.08	0.08	3	0.06	0.07	6	0	0
5	1.0150	313.00	1.62	2.50	2.60	0.34	3	0.08	0.09	3	0.06	0.07	6	0	0
6	1.0200	302.00	1.61	4.30	5.20	0.54	3	0.09	0.10	3	0.07	0.08	6	0	0
7	1.0825	363.00	1.76	4.60	5.80	0.54	3	0.09	0.10	3	0.07	0.08	6	0	0
8	1.0400	352.00	1.78	4.10	5.50	0.43	3	0.08	0.09	3	0.07	0.08	6	0	0
9	1.0475	321.00	1.61	3.80	4.70	0.44	3	0.08	0.09	3	0.07	0.08	6	0	0
10	1.0275	278.00	1.42	3.50	4.50	0.34	3	0.07	0.08	3	0.07	0.07	6	0	0
11	1.0575	329.00	1.64	2.80	4.40	0.30	3	0.07	0.08	3	0.07	0.08	6	0	0
12	1.0450	324.00	1.63	8.60	9.90	0.37	3	0.07	0.07	3	0.07	0.07	6	0	0
13	0.9725	296.00	1.60	4.70	6.70	0.42	3	0.06	0.07	3	0.07	0.07	6	0	0
14	1.1552	320.00	1.46	4.60	6.50	0.30	3	0.07	0.08	3	0.09	0.11	6	0	0
15	0.9750	312.00	1.68	4.50	8.80	0.24	3	0.07	0.08	3	0.08	0.08	6	0	0
16	1.0400	315.00	1.59	4.50	4.70	0.32	3	0.08	0.09	3	0.07	0.08	6	0	0
17	0.8825	280.00	1.67	11.90	16.10	0.51	3	0.09	0.10	3	0.08	0.09	6	0	0
18	1.0025	340.00	1.78	8.90	12.70	0.56	3	0.07	0.07	3	0.08	0.09	6	0	0
19	0.8800	190.00	1.14	6.50	7.70	0.61	3	0.07	0.08	3	0.08	0.08	6	0	0
20	0.9825	328.00	1.76	6.90	11.10	0.40	3	0.08	0.09	3	0.08	0.08	6	0	0
21	0.9525	295.00	1.63	5.90	8.80	0.34	3	0.07	0.07	3	0.08	0.08	6	0	0
22	0.9550	247.00	1.36	9.70	12.20	1.40	3	0.09	0.10	3	0.10	0.12	6	0	0
23	1.0575	352.00	1.75	7.20	9.90	0.35	3	0.08	0.10	3	0.08	0.08	6	0	0
24	0.9300	295.00	1.67	11.90	16.70	0.27	3	0.08	0.08	3	0.08	0.08	6	0	0
25	0.9250	284.00	1.62	6.00	10.10	0.38	3	0.07	0.08	3	0.08	0.09	6	0	0
26	0.8700	268.00	1.62	5.70	10.10	0.40	3	0.07	0.08	3	0.07	0.08	6	0	0
27	1.0700	275.00	1.35	7.60	12.40	0.80	3	0.08	0.08	3	0.08	0.09	6	0	0
28	0.9800	295.00	1.58	4.80	5.30	0.51	3	0.07	0.09	3	0.07	0.08	6	0	0
29	0.9775	290.00	1.56	4.50	5.20	0.51	3	0.08	0.09	3	0.08	0.09	6	0	0
30	0.9975	295.00	1.56	5.70	9.90	0.40	3	0.07	0.08	3	0.07	0.08	6	0	0
31	0.9475	282.00	1.57	5.00	6.20	0.41	3	0.06	0.07	3	0.07	0.07	6	0	0
Total	30.8402	9508.00					93			93			186	0	0
Avg.	0.9948	306.71	1.62	5.59	7.76	0.44		0.08	0.08		0.07		Total	Total	Total
Max	1.1552	427.00	2.15	11.90	16.70	1.40		0.09	0.10		0.10	0.12	6	0	0
Min.	0.8700	190.00	1.14	2.50	2.60	0.24		0.06	0.06		0.06				

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **October-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l											TAP	
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use				
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.47	0.23	0.81		0	0.00	420	6.22	40	0.59	460	7.42	5.74	1.47	1.68
2	0.60	0.26	0.75		0	0.00	416	6.50	60	0.94	476	7.80	5.83	1.77	1.97
3	0.57	0.15	0.71		0	0.00	433	6.20	61	0.87	494	6.99	4.99	1.83	2.00
4	0.53	0.25	0.78		0	0.00	321	5.06	47	0.74	368	5.68	3.86	1.63	1.82
5	0.50	0.29	0.80		0	0.00	418	6.15	43	0.63	461	7.30	5.57	1.60	1.73
6	0.52	0.30	0.79		0	0.00	424	6.21	27	0.40	451	7.74	6.12	1.52	1.62
7	0.63	0.46	0.78		0	0.00	490	6.76	47	0.65	537	8.98	7.43	1.41	1.55
8	0.60	0.30	0.81		0	0.00	536	7.69	93	1.33	629	9.47	8.04	1.30	1.43
9	0.54	0.32	0.81	0.82	0	0.00	584	8.32	117	1.67	701	9.69	7.74	1.75	1.95
10	0.39	0.26	0.81		0	0.00	555	8.06	68	0.99	623	10.54	8.70	1.66	1.84
11	0.52	0.31	0.77		0	0.00	504	7.11	1	0.01	505	7.67	6.23	1.30	1.44
12	0.56	0.25	0.81		0	0.00	545	7.79	0	0.00	545	8.94	7.11	1.67	1.83
13	0.57	0.26	0.81		0	0.00	512	7.86	33	0.51	545	10.50	8.60	1.78	1.90
14	0.47	0.29	0.77		0	0.00	540	6.98	81	1.05	621	9.36	6.82	2.36	2.54
15	0.52	0.29	0.80		0	0.00	487	7.46	39	0.60	526	9.06	6.94	1.92	2.12
16	0.56	0.27	0.79		0	0.00	474	6.80	19	0.27	493	7.85	5.78	1.92	2.07
17	0.50	0.22	0.84	0.71	0	0.00	404	6.83	17	0.29	421	7.72	5.79	1.78	1.93
18	0.55	0.28	0.80		0	0.00	527	7.85	26	0.39	553	9.42	7.43	1.89	1.99
19	0.55	0.05	0.66		0	0.00	266	4.51	39	0.66	305	5.36	2.76	2.40	2.60
20	0.51	0.30	0.63		0	0.00	255	3.87	19	0.29	274	4.46	2.18	2.09	2.28
21	0.55	0.19	0.72		0	0.00	238	3.73	16	0.25	254	4.12	1.98	1.95	2.14
22	0.57	0.24	0.62		0	0.00	234	3.66	16	0.25	250	4.17	2.10	1.88	2.07
23	0.56	0.26	0.64	0.66	0	0.00	252	3.56	38	0.54	290	4.32	1.70	2.42	2.62
24	0.59	0.24	0.82		0	0.00	216	3.47	38	0.61	254	4.29	2.02	2.10	2.27
25	0.52	0.18	0.61		0	0.00	205	3.31	32	0.52	237	3.86	1.71	1.99	2.15
26	0.76	0.32	0.69		0	0.00	184	3.16	19	0.33	203	3.50	1.63	1.69	1.87
27	0.58	0.27	0.68		0	0.00	223	3.11	16	0.22	239	3.79	1.95	1.64	1.84
28	0.47	0.27	0.75		0	0.00	218	3.32	23	0.35	241	3.78	2.12	1.49	1.66
29	0.62	0.30	0.78		0	0.00	226	3.45	21	0.32	247	4.07	2.56	1.37	1.51
30	0.51	0.34	0.74		0	0.00	233	3.49	60	0.90	293	4.44	2.57	1.71	1.87
31	0.49	0.33	0.76		0	0.00	282	4.44	15	0.24	297	4.85	3.10	1.60	1.75
Tot.							11,202		1,131		12,793				
Avg.	0.55	0.27	0.75	0.73	0.00	0.00	378.00	5.62	38.53	0.57	416.53	6.74	4.80	1.78	1.94
Max	0.76	0.46	0.84	0.82	0.00	0.00	584.00	8.32	117.00	1.67	701.00	10.54	8.70	2.42	2.62
Min.	0.39	0.05	0.61	0.66	0.00	0.00	184.00	3.11	0.00	0.00	203.00	3.50	1.63	1.30	1.43

WSSN 0600 | MONTH/YEAR | October-19 |

CITY OF BENTON HARBOR CHEMICAL ANALYSES

			Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
D A T E	pH Raw 29.	pH Tap 30.	Raw 31.	Tap 32.	Raw 33.	Tap 34.	Raw 35.	Tap 36.	Raw 37	Tap 38	Raw 39	Tap 40	Raw 41	Tap 42
1	8.2	8.1	152	146	109	107	43	39	41	40	12	11		
2	8.0	8.1	156	148	110	105	46	43	39	38	14	13		
3	8.0	7.9	154	148	107	104	47	44	38	37	14	14		
4	8.2	8.1	164	158	118	117	46	41	40	38	16	15		
5	7.9	8.0	138	140	111	106	27	34	39	42	10	9		
6	8.2	8.2	156	142	127	104	29	38	47	42	9	9		
7	8.0	8.1	178	148	138	109	40	39	51	43	12	10		
8	8.0	8.1	172	158	136	117	36	41	51	49	11	9	19.0	19.5
9	8.1	8.0	158	162	124	120	34	42	45	46	11	12		
10	8.0	8.2	156	164	117	124	39	40	47	51	9	9		
11	8.1	8.1	144	162	113	122	31	40	42	46	10	11		
12	8.1	8.1	144	150	118	114	26	36	45	46	8	8		
13	8.1	7.9	146	148	112	112	34	36	42	45	10	9		
14	8.3	8.1	164	158	121	111	43	47	40	42	16	13		
15	8.1	7.9	164	158	112	107	52	51	42	41	14	14	20.0	24.5
16	8.1	8.1	146	140	116	107	30	33	44	45	9	7	21.0	24.0
17	8.2	8.1	152	142	121	109	31	33	42	44	11	8		
18	8.0	8.0	150	146	111	108	39	38	45	42	9	10		
19	8.1	8.0	166	154	114	106	52	48	40	38	16	14		
20	8.0	8.1	162	156	113	106	49	50	38	37	17	16	19.5	23.5
21	8.1	7.9	154	148	110	105	44	43	38	38	14	13		
22	8.2	7.9	194	154	145	115	49	39	46	38	19	15		
23	8.0	8.1	160	162	110	100	50	62	38	42	16	14		
24	8.1	7.9	162	152	114	103	48	49	42	41	14	12		
25	8.1	8.0	162	150	111	103	51	47	41	40	15	12		
26	8.1	8.1	172	152	119	103	53	49	42	39	17	13		
27	8.2	8.0	184	154	130	104	54	50	44	39	18	14		
28	8.1	8.0	162	156	128	105	34	51	47	46	11	10	21.5	23.0
29	8.2	8.1	152	154	121	111	31	43	46	46	9	9		
30	8.1	8.0	162	156	115	110	47	46	42	41	14	13		
31	8.0	8.1	170	162	110	107	60	55	43	42	15	14		
Avg.	8.1	8.0	159.5	152.2	118.4	109.1	41.2	43.1	42.8	42.1	12.8	11.5	20.2	22.9
Max	8.3	8.2	194.0	164.0	145.0	124.0	54.0	62.0	51.0	51.0	19.0	16.0	21.5	24.5
Min.	7.9	7.9	138.0	140.0	107.0	100.0	26.0	33.0	38.0	37.0	8.0	7.0	19.0	19.5

WSSN 0600 MONTH/YEAR October-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1		0	1	A	66	0	18	19.0	0.9692	56	2.29	1.88
2			1	A	30	0	18	17.5	0.9540	41	1.72	1.40
3			1	A	54	1	18	18.0	1.1162	27	0.96	1.10
4			1	A	24	0	19	18.5	0.9694	46	1.86	1.39
5			1	A	83	0	14	19.0	0.9970	44	1.73	1.91
6			1	A	93	1	17	18.0	0.9173	42	1.82	1.29
7			1	A	134	0	18	17.0	0.9413	45	1.91	0.00
8			1	A	100	0	17	18.0	1.0320	45	1.71	1.25
9	1.52	City Hall	1	A	100	0	17	18.0	1.1290	41	1.43	1.33
9	1.28	Wolfs	1	A	85	1	17	18.0	0.9298	47	1.98	1.34
9	1.29	Bait Shed	1	A	58	0	16	17.0	1.0431	51	1.93	1.38
9	1.27	Sunny Spot	1	A	48	0	16	17.0	0.9615	48	1.97	1.63
9	1.40	B&Z	1	A	64	12	16	17.0	0.8060	47	2.30	1.89
14			1	A	78	1	15	17.5	1.0518	45	1.70	1.31
15			1	A	58	0	15	15.5	0.9144	44	1.92	0.00
16			1	A	122	0	16	17.0	0.9913	54	2.15	1.53
17	1.55	Bait Shed	1	A	44	2	14	16.0	0.8539	41	1.91	0.00
17	1.77	Wolfs	1	A	46	1	14	15.3	0.9278	52	2.20	1.32
17	1.71	City Hall	1	A	29	0	14	14.5	0.8942	43	1.92	1.51
17	1.56	Sunny Spot	1	A	133	0	14	14.3	0.9701	53	2.17	0.77
17	1.42	B&Z	1	A	67	0	15	14.5	0.9711	49	1.99	1.51
21			1	A	132	0	14	14.5	0.9442	49	2.04	1.59
22	1.44	City Hall	1	A	41	0	13	14.5	1.0643	49	1.82	1.50
22	1.29	Wolfs	1	A	24	0	13	14.0	0.9383	47	1.97	2.82
22	1.36	Bait Shed	1	A	77	1	13	13.5	1.2009	55	1.80	1.89
22	1.39	Sunny Spot	1	A	94	0	13	13.0	1.1464	59	2.04	1.85
22	1.19	B&Z	1	A	78	0	12.5	13.0	1.2206	54	1.74	2.01
27	0.78	City Hall	1	A	471	0	9.0	12.0	1.2580	47	1.47	1.22
27	1.19	Wolfs	1	A	43	1	8.7	8.5	1.2118	26	0.85	1.23
27	1.48	Bait Shed	1	A	48	0	8.5	9.5	1.2915	45	1.38	1.41
27	1.34	Sunny Spot	1	A	76	1	12.5	13.0	1.2133	47	1.53	1.46
Totals									31.8296	1436.7		
AVG.	1.38		1	A	84	1	14	15	1.0268	46.3	1.80	1.36
Max	1.77				471	12	19	19	1.2915	59.0	2.30	2.82
Min	0.78				24	0	9	9	0.8060	26.1	0.85	0.00

DISTRIBUTION SYSTEM MONITORING WSSN 0600 October-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1	1.07		0.78	0.54	0.73		0.69			
2										
3										
4										
5										
6										
7										
8										
9	0.79		0.70	0.87	0.42		0.60			
10										
11										
12										
13										
14										
15										
16										
17	1.49		0.79	0.62	0.94		0.59			
18										
19										
20										
21										
22										
23	0.25		1.19	1.03	1.08		0.85			
24										
25										
26										
27										
28										
29										
30	1.10		1.01	0.92	1.04		0.72			
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	25		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	0.83	1.49	0.25
Total number of check samples	0600			
Total number of positive check samples	0600			

MI 0600 Correction MOR NOV 2019

OPP & Meter ON Modified Booth Page

WSSN 0600 MONTH/YEAR November-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

DATE	Ortho P System: System Ortho P Residual mg/L	Ortho P System: System Ortho P Residual Location	PLANT TAP: No. of Samples	PLANT TAP: Colilert P/A	Standard Plate Count: Raw	Standard Plate Count: Tap	Raw TEMP. 'C	Tap TEMP. 'C	Distrubution flow and Corrosion Treatment: High Lift To Distribution	Lbs PO4	PO4 Treatment mg/L	Ortho P Residual mg/L
1			1	A	75	0	11	12.5	0.9548	46	1.91	1.54
2			1	A	93	0	11	12.5	0.7336	50	2.68	1.45
3			1	A	119	0	11	12.0	1.0696	47	1.73	1.46
4			1	A	119	9	10	11.5	0.9394	45	1.87	1.37
5			1	A	108	0	10	12.0	0.9170	50	2.16	1.62
6	1.47	City Hall	1	A	102	0	10	10.5	0.9492	49	2.03	1.55
6	1.39	Wolfs	1	A	97	0	10	11.0	0.9884	51	2.02	1.54
6	1.58	Bait Shed	1	A	164	0	10	11.0	0.9338	53	2.24	1.48
6	1.57	Sunny Spot	1	A	95	1	8	10.0	0.9478	45	1.88	1.51
6	1.33	B & Z	1	A	102	0	8	9.5	0.8554	52	2.41	0.81
11			1	A	111	0	8	9.0	0.9828	51	2.03	1.48
12	1.52	City Hall	1	A	168	0	8	9.0	0.9716	36	1.45	1.47
12	1.34	Wolfs	1	A	109	1	7	8.5	1.0136	54	2.11	1.46
12	1.45	Bait Shed	1	A	152	0	7	9.0	1.0374	60	2.28	1.56
12	1.40	Sunny Spot	1	A	146	0	7	8.0	1.0430	54	2.05	1.56
12	1.25	B & Z	1	A	50	2	6	8.5	0.9842	58	2.32	1.47
17			1	A	74	4	7	8.0	0.9639	59	2.43	1.53
18			1	A	58	0	7	7.0	1.0080	56	2.21	1.50
19			1	A	79	0	6	6.5	0.8960	58	2.54	1.57
20	1.66	City Hall	1	A	86	0	6	7.0	1.1354	56	1.94	1.50
20	1.47	Wolfs	1	A	98	1	6	6.5	0.9268	57	2.44	1.41
20	1.51	Bait Shed	1	A	85	0	7	7.5	0.9730	19	0.79	1.47
20	1.45	Sunny Spot	1	A	98	0	7	8.0	0.9240	58	2.48	1.51
20	1.24	B & Z	1	A	72	0	7	8.0	1.0080	65	2.54	1.56
25			1	A	58	0	7	8.0	0.9688	39	1.60	1.45
26			1	A	45	12	7	8.0	0.9898	52	2.07	1.49
27			1	A	153	0	7.2	7.5	0.9688	50	2.05	1.47
28			1	A	163	0	9.0	12.0	0.8582	46	2.11	1.52
29			1	A	236	0	8.7	8.5	0.8260	44	2.11	1.52
30			1	A	95	0	8.5	9.5	0.8316	46	2.20	1.48
			0									
Totals									28.5999	1502.5		
AVG.	1.44		1	A	108	1	8	9	0.9533	50.1	2.10	1.47
Max	1.66				236	12		13	1.1354	64.6	2.68	1.62
Min	1.24				45	0	6	7	0.7336	19.4	0.79	0.81

TYPO was not included in original MOR

Sorry Mike,

There was trouble w/ the OPP Barrel on Sunday 11/10/19

SAFETY DATA SHEET

BH 1 from Carus Corporation

MI 0600 Benton Harbor new corrosion treatment

Sold to BH by Elhorn Engineering

Started change Friday 2/21/20

1. Identification

Product identifier	**Aquadene® SK-7661**
Other means of identification	
SDS number	-
Recommended use	Aquadene® SK-7661 s an effective corrosion inhibitor and sequesterant for use in potable and industrial water systems.
Recommended restrictions	None known.

Note: SG Product 1.35

Strength @ 32%

Manufacturer / Importer / Supplier / Distributor information

Company name	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixtures	
Composition comments	The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling	Avoid inhalation and contact with skin and eyes. Wear appropriate personal protective equipment (See Section 8). Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	General ventilation normally adequate.
Individual protection measures, such as personal protective equipment	
Eye/face protection	If contact is likely, safety glasses with side shields are recommended.
Skin protection	
Hand protection	For prolonged or repeated skin contact use suitable protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Colorless solution.
Physical state	Liquid.
Form	Liquid.
Color	Colorless.
Odor	None.
Odor threshold	Not available.
pH	1% solution = 5.4±0.5
Melting point/freezing point	Not available.

Initial boiling point and boiling range	213.8 °F (101 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	1.35±0.03 at 25°C
Solubility(ies)	
Solubility (water)	Completely soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

BH3

1.35 × 8.34 = 11.259 #/gal

32% Strength = 3.603 #/gal OPP

OR

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization will not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents. Strong acids. Strong bases.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure	
Ingestion	May cause discomfort if swallowed.
Inhalation	In high concentrations, vapors may be irritating to the respiratory system.
Skin contact	Prolonged or repeated skin contact may cause irritation.
Eye contact	May cause eye irritation on direct contact.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
Information on toxicological effects	
Acute toxicity	May cause discomfort if swallowed.
Skin corrosion/irritation	Prolonged contact may cause dryness of the skin.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	No data available.
Skin sensitization	Not a skin sensitizer.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Reproductive toxicity	No data available.
Specific target organ toxicity - single exposure	No data available.

BH 4

Specific target organ toxicity - repeated exposure	No data available.
Aspiration hazard	Not classified.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	The product is not expected to be readily biodegradable.
Bioaccumulative potential	No data available for this product.
Mobility in soil	Not available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

15. Regulatory information

US federal regulations

This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.

BH 5

US state regulations

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-March-2014

Revision date -

Version # 01

NFPA Ratings

References HSDB® - Hazardous Substances Data Bank

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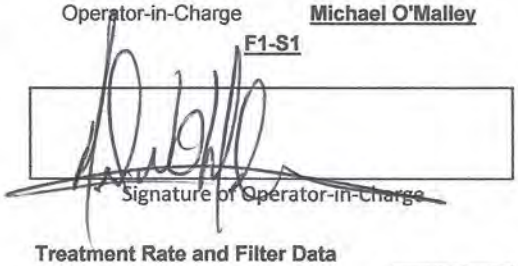
MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley** Month/Year **September-19**

F1-S1 **F1-S2**



Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.2224	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	257.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.07	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.13	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.70%	Percent of Treated Water

Chemical Data

Chlorine on hand:	22220	lb.	Est. supply:	8731 days
Primary Coagulant (Alum (Al3+)) on hand:	3649411	lb.	Est. supply:	68 days
Cost of All Chemicals per Million Gallons:	$80.35	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	90	90
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months?	NO
If yes, attach specific filter(s) information and indicate required follow-up status.	
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month?	NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	
Did POE disinfectant residual fall below 0.2 ppm during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	
Was minimum C*T credit achieved for the entire month?	YES
If no, indicate on a separate sheet the date(s) not achieved.	
Was continuous POE chlorine residual monitoring equipment off-line during the month?	NO
If yes, indicate date(s) and duration on a separate sheet.	

Distribution	Total	29.1331	Avg	0.9975833	Max	1.2046	Min	0.8386

Remarks. We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals. There was a Chlorine solution leak . It was fixed quickly and the post filter feed was increased as a safeguard. There was a question

Chlorine leak Appendix 1
Alum concern Appendix 2

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **September-19**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.55	0.22	0.59		0	0.00	353	5.61	12	0.19	365	6.86	5.23	1.50	1.63
2	0.62	0.26	0.62		0	0.00	359	5.60	10	0.16	369	6.57	4.92	1.50	1.65
3	0.51	0.29	0.57		0	0.00	413	5.62	16	0.22	429	6.25	4.44	1.67	1.81
4	0.58	0.15	0.63	0.63	0	0.00	409	5.61	28	0.38	437	6.28	4.35	1.75	1.93
5	0.66	0.32	0.75		0	0.00	415	5.66	46	0.63	461	6.17	4.31	1.68	1.86
6	0.55	0.32	0.75		0	0.00	414	5.62	42	0.57	456	6.62	4.60	1.84	2.02
7	0.53	0.28	0.73		0	0.00	456	5.57	49	0.60	505	7.00	4.87	1.94	2.13
8	0.54	0.31	0.61		0	0.00	393	5.59	32	0.45	425	6.36	4.55	1.64	1.81
9	0.53	0.36	0.77		0	0.00	399	5.52	48	0.66	447	5.54	3.67	1.70	1.87
10	0.56	0.33	0.82		0	0.00	414	5.42	22	0.29	436	6.41	4.38	1.81	2.03
11	0.60	0.38	0.83	0.67	0	0.00	389	5.52	15	0.21	404	6.20	4.31	1.72	1.89
12	0.56	0.31	0.88		0	0.00	418	5.53	14	0.19	432	5.89	4.15	1.58	1.74
13	0.66	0.31	0.84		0	0.00	426	5.49	20	0.26	446	6.07	4.36	1.57	1.71
14	0.54	0.19	0.75		0	0.00	396	5.63	42	0.60	438	7.18	5.37	1.63	1.81
15	0.43	0.22	0.74		0	0.00	376	4.84	75	0.97	451	7.14	5.39	1.57	1.75
16	0.56	0.22	0.69		0	0.00	401	5.50	31	0.43	432	6.65	4.97	1.50	1.68
17	0.69	0.15	0.62		0	0.00	370	5.52	69	1.03	439	6.90	5.36	1.37	1.54
18	0.47	0.19	0.61	0.69	0	0.00	418	5.66	35	0.47	453	6.73	4.90	1.67	1.83
19	0.60	0.23	0.65		0	0.00	410	5.64	18	0.25	428	6.81	5.35	1.27	1.46
20	0.64	0.31	0.61		0	0.00	391	5.84	31	0.46	422	6.59	4.70	1.64	1.89
21	0.57	0.30	0.52		0	0.00	451	5.88	36	0.47	487	7.01	5.35	1.52	1.66
22	0.57	0.25	0.51		0	0.00	380	5.91	30	0.47	410	7.04	5.11	1.72	1.93
23	0.69	0.28	0.59		0	0.00	438	5.94	44	0.60	482	6.88	5.20	1.51	1.68
24	0.53	0.18	0.68		0	0.00	410	5.97	33	0.48	443	6.68	4.96	1.54	1.72
25	0.61	0.18	0.60		0	0.00	426	5.92	40	0.56	466	7.93	6.31	1.42	1.62
26	0.57	0.29	0.74		0	0.00	418	5.93	52	0.74	470	6.38	4.61	1.59	1.77
27	0.58	0.27	0.83		0	0.00	421	5.78	72	0.99	493	6.69	4.91	1.61	1.78
28	0.52	0.23	0.71		0	0.00	399	6.14	47	0.72	446	6.92	5.41	1.42	1.51
29	0.55	0.24	0.79		0	0.00	412	6.17	44	0.66	456	7.11	5.62	1.32	1.49
30	0.47	0.31	0.67		0	0.00	442	6.14	53	0.74	495	7.29	5.50	1.62	1.79
31															
Tot.							11,864		1,094		13,323				
Avg.	0.57	0.26	0.69	0.66	0.00	0.00	407.23	5.69	36.87	0.51	444.10	6.67	4.90	1.59	1.77
Max	0.69	0.38	0.88	0.69	0.00	0.00	456.00	6.17	75.00	1.03	505.00	7.93	6.31	1.94	2.13
Min.	0.43	0.15	0.51	0.63	0.00	0.00	353.00	4.84	10.00	0.16	365.00	5.54	3.67	1.27	1.46

WSSN 0600 City of Benton Harbor Month/Year September-19

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.9400	282.00	1.58	0.99	1.10	0.17	3	0.07	0.08	3	0.07	0.08	6	0	0
2	0.9575	288.00	1.58	0.96	1.20	0.17	3	0.06	0.06	3	0.06	0.07	6	0	0
3	1.0975	331.00	1.59	0.86	0.97	0.17	3	0.06	0.07	3	0.06	0.06	6	0	0
4	1.0875	325.00	1.57	2.00	2.60	0.28	3	0.07	0.08	3	0.07	0.08	6	0	0
5	1.0950	324.00	1.56	1.80	1.90	0.22	3	0.07	0.07	3	0.06	0.07	6	0	0
6	1.1000	324.00	1.55	2.50	4.40	0.26	3	0.06	0.07	3	0.06	0.06	6	0	0
7	1.2224	405.00	1.74	7.20	10.10	0.27	3	0.08	0.08	3	0.06	0.07	6	0	0
8	1.0500	309.00	1.55	1.60	2.50	0.28	3	0.07	0.08	3	0.06	0.06	6	0	0
9	1.0800	317.00	1.54	1.70	2.10	0.22	3	0.07	0.08	3	0.07	0.07	6	0	0
10	1.1400	335.00	1.55	1.60	1.60	0.16	3	0.08	0.09	3	0.08	0.08	6	0	0
11	1.0525	314.00	1.57	2.00	2.10	0.19	3	0.08	0.09	3	0.07	0.08	6	0	0
12	1.1275	392.00	1.83	1.60	1.90	0.30	3	0.08	0.09	3	0.07	0.07	6	0	0
13	1.1575	332.00	1.51	1.40	1.50	0.29	3	0.07	0.08	3	0.07	0.09	6	0	0
14	1.0500	309.00	1.55	2.20	3.10	0.22	3	0.06	0.07	3	0.07	0.07	6	0	0
15	1.1600	297.00	1.35	1.90	2.00	0.19	3	0.07	0.07	3	0.07	0.07	6	0	0
16	1.0875	319.00	1.54	2.50	4.10	0.19	3	0.07	0.07	3	0.07	0.07	6	0	0
17	1.0000	296.00	1.56	1.90	3.30	0.17	3	0.07	0.08	3	0.06	0.07	6	0	0
18	1.1025	253.00	1.21	1.70	2.60	0.59	3	0.09	0.11	3	0.08	0.10	6	0	0
19	1.0850	552.00	2.68	1.50	2.10	0.28	3	0.08	0.10	3	0.09	0.14	6	0	0
20	1.0000	337.00	1.77	1.20	1.60	0.18	3	0.07	0.08	3	0.06	0.06	6	0	0
21	1.1450	345.00	1.59	1.00	1.40	0.17	3	0.06	0.06	3	0.06	0.06	6	0	0
22	0.9600	287.00	1.57	1.30	1.50	0.29	3	0.07	0.07	3	0.06	0.06	6	0	0
23	1.1000	206.00	0.99	1.50	1.70	0.33	3	0.08	0.08	3	0.07	0.07	6	0	0
24	1.0250	668.00	3.43	1.60	2.20	0.20	3	0.07	0.07	3	0.06	0.07	6	0	0
25	1.0750	457.00	2.24	2.80	3.30	0.19	3	0.06	0.07	3	0.07	0.07	6	0	0
26	1.0525	316.00	2.24	5.00	7.00	0.28	3	0.06	0.07	3	0.07	0.07	6	0	0
27	1.0875	284.00	1.37	3.10	4.60	0.26	3	0.07	0.08	3	0.07	0.08	6	0	0
28	0.9700	301.00	1.63	2.60	2.80	0.26	3	0.07	0.07	3	0.07	0.08	6	0	0
29	0.9975	288.00	1.52	3.40	3.90	0.25	3	0.06	0.06	3	0.08	0.08	6	0	0
30	1.0750	308.00	1.51	2.10	2.80	0.23	3	0.06	0.06	3	0.08	0.09	6	0	0
31															
Total	32.0799	10101.00					90			90			180	0	0
Avg.	1.0693	336.70	1.68	2.12	2.80	0.24		0.07	0.08		0.07		Total	Total	Total
Max	1.2224	668.00	3.43	7.20	10.10	0.59		0.09	0.11		0.09	0.14	6	0	0
Min.	0.9400	206.00	0.99	0.86	0.97	0.16		0.06	0.06		0.06				

WSSN 0600 MONTH/YEAR **September-19**

CITY OF BENTON HARBOR CHEMICAL ANALYSES

D A T E	pH		Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.3	8.3	146	146	114	109	32	37	41	44	11	9		
2	8.1	8.0	146	148	107	105	39	43	43	44	9	9		
3	8.0	8.1	146	148	106	105	40	43	45	47	8	7		
4	8.2	8.1	164	156	111	102	53	54	42	41	14	13		
5	8.2	8.1	164	154	111	104	53	50	42	41	14	13	21.0	27.0
6	8.0	7.9	156	150	107	104	49	46	38	37	15	14		
7	8.1	8.1	162	154	107	103	55	51	42	40	14	13		
8	8.1	8.0	158	152	106	105	52	47	41	40	14	13		
9	8.0	8.1	158	152	107	103	51	49	42	40	13	13		
10	8.2	7.9	146	144	107	105	39	39	42	41	10	10		
11	8.0	8.2	150	146	113	101	37	45	43	42	10	10	21.5	23.0
12	8.0	8.2	146	146	110	106	36	40	45	46	8	8		
13	8.3	8.1	154	148	112	105	42	43	43	43	11	10		
14	8.2	8.1	160	150	115	106	45	44	40	39	12	13		
15	8.1	8.0	162	152	112	104	50	48	41	39	15	13		
16	8.0	8.1	164	158	110	106	54	52	41	40	15	14		
17	8.1	8.1	158	152	109	106	49	46	40	39	14	13		
18	8.1	8.2	158	150	110	105	48	45	40	39	14	13		
19	8.1	8.1	142	138	111	109	31	29	42	42	9	8	20.5	23.0
20	8.1	8.1	144	140	109	103	35	37	43	44	9	7		
21	8.1	8.1	136	136	106	103	30	33	46	42	5	7		
22	8.2	8.1	138	136	109	103	29	33	43	45	7	6		
23	8.1	8.2	154	148	113	101	41	47	39	38	14	13		
24	8.1	8.1	154	146	110	103	44	43	38	36	15	14		
25	8.2	8.2	154	148	113	104	41	44	38	38	14	13		
26	8.1	8.2	162	154	110	101	52	53	40	41	15	13		
27	8.1	8.2	170	152	110	104	60	48	51	42	11	12	19.0	23.5
28	8.2	8.1	154	148	121	105	33	43	46	41	10	11	20.5	22.0
29	8.3	8.2	150	148	117	108	33	40	42	42	11	10		
30	8.1	8.0	144	148	112	109	32	39	39	39	11	12		
31											0	0		
Avg.	8.1	8.1	153.3	148.3	110.5	104.6	42.8	43.7	41.9	41.1	11.7	11.1	20.5	23.7
Max	8.3	8.3	170.0	158.0	121.0	109.0	60.0	54.0	51.0	47.0	15.0	14.0	21.5	27.0
Min.	8.0	7.9	136.0	136.0	106.0	101.0	29.0	29.0	38.0	36.0	5.0	6.0	19.0	22.0

WSSN 0600 MONTH/YEAR September-19 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS and Distrubution Flow and Corrosion Treatment

	Ortho P System		PLANT TAP		Standard Plate Count		Raw	Tap	Distrubution flow and Corrosion Treatment			
D	System	System	No. of	Colilert			TEMP.	TEMP.				
A	Ortho P	Ortho P	Samples	P/A			'C	'C	High Lift		PO4	Ortho P
T	Residual	Residual			Raw	Tap			To	Lbs PO4	Treatment	Residual
E	mg/L	Location							Distribution		mg/L	mg/L
1			1	A	60	0	13	19.0	1.0238	37	1.43	1.56
2			1	A	37	1	13	18.0	0.8865	44	1.96	1.29
3			1	A	24	3	12	17.0	1.0817	54	1.98	1.29
4	1.36	city hall	1	A	21	0	17	14.0	0.9943	55	2.20	1.70
4	1.02	wolfs	1	A	48	0	17	16.0	1.1656	49	1.66	1.46
4	1.33	bait shed	1	A	29	0	13	16.0	1.0912	55	1.99	1.94
4	1.27	sunny spot	1	A	45	0	12	15.5	1.1261	45	1.58	0.52
4	1.26	b&z	1	A	60	0	12	14.5	1.0585	54	2.01	1.09
			1	A	30	1	11	13.5	1.2730	56	1.74	0.00
			1	A	48	0	12	14.0	1.0787	54	2.00	1.51
			1	A	41	0	16	14.0	1.0156	49	1.92	1.32
			1	A	55	1	17	15.0	1.1444	54	1.87	0.00
			1	A	60	2	14	16.0	1.1473	48	1.65	1.29
			1	A	27	0	17	15.0	0.9596	51	2.09	1.30
			1	A	74	0	19	16.0	0.9952	47	1.85	1.95
			1	A	38	0	19	16.5	1.0306	35	1.35	1.37
			1	A	60	0	17	18.0	1.0057	48	1.87	1.56
16	1.34	city hall	1	A	23	0	17	17.5	1.0690	39	1.43	1.31
16	1.15	wolfs	1	A	48	0	14	18.0	0.9875	59	2.37	1.51
16	1.45	bait shed	1	A	37	0	14	17.0	1.0058	30	1.19	1.27
16	1.15	sunny spot	1	A	26	2	16	17.0	1.0800	36	1.32	1.29
16	0.63	b&z	1	A	30	1	20	18.0	0.9173	45	1.96	1.31
			1	A	21	0	20	16.5	1.0953	41	1.47	1.25
			1	A	16	0	19	18.0	1.0518	43	1.61	1.14
			1	A	25	0	20	18.5	0.9259	46	1.96	1.32
			1	A	59	0	19	19.5	1.1624	49	1.66	1.82
			1	A	33	0	19.3	19.5	1.1624	41	1.39	1.51
			1	A	42	0	9.0	12.0	1.0097	43	1.68	1.36
			1	A	19	0	8.7	8.5	1.0162	47	1.82	1.45
			1	A	57	5	8.5	9.5	1.0758	67	2.47	1.12
Totals									31.6369	1419.5		
AVG.	1.20		1	A	39	1	15	16	1.0546	47.3	1.79	1.28
Max	1.45				74	5	20	20	1.2730	67.2	2.47	1.95
Min	0.63				16	0	9	9	0.8865	30.2	1.19	0.00

DISTRIBUTION SYSTEM MONITORING WSSN 0600 September-19

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4	1.05		1.01	0.46	0.67		0.60			
5										
6										
7										
8										
9										
10										
11	0.43		1.24	0.69	1.13		0.63			
12										
13										
14										
15										
16										
17										
18	0.72		0.47	0.51	0.32		0.40			
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	15		
Total number of positive routine distribution samples	0600			
Total number of routine distribution samples required	0600	10	Max	Min
Average Chlorine Residuals by WSSN, mg/L	0600	0.69	1.24	0.32
Total number of check samples	0600			
Total number of positive check samples	0600			

MI 0600 Benton Harbor DRINKING WATER treatment EMERGENCY REPORT 09 25 2019_ CI2

The Michigan Safe Drinking Water Act, 1976 PA 399, as amended, and the Administrative Rules promulgated thereunder (Act 399), Rule 2304 (2) requires that a written report be filed by the supply within ninety days after an emergency.

Please Complete and Return to :

Mr. Ernie Sarkipato
Grand Rapids District / Drinking Water and Municipal Assistance
Michigan Department of Environmental Quality
sarkipatoe@michigan.gov

Water Supply:	Benton Harbor Water Plant
WSSN:	0600
County:	Berrien
Address:	601 Ridgeway
City:	St. Joseph
State/Zip:	MI 49085
Report Prepared Date:	9/25/2019
Report Prepared By:	Mike O'Malley

Briefly describe the following. Attach additional pages as necessary.

1.	Discovery of the emergency

The operator Doug, found a liquid Chlorine leak in the feed room. Shut the plant down and came to get Mike O'Malley for help. 9/18/2019 12:30 pm

2.	Cause of the emergency

Peristaltic pump had a pin hole in it. This pump feeds to the Pre-treatment point.
May have reduced the amount of Chlorine going into treatment.

3.	Area of the system effected by the emergency

Chlorine feed room. No impact seen to the treated water.

4.	Duration of the emergency

15 minutes. About ½ inch on the floor.

5.	Procedures by which the public was notified
	Public was not notified. Spill contained in plant. Treatment water was stopped, and the post Chlorine treatment was increased, just in case.

6.	Corrective actions taken during the emergency
	Mike replaced the hose. Then Mike and the gang cleaned up the spill.
7.	Steps that will be taken by the supply to prevent future emergencies
	Spare hoses are kept in the Liquid Chlorine Feed Room for quick and routine replacement.

Appendix 2 pg 1-2

MI 0600 Benton Harbor DRINKING WATER treatment EMERGENCY REPORT 09 25 2019_Alum

The Michigan Safe Drinking Water Act, 1976 PA 399, as amended, and the Administrative Rules promulgated thereunder (Act 399), Rule 2304 (2) requires that a written report be filed by the supply within ninety days after an emergency.

Please Complete and Return to :

Mr. Ernie Sarkipato
Grand Rapids District / Drinking Water and Municipal Assistance
Michigan Department of Environmental Quality
sarkipatoe@michigan.gov

Water Supply:	Benton Harbor Water Plant
WSSN:	0600
County:	Berrien
Address:	601 Ridgeway
City:	St. Joseph
State/Zip:	MI 49085
Report Prepared Date:	9/25/2019
Report Prepared By:	Mike O'Malley

Briefly describe the following. Attach additional pages as necessary.

1.	Discovery of the emergency

The operator Doug, reported to me that the Alum Pump to the new Rapid Mixer was not working properly. He shut the plant down. 9/19/2019 2:00 pm.
This was a non-emergency. None of the water of concern ever went any further into the treatment sequence.

2.	Cause of the emergency

Alum pump failed

3.	Area of the system effected by the emergency

Plate Settler in the treatment train.

4.	Duration of the emergency
	Very short period of time maybe 2-hours, since last operator tour of plant. Treatment issues are caught quickly. 1st response is to shut plant down. This way it is contained within the plant and does NOT go to the Public Drinking Water Supply.

5.	Procedures by which the public was notified
	Public was not notified. I left a note for the operators advising them what action to take when they arrive for their shift in the morning.

6.	Corrective actions taken during the emergency
	Mike dumped a great deal of water in the treatment chain into the lagoon. I showed Doug how it is done and then let him go home. Denny and Doug at 7:00 am made up all of the water lost during dumping and filled it in with the right treatment and continued. No Turbidity issue was involved.
7.	Steps that will be taken by the supply to prevent future emergencies
	The alum pump is new. I will get it repaired or replaced by the supplier. The other alum pump works fine, operation continues with that pump.

MI 0600 Benton Harbor ACO 8/14 Corrosion Study (1)

7/28/20

CITY OF BENTON HARBOR-CORROSION STUDY PLAN

Purpose:

The purpose of this study is to determine optimum corrosion control treatment for the City of Benton Harbor water treatment plant. This study will utilize harvested Lead & Galvanized service line material from the cities distribution system and new copper in order to replicate lead service line replacement activities. The study will focus on "not only Lead" but all aspects of optimum corrosion control treatment. The study will be ran for a minimum of 6 months for initial result data to be compiled and a treatment technic plan be developed. A additional 6 month period will follow.

Pipe Loops:

Example of pipe loops attached. Five Test Loops will utilized. Each pipe loop will consist of 36" sections of Lead, Galvanized & Copper pipe. A 3/4" flow meter, 24 hour timer, solenoid switch, phosphate feed pump w/injection, tubing, valves and sample taps.

Pipe Loop Operation:

Each pipe loop will be run from a 24 hour timer to be used for 6 hour on/ 6 hours off operation. Flow will be maintained using valving set to less than 0.5 gpm when solenoid valve is opened.

Source Water Feed:

The water used will be from the finished water clear well prior to any phosphate feed on (4)four of the test loops. The fifth test loop will test finished water with current phosphate feed.

Products to be Tested:

The products to be tested and there particular blends are as follows:

1-TEST LOOP-SK-7661 Blended 10% Polyphosphate/ 90% Orthophosphate Current feed rate.
1-TEST LOOP-SK-7661 " " " @1.0-1.5ppm PO4
1-TEST LOOP-Carus 8600 Blend 30% Polyphosphate/ 70% Orthophosphate@1.0-1.5ppm PO4
1-TEST LOOP-Carus 8600 " " " @2.5-3.0ppm PO4
1-TEST LOOP-Carus 4105 36% Phosphoric Acid @2.5-3.0ppm PO4

Operation:

Daily oversight will be provided by the City of Benton Harbor staff. Oversight should consist of checking test loops daily for proper operating conditions; leaks, pipe failure, pump failure, electrical problems etc. Any failures of operation should be reported directly to Elhorn Company @517-676-3786. Minor issue's can be discussed for correct repair instructions.
Weekly visits from Elhorn Staff will commence upon study system startup.

Sample/Testing Schedule:

Benton Harbor staff to provide daily PO4 residual testing on all test loops! Reagents will be provided by Elhorn Company for additional testing. Elhorn Company will collect weekly WQP samples & First Draw L/C samples from each test loop. Samples will be delivered to Carus Corporation for analysis. Each sample will be tested for: Hardness, Orhtophosphate, Iron, Manganese, pH, Langelier, Temperature, Alkalinity, Calcium, Chloride, Conductivity, TDS, Sulfate, Polyphosphate & Total phosphate, Lead, Copper.

Section Pieces:

The section pieces will be individually weighed prior to installation on the pipe loop. The pieces will consist of 2 sections each of lead, galvanized & copper pipe. Rubber fernco style fittings will hold pieces in place during operation. After a minimum of 90 days 1 section of each type of material will be carefully removed from the loop system. A unknown drying time will be determined for each piece and then re-weighed upon dried weight. Section pieces will then be sent to Carus Lab for analysis of film development.

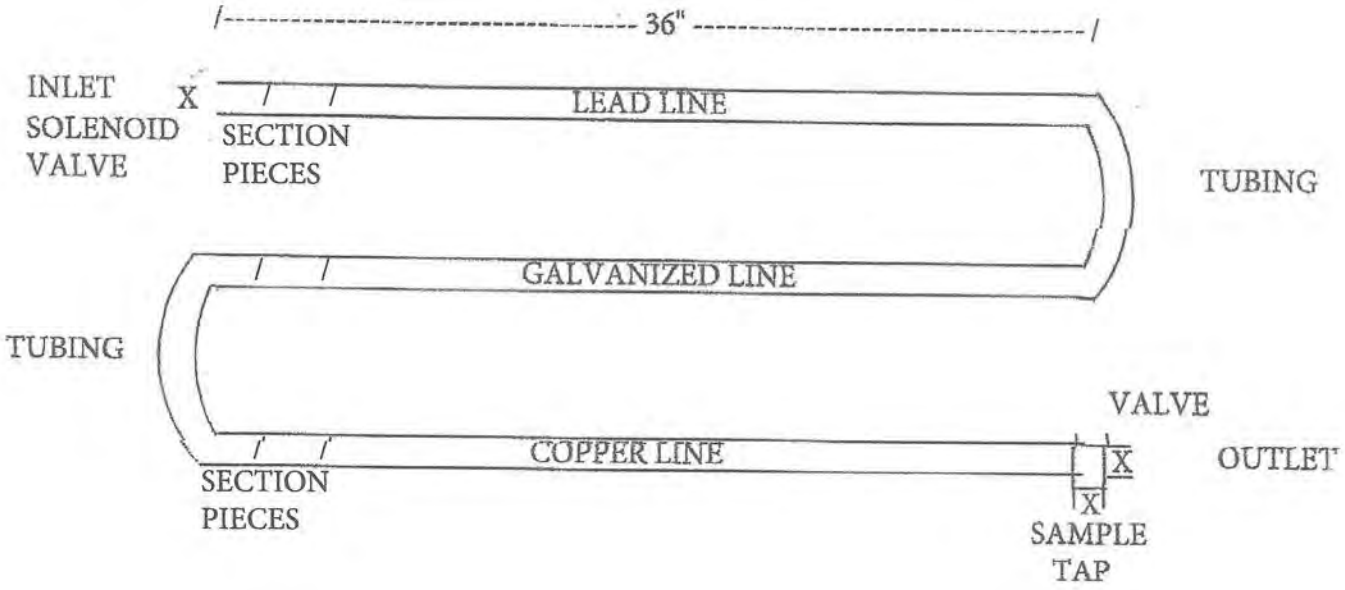
This same procedure will take place with the 2nd section piece of each material after a minimum of 180 days.

Completion of Results:

All results will be compiled into several spread sheets and graphs to determine a optimal corrosion treatment plan. The plan will depict the best overall treatment product and dosage rates concerning the City of Benton Harbor Water Treatment Plant.

Acc Reply Corrosion study (3)

PIPE LOOP LAYOUT



Inlet will consist of 3/4" water meter and solenoid valve for on & off operation. Flow will be 0.5 gpm for 6 hours on / 6 hours off. 24 hour timers will be used for on/off operation. Timers will be setup based on operator scheduling for weekly sampling requirements.

MI 0600 Benton Harbor ACO 8/14 Corrosion Study (1)

7/28/20

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Products to be Tested:

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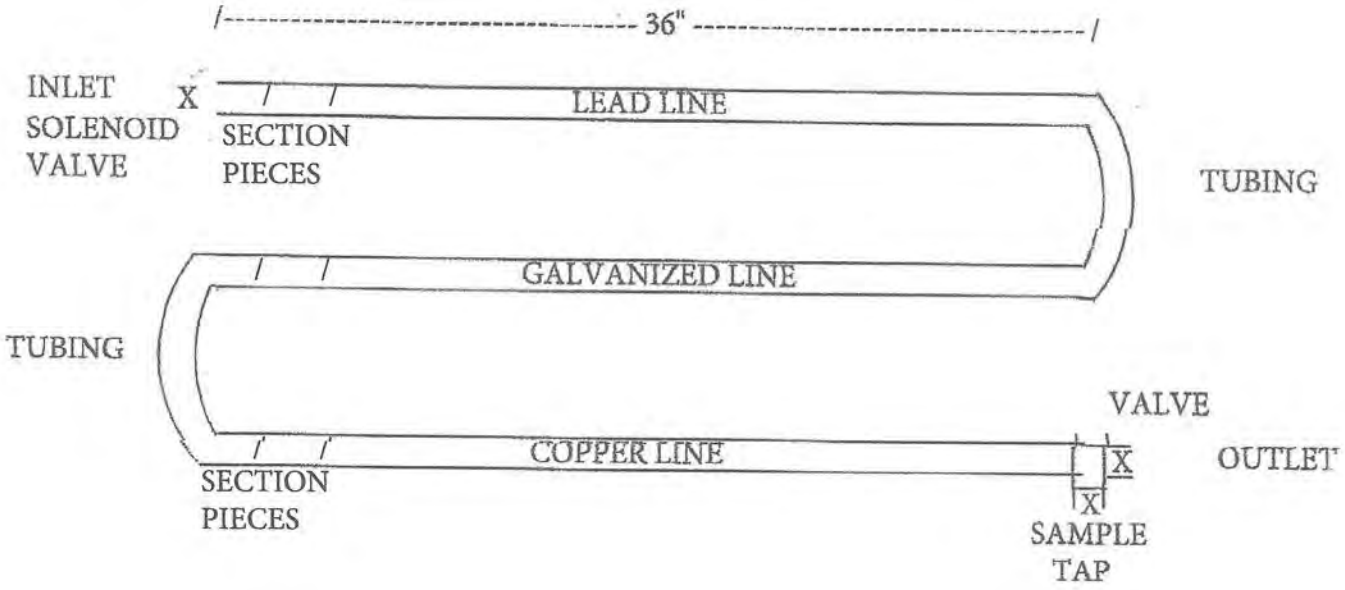

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MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Michael O'Malley**

F1-S1

Signature of Operator-in-Charge

Month/Year **Feburary 2019**

F1-S2

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.7439	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	188.13	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.40	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.98	Gallons Per Square Feet per Minute
Average Wash Water Use:	1.84%	Percent of Treated Water

Chemical Data

Chlorine on hand:	37370	lb.	Est. supply:	202 days
Primary Coagulant (Alum (Al3+)) on hand:	59573	lb.	Est. supply:	81 days
Cost of All Chemicals per Million Gallons:	$72.36	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	83	82
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO

If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO

If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES

If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO

If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	37.91904	Avg	1.3914114	Max	1.63784	Min	1.24444

Remarks: Data developed to re-determine Water Distributed to System
The Sodium Fluoride transfer pump broke late in January, took until March for parts to arrive.
During, February, analysis of F-ion was susspended for convience.

CITY OF BENTON HARBOR

WSSN 0600 MONTH/YEAR **Feburary 2019**

FLUORIDATION AND CHLORINATION

	Fluoride Analysis				Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l											TAP	
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use				
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.00	0.32	0.31				306	3.89	49	0.62	355	5.09	2.59	2.29	2.50
2	0.00	0.27	0.28				293	3.01	38	0.39	331	3.68	1.16	2.31	2.52
3	0.00	0.36	0.38				271	2.71	28	0.28	299	3.44	0.86	2.36	2.58
4	0.00	0.32	0.29				310	2.95	41	0.39	351	3.81	1.63	1.97	2.18
5	0.00	0.36	0.36				328	3.44	17	0.18	345	3.71	1.80	1.71	1.91
6	0.00	0.30	0.36	0.40			298	2.65	24	0.21	322	3.29	1.34	1.68	1.95
7	0.00	0.30	0.35				285	3.04	24	0.26	309	3.23	1.00	1.83	2.23
8	0.00	0.31	0.36				289	2.93	29	0.29	318	3.38	1.15	2.02	2.23
9	0.00	0.27	0.32				308	2.79	19	0.17	327	3.11	1.16	1.73	1.95
10	0.00						331	3.05	32	0.29	363	4.04	2.27	1.50	1.77
11	0.00	0.38	0.29				370	3.17	88	0.75	458	4.36	1.79	2.35	2.57
12	0.00	0.40	0.35				291	2.84	27	0.26	318	3.33	1.23	1.87	2.10
13	0.00	0.42	0.37	0.35			270	2.57	24	0.23	294	3.23	1.14	1.87	2.09
14	0.00	0.27	0.30				311	3.11	64	0.64	375	3.81	1.34	2.22	2.47
15	0.00	0.35	0.33				358	3.87	21	0.23	379	4.13	2.23	1.71	1.90
16	0.00						334	3.66	27	0.30	361	4.15	2.19	1.70	1.96
17	0.00						300	3.06	15	0.15	315	3.78	1.79	1.74	1.99
18	0.00						298	3.51	28	0.33	326	3.22	1.12	1.81	2.10
19	0.00						297	3.32	17	0.19	314	3.01	1.13	1.64	1.88
20	0.00						356	3.95	19	0.21	375	3.42	1.64	1.61	1.78
21	0.00						345	3.85	19	0.21	364	3.70	1.99	1.53	1.71
22	0.00						349	3.77	20	0.22	369	3.78	1.94	1.67	1.84
23	0.00	0.33	0.33				350	4.04	47	0.54	397	4.48	2.68	1.61	1.80
24	0.00	0.44	0.37				289	3.94	35	0.48	324	3.82	1.91	1.71	1.91
25	0.00			0.21			301	3.78	28	0.35	329	3.59	1.54	1.82	2.05
26	0.00						289	3.66	26	0.33	315	3.57	1.42	1.96	2.15
27	0.00						278	3.57	24	0.31	302	3.22	1.02	2.06	2.20
28	0.00						262	4.03	16	0.25	278	3.26	1.41	1.55	1.85
Tot.	NaF Transfer Pump broken took a long time for 1 part						8,361		797		9,513				
Avg.	0.00	0.34	0.33	0.32			309.54	3.36	30.21	0.32	339.75	3.67	1.59	1.85	2.08
Max	0.00	0.44	0.38	0.40			370.00	4.04	88.00	0.75	458.00	5.09	2.68	2.36	2.58
Min.	0.00	0.27	0.28	0.21			262.00	2.57	15.00	0.15	278.00	3.01	0.86	1.50	1.71

WSSN 0600 City of Benton Harbor

Month/Year Feburary 2019

COAGULATION PARAMETERS

D A T E	MIL. GAL. TREAT.	Dry Al2(SO3)4 Pounds Add	ALUM as Al3+ mg/l	TURBIDITY UNITS RAW Avg.	RAW Max.	Applied Avg.	# ample	FILTERED NORTH Avg.	FILTERED NORTH Max.	# Samples	FILTERED SOUTH Avg.	FILTERED SOUTH Max.	2 Hour Compliance Periods # of Periods	#of Periods >.30NTU North	#of Periods >.30NTU South
1	1.1746	346.00	1.55	2.40	3.20	0.57	3	0.08	0.08	3	0.16	0.22	6	0	0
2	1.4532	411.00	1.49	4.80	7.10	0.76	3	0.07	0.07	2	0.10	0.12	5	0	0
3	1.4920	402.00	1.42	10.60	22.90	0.54	3	0.07	0.07	3	0.11	0.12	6	0	0
4	1.5664	414.00	1.39	2.20	4.00	0.72	3	0.07	0.08	3	0.09	0.13	6	0	0
5	1.4216	415.00	1.54	3.30	5.10	0.60	3	0.08	0.08	3	0.12	0.15	6	0	0
6	1.6807	421.00	1.30	3.10	3.70	0.89	3	0.08	0.09	3	0.10	0.10	6	0	0
7	1.3994	533.00	2.00	2.70	3.40	0.56	3	0.09	0.11	3	0.07	0.09	6	0	0
8	1.4700	519.00	1.86	4.70	5.40	0.62	3	0.07	0.08	3	0.07	0.08	6	0	0
9	1.6452	516.00	1.65	10.00	10.40	2.60	3	0.08	0.10	3	0.09	0.10	6	0	0
10	1.6222	533.00	1.73	4.50	5.00	1.40	3	0.08	0.09	3	0.09	0.10	6	0	0
11	1.7439	731.00	2.21	5.60	7.30	0.82	3	0.07	0.08	3	0.08	0.09	6	0	0
12	1.5314	506.00	1.74	2.20	2.60	0.99	3	0.07	0.08	3	0.09	0.12	6	0	0
13	1.5653	453.00	1.52	10.00	12.80	1.00	3	0.07	0.09	3	0.06	0.07	6	0	0
14	1.4909	500.00	1.76	7.70	10.40	1.90	3	0.11	0.15	3	0.09	0.12	6	0	0
15	1.3825	518.00	1.97	8.50	9.80	1.60	3	0.07	0.08	3	0.08	0.08	6	0	0
16	1.3614	519.00	2.01	4.60	5.10	0.75	3	0.09	0.11	3	0.08	0.10	6	0	0
17	1.4645	960.00	3.45	3.90	4.80	2.90	3	0.11	0.16	3	0.12	0.18	6	0	0
18	1.2678	639.00	2.65	4.60	5.90	0.86	3	0.10	0.13	3	0.12	0.19	6	0	0
19	1.3371	575.00	2.26	4.70	5.50	0.74	3	0.06	0.07	3	0.07	0.07	6	0	0
20	1.3470	633.00	2.47	4.30	5.50	1.80	3	0.08	0.09	3	0.10	0.11	6	0	0
21	1.3383	482.00	1.89	5.50	5.90	1.50	3	0.06	0.07	3	0.08	0.09	6	0	0
22	1.3825	531.00	2.02	3.90	4.90	1.80	3	0.07	0.08	3	0.07	0.07	6	0	0
23	1.2936	523.00	2.13	4.70	9.40	1.10	3	0.09	0.10	3	0.08	0.08	6	0	0
24	1.0952	476.00	2.29	2.90	3.60	0.80	3	0.08	0.10	3	0.07	0.07	6	0	0
25	1.1893	508.00	2.25	12.60	13.30	0.87	3	0.07	0.09	3	0.07	0.07	6	0	0
26	1.1775	433.00	2.25	7.00	8.50	1.20	3	0.06	0.06	3	0.07	0.07	6	0	0
27	1.1613	400.00	1.81	6.90	7.50	1.30	3	0.07	0.07	3	0.07	0.08	6	0	0
28	0.9713	326.00	1.77	8.10	8.40	1.70	3	0.09	0.09	2	0.09	0.09	4	0	0
Total	39.0261	14223.00					84	Samples N		82	Samples S		165	0	0
Avg.	1.3938	507.96	1.94	5.57	7.19	1.17	83	0.08	0.09		0.09		Total	Total	Total
Max	1.7439	960.00	3.45	12.60	22.90	2.90		0.11	0.16		0.16	0.19	6	0	0
Min.	0.9713	326.00	1.30	2.20	2.60	0.54		0.06	0.06		0.06		4	0	0

WSSN 0600 MONTH/YEAR Feburary 2019 PAGE 4

CITY OF BENTON HARBOR CHEMICAL ANALYSES

DATE	pH		Total Hardness as CaCO3 mg/l		Total Alkalinity as CaCO3 mg/l		Non-Carb. Hardness as CaCO3 mg/l		Calcium as Ca++ mg/l		Magnesium as Mg++ mg/l		Chloride as Cl- mg/l	
	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	7.9	174	162	126	112	48	50	45	43	15	13		
2	7.8	7.7	168	170	115	119	53	51	41	42	16	16		
3	7.9	7.8	170	164	114	110	56	54	44	40	15	16		
4	7.9	7.8	190	166	137	112	53	54	47	42	17	15		
5	7.8	7.8	188	194	126	121	62	73	48	51	17	17		
6	7.9	7.8	148	144	114	117	34	27	47	46	7	7	14.5	18.0
7	7.9	7.9	160	148	111	112	49	36	50	47	9	7		
8	7.9	7.9	154	148	105	107	49	41	46	43	10	10		
9	8.0	7.7	182	148	132	103	50	45	62	45	7	9		
10	7.9	7.9	166	156	123	116	43	40	47	46	12	10		
11	7.9	7.9	176	172	114	113	62	59	45	41	15	17		
12	7.8	7.8	168	162	112	107	56	55	42	40	16	15		
13	7.8	7.7	160	152	114	105	46	47	40	41	15	12		
14	7.8	7.8	204	166	134	104	70	62	55	42	17	15		
15	7.8	7.9	180	168	131	117	49	51	48	42	15	16	23.0	26.5
16	7.9	7.8	150	172	117	129	33	43	50	51	6	11		
17	7.9	7.8	170	158	119	113	51	45	49	47	12	10		
18	7.9	7.9	164	156	120	109	44	47	47	48	11	8		
19	7.8	7.7	142	144	109	105	33	39	42	43	9	9	18.5	26.0
20	7.9	7.9	186	146	131	121	55	25	56	44	11	9		
21	7.9	7.9	168	178	124	131	44	47	55	61	8	6		
22	7.9	7.7	176	162	134	125	42	37	55	55	9	6		
23	8.0	8.0	186	170	132	125	54	45	48	44	16	15		
24	8.0	8.0	194	176	153	125	41	51	43	46	21	15	17.5	24.5
25	7.8	7.8	152	158	108	119	44	39	47	53	8	6	19.5	22.0
26	7.8	7.8	148	152	108	111	40	41	46	46	8	9		
27	8.2	8.0	168	148	114	111	54	37	46	43	13	10		
28	7.8	7.9	162	148	111	102	51	46	46	45	11	9		
Avg.	7.9	7.8	169.8	160.3	121.0	114.3	48.8	46.0	47.8	45.6	12.4	11.4	18.6	23.4
Max	8.2	8.0	204.0	194.0	153.0	131.0	70.0	73.0	62.0	61.0	21.0	17.0	23.0	26.5
Min.	7.8	7.7	142.0	144.0	105.0	102.0	33.0	25.0	40.0	40.0	6.0	6.0	14.5	18.0

WSSN 0600 MONTH/YEAR Feburary 2019 PAGE 6

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

D A T E	RAW No. of Samples	RAW Colilert P/A	PLANT TAP No. of Samples	PLANT TAP Colilert P/A	Standard Plate Count Raw	Standard Plate Count Tap	Raw TEMP. 'C	Tap TEMP. 'C	COLOR ___True ___Appar. Raw	COLOR Tap	ODOR ___Cold ___60'C Raw	ODOR Tap
1			1	A	86	0	2	2.5				
2			1	A	49	0	2	2.0				
3			1	A	39	0	2	2.5				
4			1	A	48	2	2	2.5				
5			1	A	28	0	2	2.5				
6			1	A	33	0	3	4.0				
7			1	A	30	0	2	3.8				
8			1	A	27	0	2	3.3				
9			1	A	176	3	3	5.0				
10			1	A	551	2	2	4.0				
11			1	A	45	0	2	2.5				
12			1	A	47	0	2	2.5				
13			1	A	30	0	2	2.0				
14			1	A	65	0	2	2.5				
15			1	A	101	1	2	2.5				
16			1	A	118	0	2	5.0				
17			1	A	83	0	2	5.0				
18			1	A	45	0	2	4.0				
19			1	A	38	0	2	6.0				
20			1	A	63	0	2	4.0				
21			1	A	71	1	2	4.0				
22			1	A	71	1	2	4.0				
23			1	A	90	1	2	3.0				
24			1	A	90	0	3	3.5				
25			1	A	38	0	2	5.0				
26			1	A	54	0	2	5.0				
27			1	A	38	0	2.0	4.0				
28			1	A	24	0	9.0	12.0				
AVG.			1	A	78	0	2	4				
Max					551	3	9	12				
Min					24	0	2	2				

DISTRIBUTION SYSTEM MONITORING DMR WSSN 0600 Feburary 2019

DATE	Chlorine Residual at Bacteriological Monitoring Stations mg/l									
	CITY OF BENTON HARBOR					blu water	B&Z			
	1	2	3	4	5	6	7			
1										
2										
3										
4										
5										
6	1.04		1.31	0.00	0.93		0.89			
7										
8										
9										
10										
11										
12										
13	0.90		1.02	0.65	1.21		2.05			
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25	1.13			0.93	1.08		1.28			
26			1.00				1.20			
27										
28										
29										
30										
31										

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

Total number of routine distribution samples analyzed	0600	16	
Total number of positive routine distribution samples	0600		
Total number of routine distribution samples required	0600	10	Max Min
Average Chlorine Residuals by WSSN, mg/L	0600	1.04	2.05 0.00
Total number of check samples	0600		
Total number of positive check samples	0600		

MI 0600 Benton Harbor Water MOR Cover sheet Revised @ 02/4/19

MONTHLY OPERATION REPORT OF THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: CITY OF BENTON HARBOR

WSSN:600

Operator-in-Charge **Michael O'Malley** F1-S1

Signature of Operator-in-Charge

Month/Year **January-19** F1-S2

Water Plant Classification

Berrien County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.4059	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	273.00	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	1.06	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.40	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.39%	Percent of Treated Water

Chemical Data

Chlorine on hand:	38380	lb.	Est. supply:	102 days
Primary Coagulant (Alum (Al3+)) on hand:	32566	lb.	Est. supply:	116 days
Cost of All Chemicals per Million Gallons:	$70.97	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	93	93
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

← Revised to be correct

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? **If yes**, attach specific filter(s) information and indicate required follow-up status.	NO
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? **If yes**, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.	NO
Did POE disinfectant residual fall below 0.2 ppm during the month? **If yes**, indicate date(s) and duration on a separate sheet.	NO
Was minimum C*T credit achieved for the entire month? **If no**, indicate on a separate sheet the date(s) not achieved.	YES
Was continuous POE chlorine residual monitoring equipment off-line during the month? **If yes**, indicate date(s) and duration on a separate sheet.	NO

Distribution	Total	30.48468	Avg	1.0162826	Max	1.39556	Min	0.82812

Remarks: Data developed to re-determine Water Distributed to System Max days during water main break of 4" about 7 days.

MI 0600 Benton Harbor Water MOR Revised pg 2/11/19

Missed these

WSSN 0600 City of Benton Harbor

Month/Year January-19

COAGULATION PARAMETERS

DAY	MIL. GAL. TREAT.	Dry Al2(SO3)4 Pounds Add	ALUM as Al3+ mg/l	TURBIDITY UNITS RAW Avg.	RAW Max.	Applied Avg.	# Samples	FILTERED NORTH Avg.	FILTERED NORTH Max.	# Samples	FILTERED SOUTH Avg.	FILTERED SOUTH Max.	2 Hour Compliance Periods # of Periods	#of Periods >.30NTU North	#of Periods >.30NTU South
1	0.8675	289.00	1.75	6.90	7.40	0.30	3	0.06	0.07	3	0.06	0.07	6	0	0
2	0.9450	308.00	1.71	8.20	10.10	0.34	3	0.06	0.07	3	0.07	0.08	6	0	0
3	0.8312	270.00	1.71	7.50	7.70	0.79	3	0.08	0.09	3	0.07	0.07	6	0	0
4	0.9450	337.00	1.88	8.20	8.70	0.77	3	0.06	0.06	3	0.09	0.10	6	0	0
5	0.9051	293.00	1.70	9.00	14.10	0.66	3	0.08	0.08	3	0.07	0.07	6	0	0
6	1.0500	333.00	1.47	7.60	8.40	0.69	3	0.07	0.08	3	0.06	0.07	6	0	0
7	1.0500	341.00	1.71	7.10	8.50	0.64	3	0.08	0.10	3	0.07	0.07	6	0	0
8	0.9071	310.00	1.80	7.20	10.60	0.50	3	0.07	0.08	3	0.07	0.08	6	0	0
9	1.0519	299.00	1.50	7.20	7.70	0.42	3	0.08	0.08	3	0.06	0.07	6	0	0
10	0.9750	327.00	1.76	8.30	9.20	0.55	3	0.07	0.08	3	0.06	0.06	6	0	0
11	0.8600	268.00	1.64	7.30	7.90	0.63	3	0.07	0.08	3	0.07	0.09	6	0	0
12	0.9870	297.00	1.58	6.40	9.50	0.55	3	0.07	0.08	3	0.07	0.08	6	0	0
13	0.8280	277.00	1.76	6.40	9.50	0.42	3	0.06	0.06	3	0.06	0.07	6	0	0
14	1.0560	352.00	1.75	5.80	7.60	0.46	3	0.07	0.09	3	0.07	0.08	6	0	0
15	1.0550	321.00	1.60	7.00	9.10	0.81	3	0.07	0.07	3	0.07	0.08	6	0	0
16	1.0612	340.00	1.69	8.30	11.60	0.63	3	0.06	0.07	3	0.07	0.07	6	0	0
17	0.9114	295.00	1.70	5.00	5.50	0.48	3	0.07	0.08	3	0.08	0.09	6	0	0
18	1.0556	350.00	1.74	8.30	12.00	0.57	3	0.07	0.07	3	0.07	0.08	6	0	0
19	0.9300	252.00	1.43	7.40	7.50	0.66	3	0.07	0.09	3	0.07	0.07	6	0	0
20	1.0125	313.00	1.63	8.70	11.60	0.55	3	0.07	0.07	3	0.07	0.08	6	0	0
21	0.9720	303.00	1.64	6.60	6.90	0.59	3	0.07	0.07	3	0.07	0.08	6	0	0
22	0.9900	330.00	1.75	8.00	10.90	0.72	3	0.07	0.09	3	0.07	0.08	6	0	0
23	1.0858	324.00	1.57	10.00	18.50	0.66	3	0.07	0.08	3	0.08	0.09	6	0	0
24	1.3860	485.00	1.84	14.70	20.60	1.40	3	0.10	0.14	3	0.10	0.13	6	0	0
25	1.4059	341.00	1.28	12.40	12.70	0.13	3	0.07	0.08	3	0.08	0.09	6	0	0
26	1.3839	457.00	1.28	10.20	15.40	0.93	3	0.07	0.08	3	0.11	0.14	6	0	0
27	1.0777	353.00	1.72	7.00	8.30	0.60	3	0.07	0.07	3	0.09	0.12	6	0	0
28	1.4014	431.00	1.62	7.90	9.50	1.00	3	0.07	0.08	3	0.12	0.16	6	0	0
29	1.2195	384.00	1.66	13.10	15.50	1.00	3	0.07	0.07	3	0.18	0.29	6	0	0
30	1.2820	353.00	1.45	14.40	21.60	1.10	3	0.07	0.08	3	0.11	0.14	6	0	0
31	1.2678	356.00	1.48	5.70	6.60	1.50	3	0.06	0.07	3	0.11	0.15	6	0	0
Total	32.7565	10289.00					93			93			186	0	0
Avg.	1.0567	331.90	1.64	8.32	10.67	0.68	93	0.07	0.08		0.08		Total	Total	Total
Max	1.4059	485.00	1.88	14.70	21.60	1.50		0.10	0.14		0.18	0.29	6	0	0
Min.	0.8280	252.00	1.28	5.00	5.50	0.13		0.06	0.06		0.06				

Midwest
Municipal
Instrumentation Inc.

McCROMETER
The Flow Measurement Specialists

Customer: City of Benton Harbor Water Treatment Plant

Reference: Insertion Meters
Date: 02/4/19

Attention: Mr. Mike O'Malley

We are pleased to offer our proposal for furnishing and delivering McCrometer Inc. equipment for the above referenced project. Equipment is specifically listed in the attached "Proposed Equipment List." Items required, but not listed, are to be furnished by others. **Make all Purchase Orders out to McCrometer, Inc.; c/o: Midwest Municipal Instrumentation**

PROPOSED EQUIPMENT LIST

Freight Included
Does not include taxes

30 Inch INSERTION Meters with AC Power

Quantity	Model	Unit Cost
1	FPI MAG 395L McCrometer, FPI Flow Meter. Multi-Mag Insertion Type Multiple sets of 316 Stainless Steel Electrodes as Specified **Forward Flow ONLY** **Probe Insertion: 30 Inches in Length** 2 Inch Stainless Steel Diameter Probe as Specified NSF Fusion Bonded liner Sliding Joint: (Hot Tap) 2 Inch NPT 1% Accuracy from 0.3 Feet/second to 20 Feet/second (0 to 33,000 GPM) 110 VAC Power / Dual 4-20mA output for flow / Low Flow Contact NEMA 4X Transmitter with 6 Digit totalizer as Specified **40 Feet of cable of dual submersible cable** 2 Inch Stainless Steel Valve and 316 Stainless Steel Nipple P#43059-1 Included / Saddle not included Tag FE/FIT Advise	$13,995.00.
1	Ship Insertion measuring Tool	Included
	Startup by Oudbier Instruments NOT INCUDED	

Curtis Brzyski
MMI Inc.

Prepared by: Richard W Mommers
4391 Bonnymede Court
Jackson, MI 49201
Per McCrometer Terms & Conditions

Telephone: 419-936-4369
Fax: 419-754-2100
Cell: 419-419-9733
E-mail: rmommersmmi@msn.com

Validity of Proposal: 90 Days FOB: Factory
Payment Terms: 100% Net 30 Days from shipment
Taxes: Excluded and are the responsibility of the Buyer
Installation and all on-site services: Not Included

McCrometer, INC. - PROVISIONS & CONDITIONS

Acceptance: All orders subject to acceptance by Marsh-McBirney, Inc., hereinafter "Seller". Seller sells only pursuant to the provisions and conditions in this Order Acknowledgment. If Buyer's order contains written, printed, or stamped conditions inconsistent with the written, printed, or stamped provisions contained in this Order Acknowledgment, then the provisions of this Order Acknowledgment shall prevail.

Payment Terms: Invoices for material delivered under this order are payable only in United States dollars. All payments are due from date of invoice or shipment, whichever is sooner. These terms of payment are subject, nevertheless, at all times to the approval of Seller's Credit Department and in case of doubt arising as to Buyer's financial responsibility, shipment may be suspended until satisfactory assurances of Buyer's responsibility is received. **In the event that payment is received in excess of thirty (30) days from date of invoice, a Service Fee of 1.5% per month (18% per annum) shall be assessed. In the event that collection procedures are required by reasonable attorney fees, court costs, other litigation-related expenses, and interest at 1.5% per month from thirty days after date of invoice until receipt of payment.** Each shipment shall be considered a separate and independent transaction, and payment therefore shall be made accordingly. In the event the Buyer delays shipments, payments shall become due on the date when the Seller is prepared to make shipment. In the event the Buyer delays the work covered by the purchase order, payments shall be based on the purchase price and the percentage of completion. Products held for the Buyer shall be at the risk of the Buyer. The Seller reserves the right to ship to its order and make collection by sight draft with bill of lading attached.

Assignment: All accounts receivable balances due are assignable at the discretion of the Seller.

Delivery Dates: The estimated shipping capability stated on this order acknowledgment is given solely for the Buyer's information and does not constitute a commitment to deliver products in accordance herewith. Buyer may request a specific shipping date or shipping schedule; however, Buyer may not request that a shipment be scheduled beyond one year from the issuance of its purchase order. Seller will schedule shipments based upon Buyer's request and Seller's shipping capabilities at the time Buyer's purchase order is processed, at which time Seller will issue to Buyer a formal acknowledgment that will indicate the estimated shipping date(s). After the shipments have been scheduled, Buyer may not cancel or postpone a scheduled shipment unless Buyer submits its request in writing and Seller consents by issuing a new acknowledgment. Any request to reschedule the shipment that is received less than thirty (30) days from the date scheduled for the shipment of the products covered by the request may be rejected as untimely, or may be accepted upon payment of a rescheduling charge of 10% of the sales price shown on this acknowledgment, at Seller's option. Seller will use its best efforts to ship on or before the estimated shipping dates indicated, but will not be liable for any delay or failure to deliver resulting from circumstances which are beyond the reasonable control of the Seller or which would cause Seller to incur unreasonable expense in order to effect such delivery. Seller shall not be liable for any special incidental or consequential damages resulting from delivery delays or inability to deliver.

Cancellations: In the event Buyer cancels the contract embodied in Buyer's order and this acceptance thereof in whole or in part, or such contract is canceled by Seller because of default by the Buyer, then Buyer shall pay Seller by reason of such cancellation or default for all damages sustained, and shall pay for units in process and completed units, shipped or unshipped, at current price applicable to the total quantity completed at time of default.

Shipping: All items are shipped FOB Frederick, Maryland with freight charges prepaid and added to the invoice. Title and risk of loss shall pass to Buyer upon tender of the products by Seller to a common carrier. In absence of specific written instruction from Buyer, Seller will select the common carrier, but Seller shall not thereby incur any liability in connection with shipment. Buyer

shall be responsible for any freight charge.

Returns/Exchanges: Only instrumentation manufactured by Marsh-McBirney, Inc. will be accepted for return/exchange. An instrument can only be returned or exchanged after first; notifying the factory of the reason for return/exchange, and secondly, receiving authorization from a Marsh-McBirney, Inc. factory representative. Computers and other peripheral devices supplied by Marsh-McBirney, Inc. with a customer's order will not be exchanged or accepted for return after shipment. For all returns of instrumentation and accessories, there is a 25% restocking charge.

Start-up Service: It is the customer's responsibility to notify Marsh-McBirney, Inc. to schedule on-site start-up service. Marsh-McBirney, Inc. will make every effort to schedule the start-up service as soon as possible after receipt of notification.

Warranty: The one-year warranty period starts from date of shipment from the factory. This warranty covers only instrumentation manufactured by Marsh-McBirney, Inc. See complete warranty statement enclosed. For extended maintenance agreements, please contact our Customer Service Department.

Seller and Buyer agree that the laws of Maryland shall govern their agreement.

ABB INC.
GENERAL TERMS AND CONDITIONS OF SALE

1. General. The terms and conditions contained herein, together with any additional or different terms contained in ABB's Proposal, if any, submitted to Purchaser (which Proposal shall control over any conflicting terms), constitute the entire agreement (the "Agreement") between the parties with respect to the order and supersede all prior communications and agreements regarding the order. Acceptance by ABB of the order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. These terms and conditions may not be changed or superseded by any different or additional terms and conditions proposed by Purchaser to which terms ABB hereby objects. Unless the context otherwise requires, the term "Equipment" as used herein means all of the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the order. Unless the context otherwise requires, the term "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the order. As used herein, the term "Purchaser" shall include the initial end use of the Equipment and/or services; provided, however, that Paragraph 13(a) shall apply exclusively to the initial end user.

2. Prices.
(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof.
(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.
(c) The price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, or other like taxes which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such taxes which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any tax or holds a direct payment permit, Purchaser shall, upon order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.
(d) The price includes customs duties and other importation or exportation fees, if any, at the rates in effect on the date of ABB's Proposal. Any change after that date in such duties, fees, or rates, shall increase the price by ABB's additional cost.

3. Payment.
(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal.
(b) If in the judgment of ABB the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB, or may terminate the order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.
(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection.

4. Changes.
(a) Any changes requested by Purchaser affecting the ordered scope of work must be accepted by ABB and resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.
(b) ABB may, at its expense, make such changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications. If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection.

5. Delivery.
(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered F.O.B. point of shipment. Equipment shipped from outside the continental United States is delivered F.O.B. United States port of entry. Purchaser shall be responsible for any and all demurrage or detention charges.
(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.
(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.
(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier

6. Title & Risk of Loss. Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall remain in ABB until fully paid for. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage shall pass to Purchaser upon delivery.

7. Inspection, Testing and Acceptance.
(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours.
(b) If the order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.
(c) If the order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.
(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software, Spare Parts and Refurbished or Repaired Parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. The Warranty Remedy Period for refurbished or repaired parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.
(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or 30 days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.
(c) Exceptions. ABB shall not be responsible for providing working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.
(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".
(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Patent Indemnity.
(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB (a "Process") directly infringes any claim of a patent of the United States

of America and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.
(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any patent issued after the date hereof; or (v) any action settled or otherwise terminated without the prior written consent of ABB.
(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY PATENT INFRINGEMENT.
(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Patent Indemnity" provision.

10. Limitation of Liability.
(a) In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages. ABB's liability for any claim whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Patent Indemnity") exceed one-half (1/2) of the purchase price allocable to the Equipment or part thereof or Services which gives rise to the claim.
(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.
(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

11. Laws and Regulations. ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth herein, and compliance with any laws and regulations relating to the operation or use of the Equipment or Software is the sole responsibility of the Purchaser. All laws and regulations referenced herein shall be those in effect as of the Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall be governed by the laws of the State of New York, but excluding the provisions of the United Nations Convention on Contracts for the International Sale of Goods and excluding New York law with respect to conflicts of law. Purchaser agrees that all causes of action against ABB under this Agreement shall be brought in the State Courts of the State of New York, or the U.S. District Court for the Southern District of New York. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

12. OSHA. ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

13. Software License.
(a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) The Software may be used only in conjunction with equipment specified by ABB; (ii) The Software shall be kept strictly confidential; (iii) The Software shall not be copied, reverse engineered, or modified; (iv) The Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.
(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine readable Software from all of Purchaser's storage media.

14. Inventions and Information. Unless otherwise agreed in writing by ABB and Purchaser, all right, title and interest in any inventions, developments, improvements or modifications of or for Equipment and Services shall remain with ABB. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

15. Force Majeure. ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

16. Cancellation. Any order may be cancelled by Purchaser only upon prior written notice and payment of termination charges, including but not limited to, all costs identified to the order incurred prior to the effective date of notice of termination and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

17. Termination. No termination by Purchaser for default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

18. Export Control.
(a) Purchaser represents and warrants that the Equipment and Services provided hereunder and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use. Purchaser agrees not to disclose, use, export or re-export, directly or indirectly, any information provided by ABB or the "direct product" thereof as defined in the Export Control Regulations of the United States Department of Commerce, except in compliance with such Regulations.
(b) If applicable, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

19. Assignment. Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

20. Nuclear Insurance – Indemnity. For applications in nuclear projects, the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage resulting from a nuclear incident to and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident.

21. Resale. If Purchaser resells any of the Equipment, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder.

22. Entire Agreement. This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided.

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Catherine A. Winn** **F1-S1**

Month/Year **April-21** **F1-S2**

Catherine A. Winn
Signature of Operator-in-Charge

REVISED 5/17/2021

Water Plant Classification
Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1866	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	169.67	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.97	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.93	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.88%	Percent of Treated Water

Chemical Data

Chlorine on hand:	66357	lb.	Est. supply:	293	days
Primary Coagulant (Alum (Al3+)) on hand:	65530	lb.	Est. supply:	230	days
Cost of All Chemicals per Million Gallons:	$64.74	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	87	90
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	26.495952	Avg	0.9172796	Max	1.333876	Min	0.733097

Remarks:
Catherine A. Winn is OIC for final data review only.
We continue to work with City staff on plant tap WQP analysis frequency.

WSSN 0600 CITY OF BENTON HARBOR Month/Year **April-21**

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30 NTU	>.30 NTU
														North	South
1	1.0800	331.00	1.61	4.50	5.40	0.78	3	0.07	0.07	3	0.16	0.20	6	0	0
2	1.1200	340.00	1.60	4.90	5.20	0.95	3	0.07	0.07	3	0.15	0.17	6	0	0
3	1.1050	317.00	1.51	6.30	6.90	1.40	3	0.07	0.08	3	0.16	0.18	6	0	0
4	1.1325	326.00	1.51	3.60	4.10	0.92	3	0.08	0.09	3	0.11	0.14	6	0	0
5	0.8925	254.00	1.50	3.10	5.10	0.81	3	0.08	0.08	3	0.09	0.13	6	0	0
6	0.9275	281.00	1.44	4.40	6.40	0.74	3	0.07	0.07	3	0.11	0.11	6	0	0
7	0.9150	274.00	1.58	4.30	8.00	0.76	3	0.07	0.07	3	0.08	0.08	6	0	0
8	0.9525	287.00	1.59	3.20	5.40	0.58	3	0.07	0.08	3	0.09	0.09	6	0	0
9	1.1866	399.00	1.77	5.20	6.40	0.74	3	0.08	0.09	3	0.08	0.08	6	0	0
10	1.0125	408.00	2.12	1.80	1.90	0.38	3	0.07	0.07	3	0.07	0.07	6	0	0
11	1.0500	312.00	1.56	2.00	2.00	0.49	3	0.00	0.00	3	0.07	0.07	3	0	0
12	1.0375	322.00	1.63	2.00	2.20	0.50	3	0.08	0.09	3	0.07	0.08	6	0	0
13	1.0875	313.00	1.51	2.30	2.90	0.52	3	0.08	0.08	3	0.06	0.07	6	0	0
14	0.9425	274.00	1.53	2.40	2.90	0.54	3	0.08	0.10	3	0.09	0.09	6	0	0
15	0.8925	275.00	1.62	2.80	4.30	0.48	3	0.08	0.09	3	0.09	0.10	6	0	0
16	0.9475	276.00	1.53	2.90	3.40	0.47	3	0.08	0.10	3	0.07	0.07	6	0	0
17	0.9475	288.00	1.60	3.70	6.90	0.55	3	0.09	0.12	3	0.07	0.08	6	0	0
18	0.7675	235.00	1.61	2.60	5.50	0.48	3	0.08	0.09	3	0.07	0.08	6	0	0
19	1.0050	310.00	1.62	2.40	2.70	0.78	3	0.07	0.08	3	0.07	0.07	6	0	0
20	0.7625	215.00	1.48	3.40	4.10	0.65	3	0.08	0.10	3	0.08	0.09	6	0	0
21	1.1275	343.00	1.60	3.10	3.50	0.64	3	0.08	0.09	3	0.08	0.08	6	0	0
22	1.0625	328.00	1.62	3.60	4.30	0.82	3	0.08	0.09	3	0.09	0.11	6	0	0
23	0.9150	284.00	1.63	3.10	3.60	0.70	3	0.10	0.10	3	0.09	0.10	6	0	0
24	0.9000	276.00	1.61	2.30	2.50	0.61	3	0.09	0.12	3	0.10	0.12	6	0	0
25	0.8900	274.00	1.62	3.80	4.00	0.59	3	0.08	0.08	3	0.08	0.10	6	0	0
26	0.8725	264.00	1.62	2.80	3.10	0.57	3	0.08	0.09	3	0.10	0.10	6	0	0
27	0.9175	283.00	1.62	3.20	3.70	0.77	3	0.08	0.09	3	0.07	0.07	6	0	0
28	0.9400	287.00	1.61	3.10	4.10	0.55	3	0.09	0.09	3	0.08	0.09	6	0	0
29	0.9525	289.00	1.60	2.20	2.30	0.52	3	0.08	0.07	3	0.08	0.10	6	0	0
30	0.8725	265.00	1.60	2.40	2.50	0.53	3	0.07	0.08	3	0.08	0.09	6	0	0
31											0.00	0.00	0	0	0
Total	29.2141	8930.00					90			90			177	0	0
Avg.	0.9738	297.67	1.60	3.25	4.18	0.66		0.08	0.08		0.09		Total	Total	Total
Max	1.1866	408.00	2.12	6.30	8.00	1.40		0.10	0.12		0.16	0.20	6	0	0
Min.	0.7625	215.00	1.44	1.80	1.90	0.38		0.00	0.00		0.00				

WSSN 0600 CITY OF BENTON HARBOR MONTH/YEAR **April-21**

CHEMICAL ANALYSES

			Total		Total		Non-Carb.								WQP	
			Hardness		Alkalinity		Hardness		Calcium		Magnesium		Chloride		Conductivity	Sulfate
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-			
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		umhos	mg/l
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Tap	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42		
1	8.4	8.3	186	178	156	149	30	29	53	54	13	11				
2	8.3	8.2	168	172	138	138	30	34	46	50	13	12				
3	8.4	8.2	196	174	163	136	33	38	59	55	12	9				
4	8.2	7.9	156	174	131	138	25	36	44	49	11	13				
5	8.2	8.1	172	186	129	136	43	50	41	48	17	16				
6	8.1	7.9	196	182	142	131	54	51	48	45	18	17				
7	8.1	7.8	190	182	136	129	54	53	47	45	17	17				
8	8.1	8.0	178	184	131	130	47	54	45	48	16	16	21.0	25.5	754	45
9	8.2	7.9	176	178	128	127	48	51	45	47	16	15				
10	8.2	8.1	152	156	127	127	25	29	41	46	12	10				
11	8.3	8.2	158	154	129	124	29	30	42	49	13	8				
12	8.3	8.2	156	154	131	123	25	31	42	46	12	9				
13	8.1	8.1	172	158	145	125	27	33	50	46	12	11	25.5	28.5		
14	8.2	7.9	176	166	134	124	42	42	39	38	19	17				
15	8.1	7.8	176	182	129	125	47	57	46	50	15	14				
16	8.2	8.3	152	158	124	123	28	35	42	42	12	13				
17	8.1	8.0	176	178	125	122	51	56	46	47	15	15				
18	8.1	8.0	172	168	124	119	48	49	41	42	17	15	19.5	24.0		
19	8.3	7.9	146	144	132	123	14	21	42	42	10	10				
20	8.1	7.7	168	158	139	120	29	38	48	46	12	11				
21	8.3	8.2	158	152	134	126	24	26	45	43	11	11	23.0	26.5		42
22	8.4	8.2	176	166	145	139	31	27	49	47	13	12				
23	8.5	8.3	186	168	150	137	36	31	51	47	14	12				
24	8.2	8.1	194	190	141	140	53	50	49	48	17	17				
25	8.1	7.8	196	192	138	138	58	54	48	50	18	17	21.5	26.5		
26	8.2	8.0	198	194	136	136	62	58	48	50	19	17				
27	8.1	7.9	204	194	142	132	62	62	49	47	20	18				
28	8.2	8.0	204	196	143	134	61	62	46	44	22	21				
29	8.0	8.0	204	196	137	134	67	62	49	48	20	18				
30	8.0	8.0	198	192	140	131	58	61	50	48	18	17	23.0	27.5		
31																
Avg.	8.2	8.0	178.0	174.2	136.6	130.5	41.4	43.7	46.4	46.9	15.1	14.0	22.3	26.4	754	44
Max	8.5	8.3	204.0	196.0	163.0	149.0	67.0	62.0	59.0	55.0	22.0	21.0	25.5	28.5	754	45
Min.	8.0	7.7	146.0	144.0	124.0	119.0	14.0	21.0	39.0	38.0	10.0	8.0	19.5	24.0	754	42

MONTH/YEAR **April-21**

FLUORIDATION AND CHLORINATION

		Fluoride Analysis			Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.48	0.28	0.69		0	0.00	245	3.39	46	0.64	291	4.25	2.25	1.76	2.00
2	0.48	0.36	0.70		0	0.00	244	3.25	26	0.35	270	3.60	1.84	1.56	1.76
3	0.41	0.38	0.73		0	0.00	240	3.24	35	0.47	275	4.41	2.31	1.96	2.10
4	0.46	0.29	0.78		0	0.00	242	3.19	38	0.50	280	3.68	1.49	2.01	2.19
5	0.42	0.29	0.77		0	0.00	186	3.11	50	0.84	236	4.32	1.64	2.51	2.68
6	0.41	0.24	0.77		0	0.00	183	2.95	36	0.58	219	4.05	2.07	1.82	1.98
7	0.41	0.23	0.78	0.78	0	0.00	185	3.02	54	0.88	239	4.00	0.81	3.02	3.19
8	0.49	0.38	0.77		0	0.00	189	2.96	37	0.58	226	3.91	1.84	1.91	2.07
9	0.37	0.26	0.81		0	0.00	227	2.86	26	0.33	253	2.83	0.53	2.14	2.30
10	0.47	0.23	0.74		0	0.00	234	3.45	41	0.60	275	4.19	1.77	2.20	2.42
11	0.43	0.36	0.82		0	0.00	209	2.97	37	0.53	246	4.44	2.24	2.00	2.20
12	0.47	0.34	0.76		0	0.00	205	2.95	36	0.52	241	4.09	1.84	2.00	2.25
13	0.66	0.31	0.72		0	0.00	222	3.05	38	0.52	260	3.77	1.59	1.90	2.18
14	0.64	0.27	0.73		0	0.00	197	3.12	31	0.49	228	3.81	1.94	1.72	1.87
15	0.63	0.41	0.83		0	0.00	185	3.09	38	0.64	223	4.00	1.99	1.86	2.01
16	0.51	0.50	0.90		0	0.00	187	2.95	20	0.32	207	3.33	1.50	1.63	1.83
17	0.64	0.29	0.71		0	0.00	193	3.04	38	0.60	231	3.89	1.87	1.87	2.02
18	0.61	0.27	0.69		0	0.00	147	2.86	30	0.58	177	3.60	1.70	1.74	1.90
19	0.44	0.30	0.72		0	0.00	162	2.41	33	0.49	195	3.16	0.78	2.10	2.38
20	0.59	0.31	0.79		0	0.00	151	2.96	34	0.67	185	3.77	1.97	1.60	1.80
21	0.51	0.29	0.82	0.61	0	0.00	223	2.95	45	0.60	268	3.41	1.23	1.93	2.18
22	0.50	0.40	0.84		0	0.00	220	3.09	39	0.55	259	4.00	1.97	1.79	2.03
23	0.56	0.38	0.87		0	0.00	191	3.12	26	0.42	217	3.81	2.20	1.34	1.61
24	0.76	0.30	0.87		0	0.00	211	3.50	43	0.71	254	4.67	3.01	1.51	1.66
25	0.55	0.26	0.80		0	0.00	206	3.46	40	0.67	246	4.44	2.74	1.55	1.70
26	0.55	0.26	0.68		0	0.00	203	3.47	37	0.63	240	4.26	2.35	1.75	1.91
27	0.53	0.32	0.65		0	0.00	211	3.43	41	0.67	252	4.10	1.97	1.96	2.13
28	0.69	0.22	0.67	0.84	0	0.00	214	3.40	41	0.65	255	5.05	2.57	2.31	2.48
29	0.42	0.26	0.76		0	0.00	215	3.37	42	0.66	257	3.98	1.66	2.18	2.32
30	0.43	0.24	0.76		0	0.00	176	3.01	38	0.65	214	3.77	1.68	1.94	2.09
31															
Avg.	0.52	0.31	0.76	0.74	0.00	0.00	203.43	3.12	37.20	0.58	240.63	3.95	1.84	1.92	2.11
Max	0.76	0.50	0.90	0.84	0.00	0.00	245.00	3.50	54.00	0.88	291.00	5.05	3.01	3.02	3.19
Min.	0.37	0.22	0.65	0.61	0.00	0.00	147.00	2.41	20.00	0.32	177.00	2.83	0.53	1.34	1.61

WSSN 0600 CITY OF BENTON HARBOR PAGE 5

MONTH/YEAR April-21

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	PLANT TAP		Standard Plate Count		Raw	Tap
D	No. of	Colilert			TEMP.	TEMP.
A	Samples	P/A			'C	'C
T			Raw	Tap		
E						
1	1	A	57	0	9	9.0
2	1	A	51	0	7	9.0
3	1	A	79	4	8	8.5
4	1	A	92	1	7	9.0
5	1	A	21	0	7	7.5
6	1	A	48	0	8	7.5
7	1	A	50	1	9	8.0
8	1	A	38	1	9	8.5
9	1	A	53	0	9	9.0
10	1	A	64	0	9	10.0
11	1	A	43	0	10	11.0
12	1	A	62	1	9	10.0
13	1	A	39	0	10	11.0
14	1	A	40	1	10	10.0
15	1	A	41	0	10	10.0
16	1	A	43	1	10	11.0
17	1	A	10	2	9	10.0
18	1	A	11	0	8	9.5
19	1	A	19	0	9	10.0
20	1	A	24	0	9	9.5
21	1	A	28	0	9	10.0
22	1	A	46	0	9	9.0
23	1	A	30	0	10	10.0
24	1	A	22	1	10	10.5
25	1	A	23	0	9	9.5
26	1	A	46	1	9	9.5
27	1	A	35	0	9.8	9.5
28	1	A	36	1	10.5	10.0
29	1	A	57	0	10.5	10.5
30	1	A	31	0	10.5	11.0
31						
AVG.	1	A	41	1	9	10
Max			92	4	11	11
Min			10	0	7	8

WSSN 0600 CITY OF BENTON HARBOR PAGE 6

MONTH/YEAR **April-21**

Distrubution Flow and Corrosion Treatment

	Ortho P System					Distrubution flow and Corrosion Treatment			
D	City Hall	Wolfs	Bait Shed	Sunny Spot	B&Z				
A	Ortho P	Ortho P	Ortho P	Ortho P	Ortho P	High Lift		PO4	Ortho P
T	Residual	Residual	Residual	Residual	Residual	To	Lbs PO4	Treatment	Residual
E	mg/L	mg/L	mg/L	mg/L	mg/L	Distribution		mg/L	mg/L
1						0.7238	98	5.36	3.11
2						0.7084	105	5.86	2.94
3						0.6314	113	7.08	2.93
4						0.7392	96	5.14	3.27
5						0.5082	87	6.77	3.24
6						0.4774	92	7.63	3.29
7	3.30		3.21	3.09	3.07	0.5082	96	7.47	3.16
8						0.5236	137	10.35	3.15
9						0.9394	99	4.17	3.25
10						0.6622	83	4.96	3.12
11						0.4620	87	7.45	3.14
12						0.5082	103	8.02	3.10
13						0.6314	93	5.83	3.25
14	3.27	3.00	3.29	3.15	3.14	0.4774	101	8.37	3.19
15						0.5852	86	5.81	4.08
16						0.5698	98	6.81	3.08
17						0.4928	100	8.03	3.36
18						0.4928	88	7.07	3.74
19						0.5544	98	6.99	2.99
20						0.4928	117	9.39	4.00
21	3.10	3.10	3.24	3.07	2.96	0.8316	99	4.71	3.14
22						0.5544	108	7.71	3.09
23						0.4928	99	7.95	3.10
24						0.4774	95	7.87	3.11
25						0.4928	65	5.22	3.21
26						0.4928	59	4.74	3.04
27						0.9185	96	4.14	3.14
28	2.93	2.54	2.60	1.59	2.57	0.5698	109	7.57	4.28
29						0.5698	107	7.43	4.24
30						0.5544	106	7.57	4.44
31									
Totals						17.6429	2920.0		
AVG.	3.15	2.88	3.09	2.73	2.94	0.5881	97.3	6.83	3.35
Max	3.30	3.10	3.29	3.15	3.14	0.9394	137.0	10.35	4.44
Min	2.93	2.54	2.60	1.59	2.57	0.4620	59.0	4.14	2.93

CITY OF BENTON HARBOR PAGE 7

DISTRIBUTION SYSTEM MONITORING WSSN 0600 April-21

Chlorine Residual at Bacteriological Monitoring Stations mg/l

	City Hall		Wolf Marine	470 W. Main	Sunny Spot		B&Z
DATE	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7	1.26		1.24	1.28	0.75		1.09
8							
9							
10							
11							
12							
13							
14	1.20		1.25	1.25	0.44		0.89
15							
16							
17							
18							
19							
20							
21	1.13		0.89	1.13	0.81		0.44
22							
23							
24							
25							
26							
27							
28	1.61		1.35	1.24	1.04		0.46
29							
30							
31							

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

	Avg.	Max.	Min.
Chlorine Residuals, mg/L	**1.04**	1.61	0.44
Total number of routine distribution samples analyzed	**20**		
Total number of positive routine distribution samples	0		
Total number of routine distribution samples required	10		
Total number of check samples	**0**		
Total number of positive check samples	**0**		

Notes from Mike Bolf's OneNote

6-8-2021

1. Mr. Mitchell; Concerns about latest violation notice regarding late certification form. The discussion revealed an ongoing lack of managerial capacity. Either letters are not being read carefully or no one is taking the lead on responding.
2. Abul: Does not know when water staff are coming and going. He and Darold recommend a uniform start time so they can have a brief team meeting each morning to set duties, tasks, and priorities. Ellis supports this and will talk to city HR.
3. Abul: Recommends moving PO4 feed point from HS discharge to post filtration controlled by LS pump operation. This will result in better control because LS pumps run on long blocks of time and HS run some times in short periods (15 mins) and run at night when the plant is unstaffed. EGLE encourages the city to propose ways to enhance the design and control of the PO4 system. Especially since the city is still in a ALE.
4. City and F&V inquired about status of grant money for TMF study. It turns out EGLE FD sent Ellis an email about a month ago announcing they received the grant and asking them to fill out a form. The city never responded. This is another example of lack of managerial capacity.

RFP pre-bid meeting

Friday, April 23, 2021 10:11 AM

Multi-phase proposals

Validate current approach

Looking to the future.

"optimized" per definition of LCR is not necessarily fully
This doesn't mean 'NO LEAD RELEASE'

Damon Garrett:
-confirmation of materials? (#1) This is more FYI, not as much a focus of a corrosion study
-water use trends…just a general, not something to dive into in specificity

Gwen Kubacki
-full (fee?) with this, or ?
-Jason M: needs to be around $50k, +/-
-approach, and qualifications.

Heather Chesalik
-had send 2 or 3 questions to Kim earlier. Is an addendum pending?

Cornwell, garrtett, mitchell, tummons, Gwendolyn Kubacki (ardadis), chesalik (BV), Wagner (Cornwell), Kalaya Williams (metro), Kimberly Hoyle, Richard Brown

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN

Required under the Authority of 1976 PA 399, as amended

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environmental Quality (DEQ) Staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: City of Benton Harbor Water Treatment Plant 200 East Wall Street Benton Harbor MI 49022 **WSSN**: 00600	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY PERMIT NO. W FEB 25 '19 1 9 9 0 1 5 EXAMINED AND APPROVED FOR COMPLIANCE WITH ACT 399, P.A. 1976
2. **Owner's Contact Person** (provide name for questions): Contact: Mr. Mike O'Malley Title: Water Plant Superintendent Phone: (269) 927-8470	

3. **Project Name** (Provide phase number if project is segmented):	4. **Project Location** (City, Village, Township):	5. **County** (location of project):
Phosphate Corrosion Inhibitor Installation	City of Benton Harbor	Berrien

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF THE DEPARTMENT OF ENVIRONMENT QUALITY

cc: Berrien County Health Department
Mr. Mike Enlow, Elhorn Engineering Company

Issued by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

Reviewed by: _____
Ernie Sarkipato, P.E., Surface Water Engineer

☒ **If this box is marked see attached special conditions.**

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the DEQ District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other DEQ permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws, and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended.
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

RECEIVED
JAN 24 2019
STATE OF MICHIGAN
DEPT. OF ENV. QUALITY

FT430/440/450
RATE/TOTAL INDICATOR

Seametrics
Precision Flow Measurement
An ONICON Brand

Optional Protective Cover Closed

THE RIGHT INDICATOR FOR

Water Treatment

Water Utility

Industrial Chemical Handling

Features

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- DC Powered (FT430)
- Loop Powered (FT440)
- Battery Powered (FT450)
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- Non-volatile Memory

Contact Your Supplier

The **FT430/440/450** flow computers are microcontroller-based indicator/transmitters that interface with pulse output flow sensors to compute and display flow rate, flow total, and also generate output signals representing flow. The FT430 and FT450 have one scaled pulse output and one pulse pass through. The FT440 has two scaled pulse outputs. Galvanic isolation is provided for most pulse outputs.

The FT450 is battery powered while the FT430 may be powered by an external DC power source or an optional internal AC power supply*. The FT440 is a "two-wire" or "loop powered" device, meaning that it is powered by the 4-20 mA loop circuit itself. An optional internal AC power supply* is available for the FT440 with dual 24 and 12VDC outputs to power both the loop and sensors requiring more power than the loop can supply.

Pulse and 4-20mA analog outputs can be used to signal external devices, e.g. certain metering pumps and water treatment controls. Alternatively, one or more pulse outputs can be configured as alarm outputs. These flow computers can be password protected to prevent resetting the total or changing configuration settings.

The FT430/440/450 meters are available in wall and meter mount configurations. The FT430 and FT440 models can also be panel mounted. Some configurations can be converted from wall to meter or meter to wall after installation if needed. Consult factory for details.

Order the FT440 only if a 4-20mA output signal is a requirement and the FT450 if internal battery power is needed. Otherwise the FT430 offers the most flexibility.

**Internal power supply is available for the wall mount option only.*

ISO 9001:2008 Certified Company

PROUDLY MADE IN THE USA

Specifications*

		FT430	FT440	FT450
Power		7-30Vdc, 4mA	9-30Vdc, 4mA (4-20 mA when loop-powered)	Lithium "C", 3.6Vdc, replaceable. Life is ~5 years depending on usage.
Display	**Rate**	5-digit autorange	5-digit autorange	5-digit autorange
	Total	8-digit	8-digit	8-digit
Units	**Rate Units**	Gallons/Second/Minute/Hour/Day, Liter/Second/Minute/Hour/Day, Cubic Feet/Second/Minute/Hour/Day, Cubic Meters/Second/Minute/Hour/Day, Mega Liters/Day, Million Gallons/Day, Fluid Oz/Second/Minute/Hour/Day, Barrels/Second/Minute/Hour/Day		
	Total Units	Gallon, Gallon x 1000, Liters, Mega Liter, Cubic Meter, Acre Feet, Cubic Feet, Cubic Feet x 1000, Million Gallon, Acre Inch, Fluid Ounce, Barrels		
Outputs	**Pulse Output 1**	Scaled pulse output, high alarm output or low alarm output. Optoisolated on FT430 and FT440.[1]		
	Pulse Output 2	Pulse pass through	Scaled pulse output, high alarm output or low alarm output.[1]	Pulse pass through
	Loop Power Output	N/A	4-20mA Loop	N/A
Set P Range		0.1 - 99999.9 units/pulse	0.1 - 99999.9 units/pulse	0.1 - 99999.9 units/pulse
Input		5V pulse or contact closure	5V pulse or contact closure	Micropower GMR Sensor (square wave)
Input Range		0.75[2] - 2000Hz	0.75[2] - 2000Hz	0.75[2] - 550Hz
K-Factor Range		.001 - 999999.999	.001 - 999999.999	.001 - 999999.999
Flow Alarm Output Range		0.1 - 99999.9	0.1 - 99999.9	0.1 - 99999.9
Operating Temperature		-5˚ to 55˚ C (23˚ to 131˚ F)	-5˚ to 55˚ C (23˚ to 131˚ F)	-5˚ to 55˚ C (23˚ to 131˚ F)
Non-Operating Temperature		-40˚ to 75˚ C (-40˚ to 158˚ F)	-40˚ to 75˚ C (-40˚ to 158˚ F)	-40˚ to 75˚ C (-40˚ to 158˚ F)
Environmental		NEMA 4X, IP67	NEMA 4X, IP67	NEMA 4X, IP67
Regulatory		CE Mark	CE Mark	CE Mark

** Specifications subject to change • Please consult our website for current data (www.seametrics.com).*
1 Scaled output pulses have a fixed width of 100ms. Maximum pulses per second is 6.5Hz
2 For pulse frequencies <1 Hz, increase setting in SET F menu to 3 or higher.

Features

***Includes password protection for tamper prevention when needed*

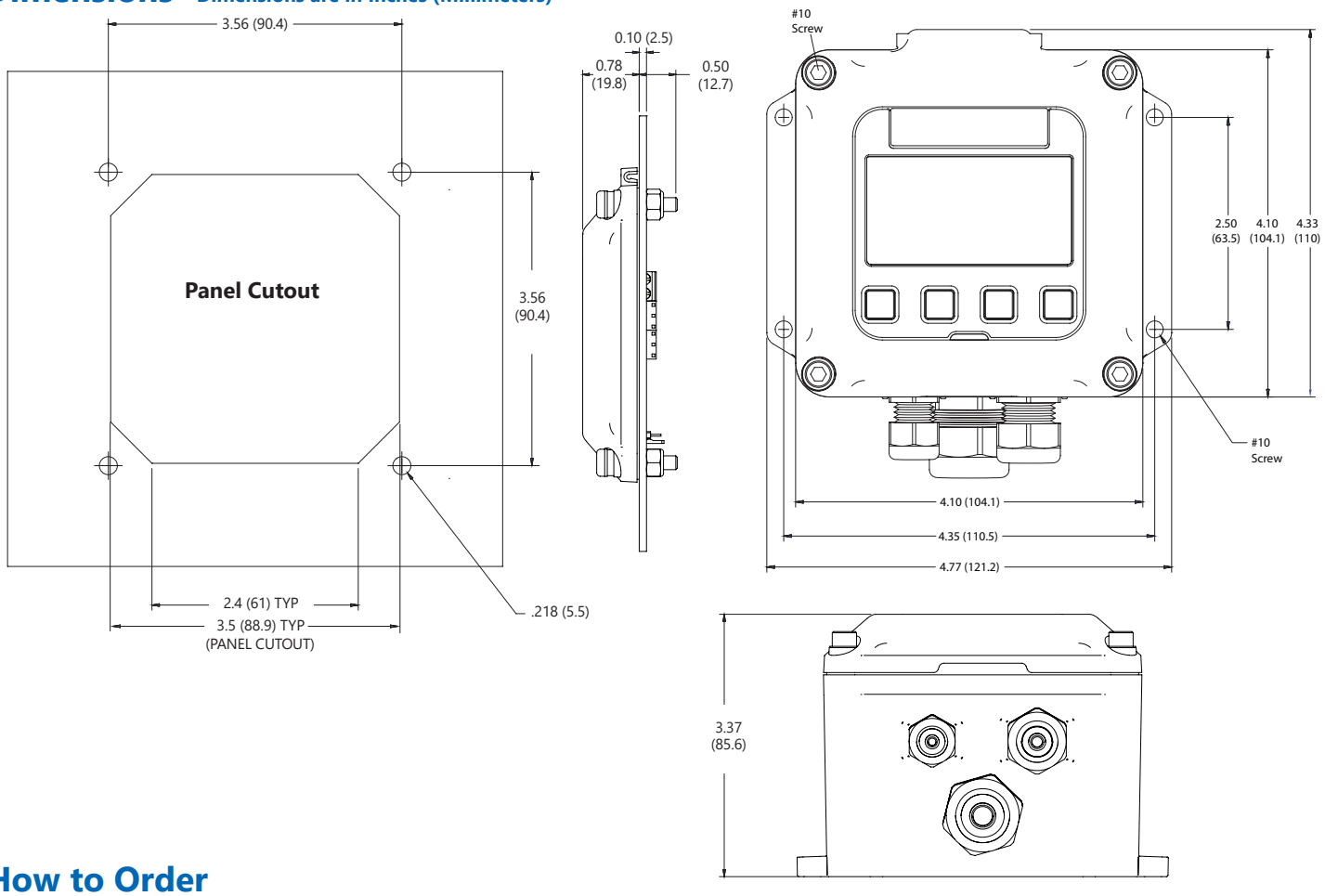
Pulse Output Function Table

PULSE OUTPUT 1 (SCALED)	FT430	FT440	FT450
TYPE	Current sinking	Current sinking	Current sinking
MAX. VOLTAGE	36 Vdc	36 Vdc	36 Vdc
MAX. CURRENT	100 mA	100 mA	100 mA
MAX. FREQUENCY	6.5 Hz	6.5 Hz	6.5 Hz
PULSE WIDTH	100 ms	100 ms	100 ms
ISOLATION	300 V	300 V	NOTE 1
CONFIGURABLE AS ALARM	YES (High or Low)	YES (High or Low)	YES (High or Low)
PULSE OUTPUT 2 (SCALED)	FT430	FT440 (Note 2)	FT450
TYPE	Not Available	Current sinking	Not Available
MAX. VOLTAGE		36 Vdc	
MAX. CURRENT		100 mA	
MAX. FREQUENCY		6.5 Hz	
PULSE WIDTH		100 ms	
ISOLATION		300 V	
CONFIGURABLE AS ALARM		YES (High or Low)	
PULSE OUTPUT 2 (PASS-THROUGH)	FT430	FT440	FT450
TYPE	Current sinking	Not Available	Current sinking
MAX. VOLTAGE	36 Vdc		36 Vdc
MAX. CURRENT	10 mA		100 mA
MAX. FREQUENCY	2000 Hz NOTE 2		550 Hz
PULSE WIDTH	SAME AS SENSOR INPUT		SAME AS SENSOR INPUT
ISOLATION	300 V		NOTE 1
CONFIGURABLE AS ALARM	NO		NO

NOTE 1: 150 V effective isolation when using Seametrics micropower sensors. • NOTE 2: With 2000 ohm or lower pull-up resistance.

Dimensions

Dimensions are in Inches (Millimeters)



How to Order

MODEL

DC-powered indicator = **FT430**

Loop-powered indicator/transmitter = **FT440**

Battery-powered indicator = **FT450**

MOUNTING

Wall mount = **-W**

Panel mount = **-P**

(FT430/FT440 only)

Meter mount = **See appropriate meter specification to order meter mounted units.**

OPTIONS

Tamper-evident = **-32**

Non-resettable total = **-64**

Dual Relay Output (FT430/440 only) = **-98**

Display Cover = **-126**

Built-in 120/240 Vac/12/24 Vdc dual power supply (FT430W/FT440W only) = **-139**

Built-in 120/240 Vac/12 Vdc single power supply (FT430W for use with mechanical or magmeters, FT440W for use with mechanical meters) = **-140**

ACCESSORIES

Display Cover = **102021**
Dual power supply, plug-in, 115 Vac, 12/24 Vdc = **PC42**
LMI pump power cable = **100013**
LMI pulse out cable = **100039**
Power converter, plug-in, 115 Vac, 24 Vdc = **PC3**
FT430 Module = **103591-01**
FT440 Module = **103591-02**
FT450 Module = **103591-03**
FT430/440 Dual Relay Option w/wire adapter = **100557**

ADAPTER KITS

	Part #	Electronics module	Lower wall housing	Lower meter housing
Convert wall to meter mount (MK10)	102632	Blue	Blue	Blue
Convert wall to meter mount (MK15)	103594	White	White	White
Convert meter to wall mount (MK20)	102633	Blue	Blue	Blue
Convert meter to wall mount (MK25)	103396	White	White	White
Adapter kit to mount white electronics to blue housing	103391	White	Blue	Blue
Adapter kit to mount white electronics to blue housing/ Tamper evident	103392	White	Blue	Blue

Seametrics • 19026 72nd Avenue South • Kent, Washington 98032 • USA
(P) 253.872.0284 • (F) 253.872.0285 • 1.800.975.8153 • seametrics.com

LT-65650318r2.1 20180726
7/26/2018

PROPOSAL

FOR: DEQ
onanb@mich.gov

ATTN: Brandon Onan - 616-307-6736
REF:

Please make Purchase Orders out to the below, thank you.
MMI, INC.

QUOTE NO: 1118DEQEQ250
REGION: B.R. - .6X
DATE: 12/3/2018
TERMS: 100% Net 30 Days
F.O.B.: Factory
VALIDITY: 90 Days
DELIVERY: 5 Weeks ARO
2592.838/2058

ITEM	MODEL	DESCRIPTION	QTY	UNIT PRICE	TOTAL COST
1.1	EX250-S-08-15	**Hot Tap - Adjustable Dept. Insertion Mag Meter - 36"**	1	$ 2,675.00	$ 2,675.00
		316 SSTL, 10"-48", (**Sensor Only**)			
		Valve Assembly, 316 SS	1		
		Reverse Flow			
1.2	FT440W-139	**WALL DISPLAY**	1		$ -
		12-24 Vdc, Loop Power, Dual Scaled Pulse Output			
		& 4-20 mA Outputs			
		120 VAC - Built in Dual Power	1		
		Tags: FE/FIT: **Advise**			
		TOTAL			$ 2,675.00

We are pleased to offer this proposal for furnishing and delivering the above referenced product. Equipment is specifically listed, items required but not listed are to be furnished by others.

Freight and Handling Charges and Taxes
o Prepay and add freight charges - the amount charged will include all freight and handling expenses
o Taxes Excluded and are the responsibility of the buyer

James L. Mommers Midwest Municipal Instrumentation, Inc.

Midwest Municipal Instrumentation Inc.
4391 Bonnymede Ct
Jackson, MI 49201

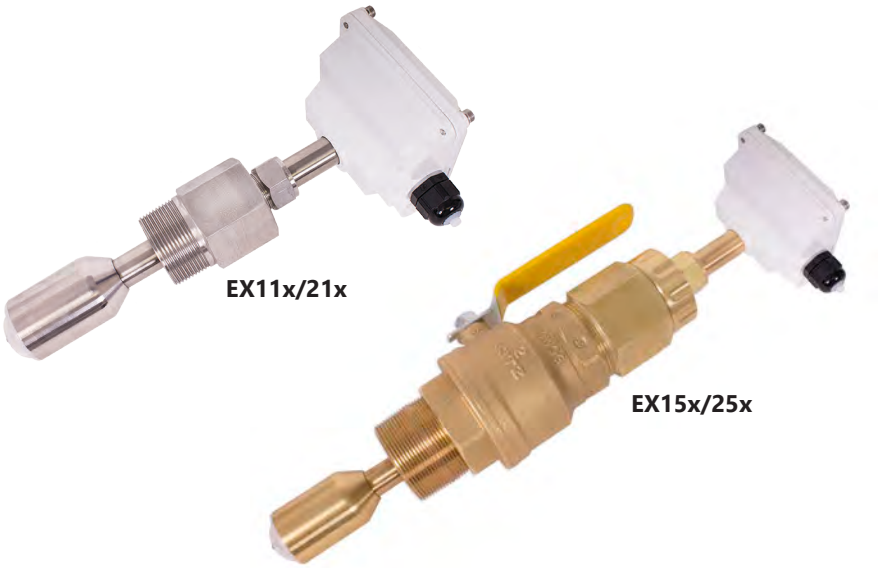
Providing: Seametrics
Your helping hand in all your Municipal Water & Wastewater Needs

Telephone: 517-764-4736
Fax: 517-764-4739
Cell: 517-250-1650
E-mail: jmommersmmi@msn.com
http://www.midwestmunicipalinstr.com

Per Factory Terms & Conditions - see website
http://www2.emersonprocess.com;

EX100/200-SERIES
INSERTION ELECTROMAGNETIC FLOW SENSOR

Seametrics
Precision Flow Measurement
An ONICON Brand



APPLICATIONS

3" - 48" pipe (up to 72" optional)
Clean or "dirty" liquids
Conductive liquids
Municipal
Industrial
Irrigation

Features

- No moving parts
- Durable
- Adjustable depth
- Hot-tap available
- Brass or stainless steel
- Immersibility available
- Reverse flow output available

Contact Your Supplier

The **EX100/200-Series** are adjustable depth insertion magmeters that fit 3" to 48" pipe (up to 72" optional). The complete lack of moving parts of the EX100/200-Series is the source of its reliability. Brass and stainless steel models withstand a variety of temperature, pressure, and chemical conditions. The EX-Series has no rotor to stop turning in dirty water and there are no bearings to wear out. Like all magmeters, when used in chemical injection applications, these meters should be installed upstream of the chemical line (or far enough downstream to allow complete mixing of fluids before the meter). Adapters mate with standard 1-1/2" (11x/21x) or 2" (15x/25x) FNPT threaded fittings such as saddles and weldolets which may be purchased either locally or from Seametrics.

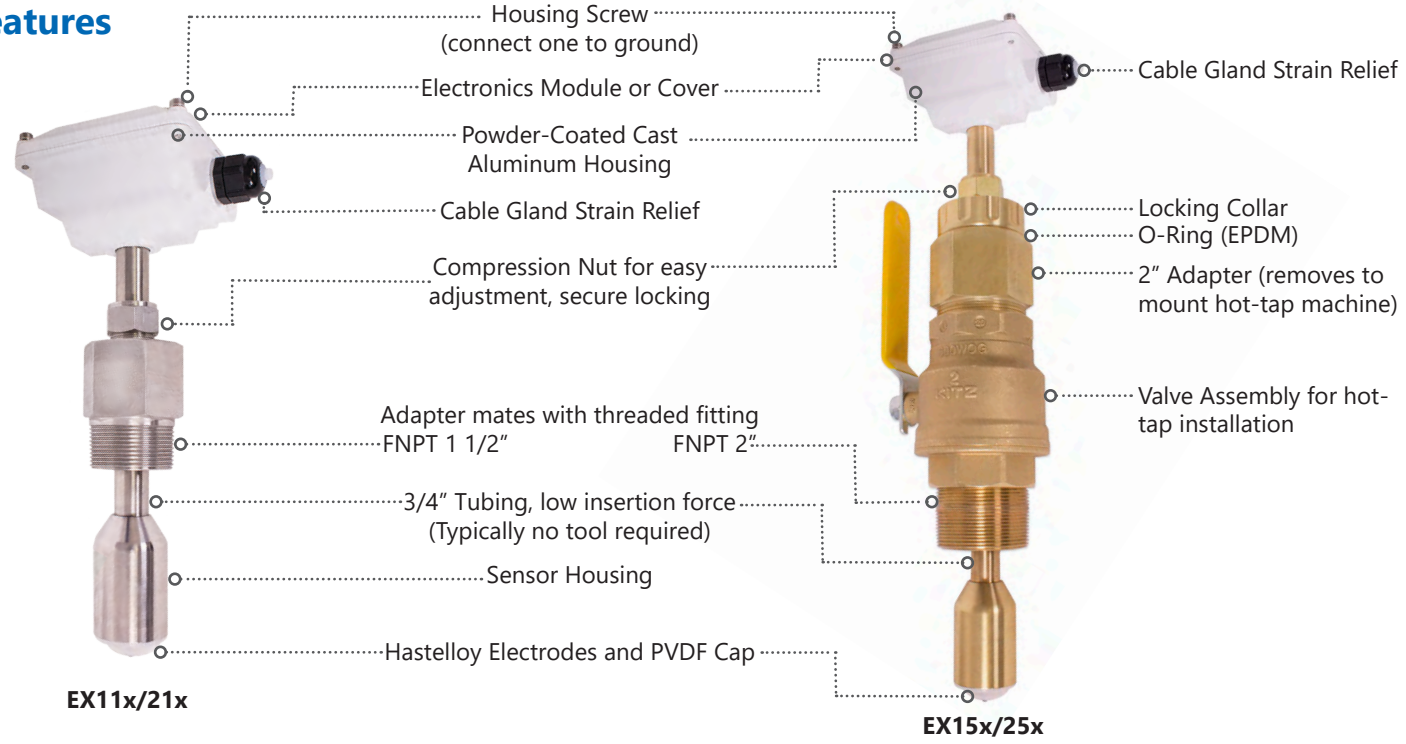
A rapidly reversing magnetic field is produced in the lower housing. As the fluid moves through this field, a voltage is generated that is measured and translated into a frequency signal proportional to flow rate. This square wave signal can be sent directly to a PLC or other control or can be converted using any of the Seametrics family of indicators and converters. A modular system of electronics can be installed directly on the flow sensor or mounted remotely. The FT430 (externally powered with pulse) and the FT440 (loop powered), both provide digital rate and total displays, as well as a programmable pulse; the FT440 also provides a 4-20 mA analog output. The AO55 is a blind analog (4-20 mA) transmitter. Programmable pulse for pump pacing is available with the PD10 (available as wall-mounted unit only).

The "hot-tap" models (EX15x/25x) can be installed or serviced without shutting down the line by means of a 2" full-port isolation valve that comes with a nipple for installation on the pipe fitting; a bronze ball valve is standard, with a 316 stainless steel valve option if needed. In most circumstances, no special tool is required.

Reverse flow output and immersibility are optional.

ISO 9001:2008 Certified Company
PROUDLY MADE IN THE USA

Features

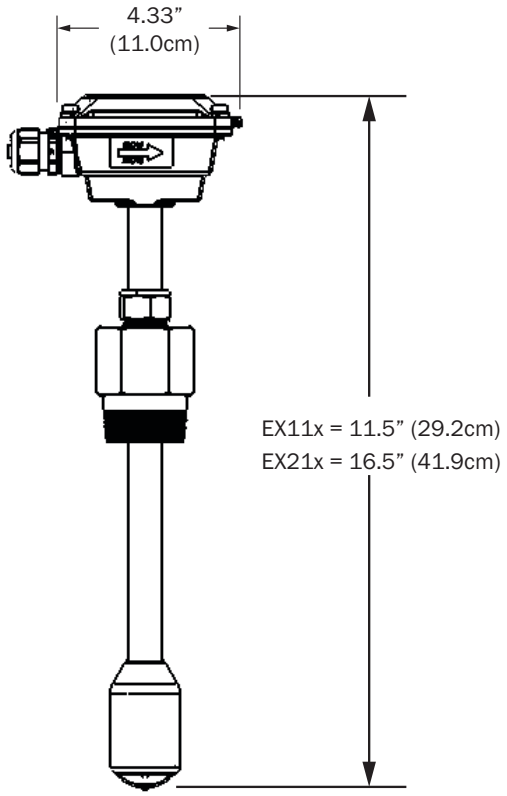


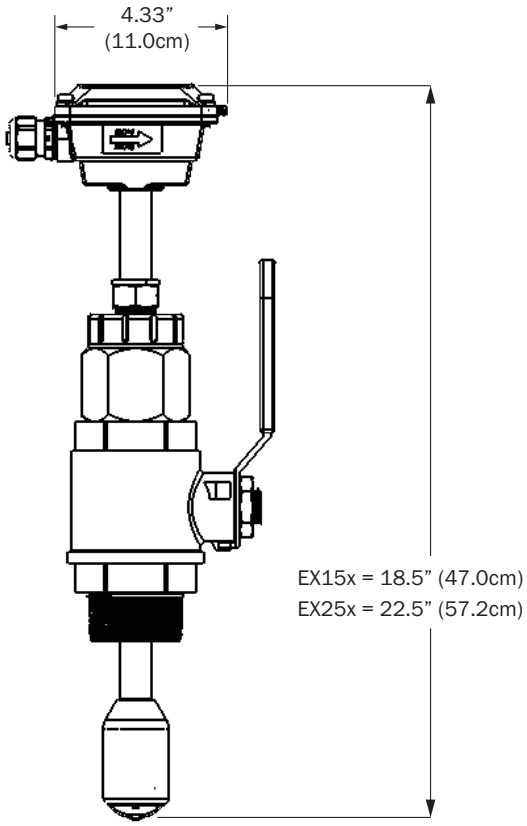
Specifications*

Pipe Size		3" to 48" (up to 72" optional)
Power		**Full Power:** 12 - 24 Vdc, 250mA **Low Power:** 12 - 24 Vdc, 40mA average with 250mA peaks
Materials	**Housing**	Powder-coated cast aluminum
	Tubing/Fitting/Sensor Housing	Brass or 316 Stainless Steel
	Electrodes	Hastelloy
	Electrode Cap	PVDF
	O-Ring *(15x/25x only)*	EPDM
	Valve Assembly *(15x/25x only)*	Bronze (stainless optional) with bronze ball valve
Fitting Size Required		**11x/21x:** 1.5" FNPT **15x/25x:** 2" FNPT
Maximum Pressure		200 psi (14 bar)
Temperature	**Ambient**	0˚ to 160˚ F (-17˚ to 72˚ C)
	Fluid	32˚ to 200˚ F (0˚ to 93˚ C)
Minimum Conductivity		20 microSiemens/cm
Flow Velocity		0.28 - 20 ft/sec (0.08 - 6.09 m/sec)
Accuracy		± 1% of full scale
Output		Square wave pulse, opto-isolated, 500 Hz @ 20 ft/sec 6 mA max, 30Vdc forward flow standard; reverse flow optional
Empty Pipe Detection		Software, defaults to zero flow
Cable		Standard 18' (6m), #22 shielded twisted pair, 4-conn. Max. cable run at 24 Vdc = 1000' (300m); at 12 Vdc = 500' (150m). For other circumstances, contact the factory.
Environmental		See meter mounted electronic specification for rating.

**Specifications subject to change • Please consult our website for current data (www.seametrics.com).*

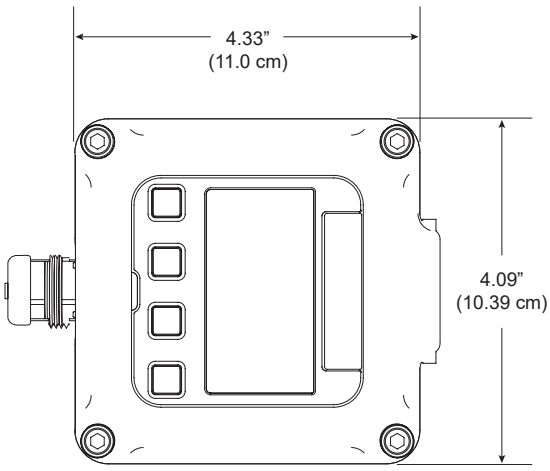
Dimensions





Flow Range

Flow Range (GPM)		
Nominal Pipe Size	**Minimum Flow**	**Maximum Flow**
3	6	440
4	11	783
6	25	1,762
8	44	3,133
10	69	4,895
12	99	7,050
14	134	9,596
16	175	12,533
18	222	15,863
20	274	19,584
24	395	28,200
30	617	44,064
36	888	63,452
48	1,580	112,804



How to Order

	Description	Size	Sensor Material	Options (110/210)	Options (150/250)
Sensor Only	Externally powered (12 - 24Vdc) sensor only.	3" – 10" pipe = EX110 10" – 48" pipe = EX210 Hot Tap 3" – 10" pipe = EX150 10" – 48" pipe = EX250	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Old Style Adapter 1 ½" NPT = -35 *Immersible = -40 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 316 SS Valve Assembly = -08 Reverse Flow Output = -15 *Immersible = -40 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (112/212)	Options (152/252)
AO55 Mounted on Sensor	Externally powered (12 - 24Vdc) sensor with AO55 blind 4-20mA analog transmitter mounted on the sensor.	3" – 10" pipe = EX112 10" – 48" pipe = EX212 Hot Tap 3" – 10" pipe = EX152 10" – 48" pipe = EX252	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (113/213)	Options (153/253)
FT430 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with FT430 rate and total indicator (with pulse outputs) mounted on the sensor.	3" – 10" pipe = EX113 10" – 48" pipe = EX213 Hot Tap 3" – 10" pipe = EX153 10" – 48" pipe = EX253	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Hinged Display Cover = -126	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Dual Relay Output = -98 Hinged Display Cover = -126 Data Logger = -127

	Description	Size	Sensor Material	Options (116/216)	Options (156/256)
DL76 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with self powered DL76 data logger mounted on the sensor.	3" – 10" pipe = EX116 10" – 48" pipe = EX216 Hot Tap 3" – 10" pipe = EX156 10" – 48" pipe = EX256	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 12" Extension (200 Series Only) = -72	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Low Power = -50 12" Extension (200 Series Only) = -72

	Description	Size	Sensor Material	Options (119/219)	Options (159/259)
FT440 Mounted on Sensor	Externally powered sensor (12 - 24Vdc) with FT440 rate and total indicator (with pulse and 4-20mA outputs) mounted on the sensor.	3" – 10" pipe = EX119 10" – 48" pipe = EX219 Hot Tap 3" – 10" pipe = EX159 10" – 48" pipe = EX259	Brass = B 316 Stainless = S	Brass Adapter Fitting 2" NPT = -02 SS Adapter Fitting 2" NPT = -02 Reverse Flow Output = -15 Brass Adapter 1 ½" BSP = -23 SS Adapter 1 ½" BSP = -24 Tamper Evident Kit = -32 Old Style Adapter 1 ½" NPT = -35 Low Power = -50 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Hinged Display Cover = -126	316 SS Valve Assembly = -08 No Valve Assembly = -09 Reverse Flow Output = -15 Tamper Evident Kit = -32 Non-resettable Total = -64 12" Extension (200 Series Only) = -72 Dual Relay Output = -98 Hinged Display Cover = -126 Data Logger = -127

** Immersible to maximum of 3 ft (1m), up to 2 weeks • Roytronic is a registered trademark of Milton Roy Company.*

11-29-18: O'Malley, Enlow, Onan, Sarfeipato

Ethorn ($2k)

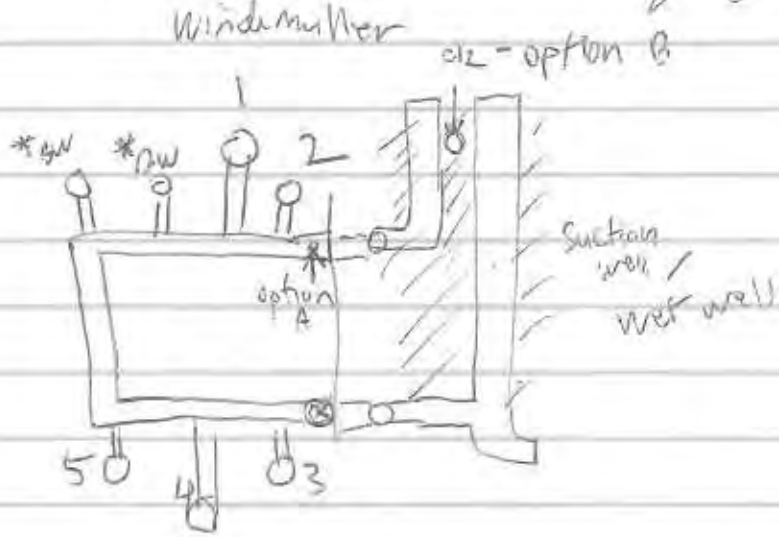
Install Coupon Racks to optimize (WHERE?)
Provide technical support, lab support

Dosage Rec: 1.0 ppm as Pdy
limit 0.5 ppm as polyphosphate (as Pdy)

DEQ
- be involved in sizing of pump, equipment selection, etc.
- check on use of pilot study grant
- talk w/ WRD / WWTP

BH
- talk w/ WWTP - Tim Lynch

• Alan / Mead & White Electric
- check non switch in polymer room
•



• lack of single feed lines:
- option C: settled water in HSP room

STENNER PUMPS®

S SERIES

PERISTALTIC PUMP

SMART TECHNOLOGY

SIMPLE PROGRAMMING

SOLID CONSTRUCTION

For Demanding Applications

S SERIES
PERISTALTIC PUMP
For Demanding Applications

THE S SERIES INTERFACES WITH PROCESS CONTROL SYSTEMS UTILIZING A 4-20mA OUTPUT SIGNAL AND THREE RELAY OUTPUTS

Built to NEMA 4X for demanding applications. Select from multiple performance indicators and operational modes with intuitive programming and easy navigation. Fine-tune the pump to fit the application; monitor the pump for peace of mind. Prevent unauthorized access to programmed settings with the password protection.

SMART TECHNOLOGY

PERFORMANCE INDICATORS

Program the pump to respond based on a selected condition:

- Tube Leak
- Tube Change
- Standby
- Repeat Pulse
- Run
- Mode Change
- Low Signal
- High Signal
- Low Flow
- High Flow
- Drive Fault
- Signal Overrun
- Transfer
- Off

TUBE LEAK DETECTOR

- Can detect solution in the pump head, vertically or horizontally
- Program alarm indicator with option to stop pump upon alarm
- Calibrate the sensitivity to avoid false detection

TUBE TIMER

Set the tube's life expectancy in hours. When the set time is reached, the display shows the tube change alarm indicator.

STANDBY

Program the transfer function to activate a relay to start a second S Series in Standby, as a back up to the primary pump.

SIMPLE PROGRAMMING

PUMP SIGNAL INPUTS

ANALOG	4-20mA	• Proportional response to a 4-20mA signal; scalable, invertible. • Speed varies to the signal level.
	0-10VDC	• Proportional response to a 0-10VDC signal; scalable, invertible. • Speed varies to the signal level.
DIGITAL	Pulse	• Accepts a dry contact or open collector type input signal from a controller or water meter. • Activates at the number of pulses received, to run for a set amount of time.
	Hall Effect	• Speed varies according to Hall Effect input from a controller or flow meter. • Program is based on meter's K factor, process flow range and desired pump output.
	PPM Feed Constant Flow	• Accepts a dry contact or open collector type input signal from a flow switch. • Program is based on the process flow rate, chemical concentration, chemical specific gravity and the desired ppm feed rate.
	PPM Feed Variable Flow	• Accepts a Hall Effect input from a flow meter. • Speed varies to maintain the desired ppm feed rate. • Program is based on meter's K factor, process flow range, chemical concentration, chemical specific gravity and desired ppm feed rate.
MANUAL	Manual	• Speed controlled manually. • Adjustable from 0% to 100% in 1% increments.
	7 Day / 24 Hour Timer	• Program with a clock in real time. • Run for a specific day, at a specific time, at speeds from 1% to 100%. • 24 independent events, any combination of days.
	Cycle Timer	• Run on a repeatable ON/OFF sequence.

PUMP SIGNAL OUTPUTS

ANALOG	4-20mA	• Produces a non-adjustable, proportional signal corresponding to the speed percentage the pump is running. 4mA=0% & 20mA=100%
DIGITAL	Relays	• Dry contact signal; program normally open or normally closed. • Indicate an alarm. • Repeat an incoming signal. • Transfer operation to another S Series pump in Standby.

S SERIES
PERISTALTIC PUMP
For Demanding Applications

SOLID CONSTRUCTION

- Brushless DC motor is equipped with ball bearing support
- Switch mode power supply is energy efficient
- Totally enclosed pump is outdoor rated
- OLED operating display is easy to navigate with intuitive programming
- QuickPro® pump head offers tube replacement without tools
- Splined shaft designed pump head & roller assembly allow smooth installation & replacement
- NEMA 4X, NSF 61 & 372, cULus indoor/outdoor, CE IP65

MAXIMUM FLOW RATES
40 gpd, up to 100 psi / 151.4 lpd, up to 6.9 bar
85 gpd, up to 25 psi / 321.8 lpd, up to 1.7 bar

VOLTAGE
120 VAC, 60Hz
230 VAC, 50Hz

STENNER PUMPS BUILT WITH A STRONG WORK ETHIC

1. Self-priming against maximum working pressure
2. Can inject off-gassing solutions
3. No vapor lock or loss of prime
4. Easy tube replacement without tools
5. Uniquely manufactured solid one piece tube construction
6. Tube lubrication not required
7. Three point roller design assists with anti-siphoning
8. Output reproducibility
9. Output volume not affected by back pressure
10. Foot, prime or de-gassing valve not required

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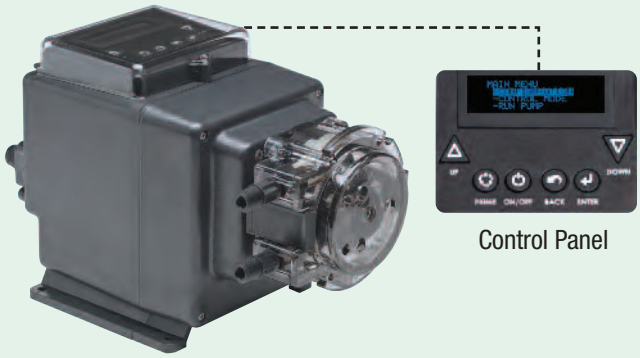
S SERIES

Variable Speed
Multiple Control Modes
Performance Indicators



S SERIES

Designed for Demanding Applications

The S Series is an advanced peristaltic metering pump built to NEMA 4X for demanding applications. Select from multiple operational modes and performance indicators that readily interface with process control systems utilizing a 4-20mA output signal and three relay outputs. Navigate through the many pump configurations with the tactile keypad and OLED display to customize the parameters for the specific application.

Quick Facts

- 0.05 to 40.0 gpd, pressures to 100 psi
- 0.40 to 85.0 gpd, pressures to 25 psi
- Digital keypad with OLED display
- Tube leak detector
- Tube life timer
- Password protection

Features

- Advantages of Stenner peristaltic pumps on page 1
- Fast tube replacement without tools with patent pending QuickPro® pump head
- Brushless DC motor with ball bearing support
- Switch mode power supply
- Totally enclosed housing
- NEMA 4X
- NSF 61 & 372
- cULus indoor/outdoor
- CE IP65

Performance Indicators

		Programable Communication	
Pump Condition	Control Mode	Display Alarm on pump control panel	Output Relay to another pump, system or device
Tube Change	Manual 4-20mA 0-10VDC Pulse Hall Effect 7 Day Timer PPM Feed Cycle Timer	✓	not applicable
Tube Leak		✓	✓
Standby		✓	✓
Drive Fault		✓	✓
Off		✓	✓
Repeat Pulse		not applicable	✓
Run		not applicable	✓
Mode Change		not applicable	✓
Transfer		not applicable	✓
High Signal	4-20mA or 0-10VDC	✓	✓
Low Signal	4-20mA or 0-10VDC	✓	✓
High Flow	Hall Effect or PPM Feed	✓	✓
Low Flow	Hall Effect	✓	✓
Signal Overrun	Pulse	✓	✓

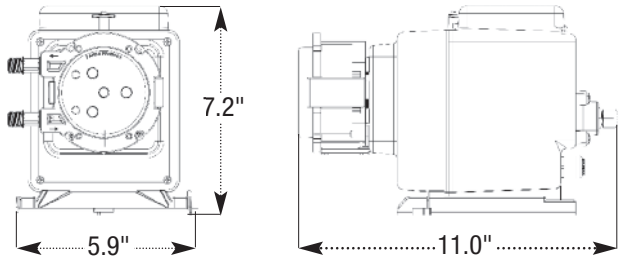
S SERIES

Weights and Dimensions

Shipping Weight 8 lbs (3.7 kg)

Box Dimensions 14 x 9 x 9 in. (35 x 23 x 23 cm)

Product Dimensions



Accessory Kit Shipped with Each Pump

3 Connecting nuts 1/4" or 3/8"

3 Ferrules 1/4" or 6 mm *EUROPE*

1 Injection check valve 100 psi (6.9 bar) OR
1 injection fitting 25 psi (1.7 bar)

1 Weighted suction line strainer 1/4", 3/8" or 6 mm *EUROPE*

1 20' Roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *EUROPE*

1 Additional pump tube

2 Additional latches

1 Mounting bracket

1 Quick start guide

Specifications

Flow Rate Output Control
Varies per control mode; digital keypad

Reproducibility ±2%

Maximum Working Pressure
25 psi (1.7 bar), 100 psi (6.9 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift
25 ft (7.6 m) vertical lift, based on water

Motor Type Brushless DC motor

Duty Cycle Continuous

Motor Voltage (Amp Draw)
120V 60Hz 1PH (0.6), 230V 50Hz 1PH (0.3)

Power Cord Type
120V 60Hz SJTOWA, 230V 50Hz H05RNF

Power Cord Plug End
120V 60Hz 15P, 230V 50Hz CEE7/7,
230V 50Hz SEV1011

Hall Effect Max. Input Frequency 100 KHz

RPM Variable

RPM (maximum) 45

RPM (gradient) By %

The % sets the speed and is not 1 to 1 for RPM.

Maximum Altitude 6562 ft. (2000 m)

Maximum Viscosity 1500 Centipoise

Pulse Duration Required 10 milliseconds

Minimum duration required for pump to read signal.

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon™**, FDA approved

CV Duckbill with Versilon™ Tube** Pellathane®†

Pump Head Rollers Polyethylene

Roller Bushings Oil Impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm
Polyethylene, FDA approved

Tube Fittings, Injection Fittings
Type 1 Rigid PVC or Polypropylene, NSF Listed

Connecting Nuts
Type 1 Rigid PVC or Polypropylene

3/8" Adapter Type 1 Rigid PVC, NSF Listed

Suction Line Strainer Polypropylene or Type 1 Rigid PVC body with Type 1 Rigid PVC Cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

Agency Listings

Models (Santoprene® only) tested by IAPMO to conform to ANSI/NSF STD 61 & 372.

c UL us LISTED METERING PUMP 4TF1

IAPMO R&T

THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANSI/NSF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.

CE IP65

* Santoprene® is a registered trademark of Exxon Mobil Corporation.

** Versilon™ is a registered trademark of Saint-Gobain Performance Plastics.

† Pellathane® is a registered trademark of The Dow Company.

S Series - Flow Rate Output Chart 25 psi (1.7 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3003	**S3003**	3	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
S3004	**S3004**	4	100:1	0.60 to 60	2.27 to 227	0.025 to 2.50	0.095 to 9.46	3.20 to 320	94.64 to 9464	0.053 to 5.33	1.58 to 158
S3005	**S3005**	5	100:1	0.85 to 85	3.22 to 322	0.035 to 3.54	0.134 to 13.41	4.53 to 453	134.07 to 13407	0.076 to 7.56	2.23 to 223
				Approximate Output @ 50/60Hz							

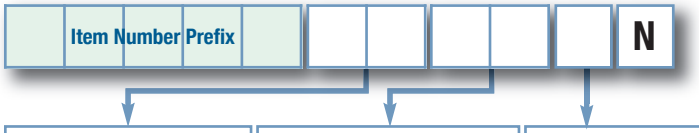
S Series - Flow Rate Output Chart 100 psi (6.9 bar) maximum

Model	Item Number Prefix	Pump Tube	Turndown Ratio	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Hour	Milliliters per Hour	Ounces per Minute	Milliliters per Minute
S3001	**S3001**	1	100:1	0.05 to 5	0.19 to 19	0.002 to 0.21	0.008 to 0.79	0.27 to 27	7.89 to 789	0.004 to 0.44	0.13 to 13
S3002	**S3002**	2	100:1	0.17 to 17	0.64 to 64	0.007 to 0.71	0.027 to 2.68	0.91 to 91	26.81 to 2681	0.015 to 1.51	0.45 to 45
S3007	**S3007**	7	100:1	0.40 to 40	1.51 to 151	0.017 to 1.67	0.063 to 6.31	2.13 to 213	63.09 to 6309	0.036 to 3.56	1.05 to 105
				Approximate Output @ 50/60Hz							

NOTE: Injection check valve included with pumps rated 100 psi (6.9 bar) maximum.

NOTICE: The information within these charts is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.

Item Number Builder



Voltage & Hertz

- **AA** 120V 60Hz
- **DC** 230V 50Hz, CEE7 Cord *INTERNATIONAL*
- **DE** 230V 50Hz, SEV1001 Cord *INTERNATIONAL*

Contact the factory for additional voltage and cord options.

Suction & Discharge Tubing

- **10** 1/4" White
- **20** 1/4" UV Black
- **30** 3/8" White
- **40** 3/8" UV Black
- **50** 6 mm White *EUROPE*

O.D. does not affect output.

Tube Material

- **1** Santoprene®
- **2** Versilon™ (#7 not available)

Refer to the chemical resistance guide for chemical compatibility.

How to build an Item Number

1. Refer to above **Flow Rate Output Chart** to select a pump.
2. Select the **Item Number Prefix** from the output chart.
3. Select the remaining options to complete the item number.

BH Weekly External

Tuesday, January 12, 2021 2:55 PM

Chris Cook (Abon)
Matt Johnson (F&V)
Cath Winn
George Regan
Darel Rice
Jason Marquardt (Abon)
Rob Jones
Blair Selover
Lesia

1. Emergencies: any new breaks, leaks, water complaints, etc.
   Rob - nothing new to report
2. Other High Priority projects (Roof, Alum feed SCADA, Intake, Floc drives)
   Rob - floc/sed - manufacturer rep coming out next week
3. Lead sampling, LSL inventory, LSL replacement (Generally, compliance with lead and copper rule)
   SUMARY OF LCR SAMPLES
   Kevin K will probably be contacting F&V
4. Corrosion Treatment
   -Try to get 3.0 mg/l in distribution. Rob, he thinks the pump has the capacity.
5. Other treatment: coagulation and disinfection
   -any hiccups.
6. SCADA upgrades, instrumentation and integration, and Historian
   -bulk chlorine level should be on scada now. (short in an alarm?)
7. ACO Progress
   a. TMF - will need a separate cost. Will the process
      AP grant - Chris Cook will need to have the scope of the TMF. What's the scope, cost, confirm EGLE approves the AP grant process.
   b. Corrosion Study
   c. Filter to waste - extension - **February Revisit**
   d. Intake rehab, mussel control
8. Alum Sludge
9. Finances
   Lesia - they have received the no-shutoff grant monies. They are in between the second and third rounds. ~$230k
10. Construction updates
    a. Jason Marquardt: vineyard will be the only one that
    b. Met w/ Rev Pinkney about access for services, right-of-entry. Have some remaining.
    c. **12x12 -> 8x8?? Ask Dan**
    d. Chris Cook - water tower project.
11. Regulatory updates, upcoming communications

Water Leak Pilot: Ninah Sasy. Two interns started yesterday. They are going to start reaching out to folks to get 100 people signed up.

Information letter to go w/ ALE.

Miss Dig: Rob Jones asked. Chris: they have looked into it. Found out what it takes. The city would need to dedicate this, or contract this out. Thinking maybe Meechie's group.
Step 1: get a designee
Step 2: apply for Miss Dig (through abonmarche)

City works: underway. All utilities, police, maybe others. Utilities first.

Money for shut-off ban? Lesia?\
Rob get a price for floc equipment/sludge collection?

Water tower - connect Rob Jones and Eric Binkowski (Dixon)
-we can revisit
-George ran the portable by peerless. Need to have pressure relief
-Rob Jones

Follow-up with Jeremy on Monitoring schedule 2021

External meeting

Monday, January 25, 2021 1:47 PM

1. Emergencies: any new breaks, leaks, water complaints, etc.

2. **Lab Certification**

   Nate Sculley deploye by FV to the BH lab. Has initial findings. Implementing corrective actions, some can move quickly.

   January 2021 extension…will need further extension.
   ERNIE: reach out to Lundy???
   Need a request to extend?

   Lundy: aware of change in staff. FV ops he's familiar with. He's happy to work with them.

3. Lead sampling, LSL inventory, LSL replacement (Generally, compliance with lead and copper rule)
   Marquardt: review was based on available info, looking at ernie's list
   Brandon: two items awaiting:
   1. 2020b report form…may not need to be revised per BO, if there is still a suspicion of Tier 1
      Rob is almost ready to submit.
   2. Sampling plan - still need this. **PROVIDE TO PINKNEY! Rob: this will be their approach.**

4. **EVERYDOORDIRECT & Public Noticing:**

   Possible gap on the delivery issue. Ellis: he made abonmarche aware.

   Can the mailing be done by city hall staff and the mailing list? Ellis, likely.

   BO; 60 day requirement for next one. Also, the city could probably expect a letter to address this issue.

   ES: public notice also still needed.

   MB: city must make a statement for transparency sake.

5. **Phosphate treatment -** any adjustments or changes? **Rob: thinks they are about where they should be.**
   Still a couple that are <3…take a look at these sites.
   BO: are there other water qualities that indicate issues w/ stagnation?
   Darold: had a meeting w/ Elhorn, corrosion control study? Update?
   BO: EGLE has pulled back on the accelerator on this. Change of operations…also trends in the data?
   -EGLE might like to see a third party for a study.
   For OCCT steps, we are actually past the study. It's simply an ACO item.
   Ellis: they want to start over and do it right…
   Bolf: the goal is the best information about optimal corrosion treatment.

6. **WATER TOWER MEETING**

   Budgeting -

7. Corrosion Treatment
8. Other treatment: coagulation and disinfection
9. SCADA upgrades, instrumentation and integration, and Historian
10. ACO Progress
    a. TMF
    b. Corrosion Study
    c. Filter to waste
    d. Intake rehab, mussel control
11. Alum Sludge
12. Finances
13. Construction updates
14. Regulatory updates, upcoming communications

EVERY DOOR DIRECT

What notices were EDD? Were additional mailings sent?
-any contacts in that area?
-records at post office?

1. LCR: PA, PE.
2. CCR?
3. Public Notices

Compliance communication from EGLE

How will the upcoming mailings be done coming up?

Cross referencing lead sampling locations against LSL data:

Used pilot grant data and meter changeout information.

Weekly external

Monday, February 1, 2021 4:14 PM

City/F&V -- need to make a note on the report form, Ellis Mitchell signed the consumer notice form…needs a note.
Consumer Notices: check for the language.

Lundy: confirmed the extension if needed.
-f&v responded to letter. Nate is still onsite. **Cath would**

Lab overview…Cath will likely still do a review, but Nate's review will likely cover a lot of ground.
Cath will be looking at all lab items. **DR Lab Services (Dale Rudkin)**
Ernie; also sanitary survey coming up.
George: Autoclave was serviced.

1. Corrosion Study (relative to EPA WIIN grant)
   Cook: line item for $50k for corrosion study.
   He doesn't have much more information, but EPA is looking to get the grant documents ready to go.
   Looking for scope of work. Who?? EGLE start up meetings?

2. Incidences - Chris, council approved permanent fix of first leak.
   -Maintenance Shed roof leak. Some electrical nearby.
   -Emergence - Rob-conflicting info, 15 hours on the meter. Others said they were consistent w/ exercise. 2018 attempt to get a maintenance contract.
   Darel-only once in 2019, and ran the plant for 8 hours.
   Filled w/ Fuel. Diesel, careful to leave less than full.
   George: might want to take a look at fuel moisture absorption. (Cath: Oscar W Larson Co, Cummings, WW Williams options)

3. Corrosion Treatment - no updates

4. Other treatment: coagulation and disinfection - no updates

5. Water Tower:
   Jason, he did reach out to AEP about moving lines.

6. SCADA upgrades, instrumentation and integration, and Historian
   1. Tom Coath? Rob hasn't heard. Darold is mainly the contact. FTW valves can be delayed.

7. ACO Progress
   a. TMF (Grant Application)
   b. Corrosion Study
   c. Filter to waste
   d. Intake rehab, mussel control
      Initial contacts w/ Solomon by Cath.
      Material stockpiled onsite. Drying is bad…should be built with green wood.

8. Alum Sludge
   Meeks continues to pursue the landfill information. He talked w/ person that would make the decision. She was going to send information to Meeks.

9. Finances

10. Construction updates

11. Regulatory updates, upcoming communications

12. DWINSWA -

ES: Check the catch-all statement by Rob.

Compl com->submit additional

Southern area of town: (Ward 3)
-LCR samples good
-TCR samples BAD (cl2 incl)
-DBP samples BAD
-WQP - samples

George: consider a sampling hydrant?	
Construction site on Milton (B&Z)	

Lesia - city mailing to all customer addresses?
Sending letters to all customers.

Floc/Sed:
Rob - still needs pricing/availability for south and north floc/sed.
They listed the necessary work, Rob will be chasing that down.

Sludge collector & valve on South side is inoperable (which is in service).
North side, more general maintenance.
Has been working on an operational plan.

Water Tower follow-up:
-Dixon, what's the lead time
-power by peerless.

TMF Grant - **EGLE check back in on it.**

Video of intake????

-Needs Survey: MEETING W/ ABONMARCHE, F&V

Weekly external

Tuesday, February 9, 2021 2:43 PM

MOR - chlorine consistency?

Cath: can submit 1. Weekly bench sheets for January can be provided.
2. MOR template too.

George will be looking at treatment targets and goals

South floc/sed: sludge removal issues. Had a contractor out yesterday, looking at discharge valve. It can open now, and can pump through. Sludge collector trips on 'overtorque'. Failsafe is to shut down the plant for a day to drain and hose out.
MB: depth of sludge?
RJ: sludge judge, about 18". Also an 18" layer of thicker material.

North floc/sed: need sprockets, bearings. Rob: has gotten estimates on parts. $20,000 for sprockets. Two different opinions on bearings.

Backup: 2MG onsite storage. Be aware

Lab Certification: needs to see an extension
Remind Lundy of a request to grant an extension.

Agenda Items:
PA - discussion/wrap-up - X
PE - EGLE is drafting a document - X
Gate - ordered a new transponder. On back order, March ETA. Has a contractor. - X
Darel Rice - everyone has a Key FOB - X
Roof leak in maintenance shed? Check generator? Don't want to do a patch unless they get the bid. This is on the agenda at commission tonight. -X
Intake - Anyone reach out yet to L&M fab tech? - X
-confusion over who would look this up. *Ellis M: will call. -X*
DWINSA - 3pm 3/18 thu meeting. - X
Fluoride - January error in equipment. Rob: FIXED
Corrosion Study: need to get something moving for EPA - Cook?
-EPA will pay as long as scope of work looks appropriate. $50k.
-they checked around for a sample RFP.
-Damon Garrett gave some names…chris wasn't sure.
Categories? Define the qualifications, technical expectations, and scope of work, attachments submittals, List of vendors….for solicitation
Sanitary Survey - need to update in 2021 - X
Water tower: -had a good meeting w/ larger group. - X
Alum sludge - nothing since last week.
TMF grant - checked back in.
CCR - 2020 - Violations drop dead date 7/1 in hands of residents.
MOR report -
Pressure sensors (pitched the idea)

Get Frank Williams in touch with Rob (power by peerless) - X

Check with Eric B on lead time needs for Seven Brothers. - X

Look at applied chlorine variability (sent to SH) - X

Distribution Cl2 - 2.2 mg/L…need to follow up w/ F&V - XX
Perhaps …. Request daily sheets to look at tmnt variability?

Phosphate history? - low priority

WEEKLY MEETINGS W/ SHIFT OPERATORS

Weekly External

Tuesday, February 23, 2021 2:53 PM

Roof leak -
sherrif goslin did an estimate
Not worsening Darel Rice
Cook: both approved
37k main 27k secondary/maintenance.
Sherrif Goslin will patch maintenance bldg.
Abonmarche will.

Floc/sed -
Parts for bearings and sprockets for both sides, $20k parts only
Could be 30k.
For sludge issue…valve repair

Timing?? Goal is to have done before

Qualification of bidders: need to know some history, examples, references.

SOPs - George did 1. startup, 2. shutdown, and 3. backwash SOP drafts.
Not proposing changes to existing practices.

Topics

Cost/Budget Update

Public Education document - deadline 3/1/2021

Corrosion Study

Missed TOC sample October 2020
- George will be there tomorrow.
- **Rob J - he will ask eurofins**

Water Tower project - delayed meeting
- Integrator - needs to get rolled in, particularly
  - Po4 pump needs to be flow paced
  - Alarms
  - Backup pump

Floc Sed - needs to be done prior to water tower????

Weekly Sheets - alum scale checks needed

Lundy - extended lab, see Cath or Nate Sculley

Intake - EM spoke w/ diving company, they are in Texas. He will send the video.

Security:
Gate - ordered a new transponder. On back order, March ETA.
Has a contractor. - X
Darel Rice - everyone has a Key FOB -

CCR draft

EPA - Cook got a packet from EPA on DWINSA.

Abonmarche - engaged w/ blue conduit, check w/ Jason Marquardt. AB will be dumping data to them.

Takeaways:

Operations Oversight: Rob and Darold out
- Rob is COVID negative, should be back soon.

Check George Regan's License (2145)

Let Ronda know about second roof. Chris will do.

Ronda - ~30k for floc/sed.

PE document: mailing - Lesia is ready.
ERNIE: email document to Mitchell.

ERNIE: email corrosion study, copy city

Lagoon Discharge - may be necessary to coordinate a contact w/ Dale Ehinger. Rob has questions about design also.

EPA WIIN Grant

Tuesday, March 2, 2021 3:58 PM

Abonmarche: Need to get going....need to start replacing lead.

Had an intro meeting for both communities. Need to stress coordination w/ EGLE, in particular w/ loans

BH submitted a revised workplan to reflect award amount. (via Abonmarche)
- -corrosion control
- -first year only 50, then ramping up moving forward.
- -four year period

GR - will soon be submitting a revised plan, again to reflect the new award.

Updates this week:
1. Received terms and conditions for grant from HQ - quarterly reporting, outcomes and outputs that were proposed.
2. davis bacon provision.
3. NEPA - this is optional for WIIN grants. (most likely a categorical exclusion)

DOES THIS MEAN MOVING ALONG?? (TIMING?)

-background on corrosion study in BH?
- -ACO mentioned, ALE background, timing discussion (brian said 1-1.5 yr)
- -EPA might like an official EGLE letter to the project scope.
- -Consider running past Andrea Porter (technical expert in drinking water group)

-background on LSL work
- -requirement for
- -schedule for SRF loan? State not until 2022.

Need to do more on Fed side in 2021??

QBS process not required for drinking water SRF (worthington) .... No RFQ needed, just need to get a copy of the contract

Andy Bielanski - EPA SRF.
Project Officer for BH and GR WIIN Grants

Steve Marquardt - section chief in Water, R5

Eric Pocan - GR grant
David Worthington - BH Grant

Request a timeline from city, strategy for where to search for LSL, where to replace, what's the administrative
"how are they going to manage this?"

Work flow? Ie. Contact, get sign-off, contract plumber, etc

Final work plan in March (need more than 50 in the first year!)
...then...
AWARD IN APRIL!

EPA

Wednesday, March 24, 2021 11:04 AM

Start date may need to change. Original date, was last october. IE the corrosion study is going out for RFP now-ish.

-Should review all start dates to be realistic. Makes the cost recovery process easier.

Jason: can't we back-date costs

Coordination has been ongoing w/ Blue Conduit,

Andrew Bielanski suggests putting down April 1, 2021.

Corrosion study: RFP is drafted, city was going to send out and administer, but will need to have support from Abonmarche. *No need for public bidding process?* $50k…Andy would say it can just be qualified bidders.

Ernie: are qualified bidders aware of the price tag/availability?? Jason - might work that in verbally w/ them

Andy: feel free to increase the proposed amt for CC study, can always submit less.

Joelle: can admin time be billed to grant? Andy: needs to be after the start date?

OCCT Study

Friday, March 26, 2021 10:02 AM

Heather Chesalik (not present - BV in GR)
Emily Tummons (corrosion control specialist)
Dave Koch (oversees MI operations)
Brandon Onan
Jason Marquardt

Budget

Pipe Loop Testing

State goal: snapshot in a quick sense to get an idea of what is going on NOW…

-

-Federal regs are 3 year implementation period

Background: pipe loop study could be the eventual study

Focus;

Weekly External

Tuesday, May 11, 2021 2:52 PM

Financials Discussion

60, 90, 180 past due are subject to shutoff per policy.
Oct, Nov, Dec Grant applied to some delinquent (some dip)

-no shutoffs (confirm)

-Bills still Sent? Do they show the balance?
- -includes prior balance
- -Has not included verbiage

-Late Payment fees assessed?
- -not sure…Lesia question…Darold thinks there is, but HAVE THEY BEEN ASSESSED DURING COVID.

-Communications about COVID/bills?
- -not yet.

-Payment plans?
- -not in the past, but Lesia and Ellis may be supportive of this.

DAROLD: federal stimulus is happening now, w/ increased unemployment.

Rhonda: cash is very low, product of cash flow being low.

LCR Sampling
-4 high results, they
- -552 Buena Vista, high Copper and Lead (held up for QA QC)
- -1037 Pearl, 109 lead (this was a 5th L sample, QA QC)
- LAB: 807 High with a lead result of 605 ppb (1st liter) and 145 ppb (5th liter) on 4/22/2021
- LAB: 718 Territorial with a lead result of 21 ppb (1st liter) and 107 ppb (5th liter) on 4/22/2021
- LAB: 1178 Broadway with a lead result of 22 ppb on 4/29/2021
- LAB: 1237 Columbus with a lead result of 23 ppb on 4/29/2021

- -718 Territorial Rd : Had LSL removed october 2020, sampled in April 2021, 107 ppb (5th)

-Rob: another batch going in tomorrow, 18 samples
- -this would make it close to 60, but not sure if this is the
- -also, he's seeing addresses that are not on his list…wants to talk to Rev P, before sending to lab

-Reach out to Health Department????
-City involvement???

ACO - owe the city a letter
-just waiting on a draft

Darold: Tom Coath, will be flow-paced PO4.

F&V - who's onsite this week?

-Cath, nothing in the past week
-Darold, typ. 4 days
-Rob - mon - wed.

Tower

-nothing new from 7 brothers, no committal yet
-I&M will work through onsite issues
-ready to release Bodin for work at WTP
-Peerless and Bodin coming onsite in the next week.

Intake
-still waiting for weather

Sludge
-B&Z, $25k to haul to SEBCO, 750 tons
-tipping fees are significant
-two days

Floc/Sed
-no changes
-parts still waiting.

Jason - update the list to remove LSL's that were removed

Construction: provide flushing instructions to residents in areas of construction.

Ernie: Make sure health department is involved
-State health HHS - in home inspection of very high.

Speculation…could there be lead plumbing in the houses?

Draft A Letter for FTW!!!!

Weekly External

Tuesday, December 15, 2020 2:58 PM

Cath - at WTP at 7AM
Blair Selover
810, Rob
Darel Rice 269-325-6519
Darold Harlan
(no Regan)

Matt Johnson was invited in case of discussion of TMF

List of sample codes…no repeat locations??
-Rob, didn't notice but thought he saw one address

Ernie: -concerns over no repeats…would prefer to have a smaller list
-concerns over misinformation of flushing information.

Rob - going to be getting consumer notices

Ernie: send a list of misinformed addresses.

Rob - gave "the list" to Rev. Pinkney (list of 20),

Thinks they have 63 samples that should be valid. Couple invalidated (one was non stagnation)

Need a budget meeting!!!!!

Emergencies?
Darold, hydrant replacement (38), 15 no aux valve and they asked to shut down watermain.
Ernie: controlled WM leaks may not require BWA, but must remain sanitary conditions in trench.
Cath: insertavalve option? If planning ahead, could be cheaper.
Darold: could fit the valve in open position, control flow, secure, and
May have an issue working isolation

Send intake proposal to Cath & group.

Cath: shadowing operator. Watching the shift, sampling, etc.
Next wants to dive into laboratory stuff.
Need to do turbidimeter calibration? Cath wants to wait until integration occurs.
Darold: met w/ Tom Coathe, continues to improve, hopes to be back next week.
Benchtop calibration? She can check the records.
Rob: did a spot check w/ standards on bench

D Rice: Meechie called 3 rivers, they said they wouldn't take it. Now he's checking another.

Phosphate Feed System: Doug VW showed Cath the PO4 system, and interlock w/ HSP. On Plant Tap sample, he is noting whether HSP is on or not.

Cath: when should they be sampling PO4 at plant tap? Get good consistency.

Any alum feed issues or settling issues? Cath, didn't observe any issues today.

Darold - maybe Tom would get to the Alum integration. First priority is turbidimeters. Then he will be looking at chemical level indicators.

Cath - talked to *Solomon Diving* who did the last inspection. RCM Group.

Darel Rice, hasn't seen any stacks of slats.

BH weekly external

Tuesday, December 29, 2020 2:41 PM

Darold Harlan
George Regan
Cath Winn
Rob Jones
Darel Rice

1. Emergencies: breaks, leaks, etc. (discuss miss dig, see attached)
2. Lead sampling, LSL inventory, LSL replacement (Generally, compliance with lead and copper rule)
3. Corrosion Treatment
4. Other treatment: coagulation and disinfection
5. SCADA upgrades, instrumentation and integration, and Historian
6. ACO Progress
    a. TMF
    b. Corrosion Study
    c. Filter to waste
    d. Intake rehab, mussel control
7. Alum Sludge - Give update from convo w/ Fred.
8. Finances

George: was onsite today. Talked with Dennis (Denny). Wondered if they were planning on taking over MOR.
Cath: **scan bench sheets on a weekly basis? Rob has implemented this.**
-was going to do a check on the MOR, was going to do this for December data using a side-by-side w/ existing.
-Will be revisiting in January to get into Lab and SOP

Darold: delay in seeing results. Ortho injected in basement. The meter wasn't working properly initially, due to large valve not closed fully. During that time, some finished water was bypassing the treatment.

Rob: they did increase po4 somewhat.

Darold: he will send a report for Tom.

Darold: next week cleaning of the 6/7th being done by contractor

Darel: waiting for return call from landfill

Rob/Cath: what about the WWTP? It is often used for phosphate removal.

FINANCES
Darold - had gotten well caught up, but now backsliding.

Tom Coathe asked about the filter to waste valves. New deadline is March 2021.
Also, wondering about controls for the alum (lockout w/ HSP).

Projects that need doing, updates:
-roof leak, has been patched. Not leaking. Will get quotes in spring.
-turbidimeters; Tom Coathe was onsite Monday & Tuesday. **Got them calibrated**
-integrated in SCADA?
-alum SCADA
-HSP/LSP work annual maintenance. Pumps that are not working (peerless inspection). **Waiting for report**. Might be all working now.
-fluoride pump
-bulk storage tank transducer (Tom has fixed this)
-Tom looked a little at the alarms. Max of 8 alarms.
-Plate settlers and chain drive. Rob - contractors are looking at them right now. ***Sludge collectors may not be working.***
Intake: Cath did get the quote from EGLE, and talked to another contractor. Had previously done work. Would like to see a video. Not sure about price.

ERNIE: get contacts for WWTP

Weekly internal

Thursday, February 4, 2021 10:52 AM

Onsite updates:

-commission approved the roof leak fix at the WTP
-another roof leak at maintenance shed (bulk chem, generator)
-Discussion about the generator. Has been used to operate plant in last few years, but not recently
-sanitary survey coming up

EPA WIIN Grant: CORROSION STUDY

-BO talked w/ Elhorn, haven't received any progress.

-looking for a scope of work for corrosion study $50k
-City wants to start over, look for qualified bidders
-**EGLE HAVE A TEMPLATE/LANGUAGE?**

ALE - letter update

Jeni moving forward, courtney finished, going out today: 66 locations, 90th=24ppb, 11 above 15ppb.

Deadlines; PA-3 days, Friday, Monday, due Tuesday. Will use Ninah's doc. Press Release. Website.
PE-March 1
PN-February 14
Last PE-

EDD update from previous PE

How many rounds of violations do we issue? What's the level of evidence needed?

ETT points? Eric, struggling with what kind of evidence is needed to retroactively.
Fines? REPEATED?

Happy medium? Softer language to identify potential for previous lack of mailings. **This would be the minimum. INCLUDE THE SECOND HALF OF 2019, FIRST ROUND OF 2020.**

Community Outreach

8:53 AM

1. Summary of external weekly meeting
2. ACO Progress
3. Corrosion Treatment
4. LCR Compliance
5. Financial

HOMEWORK:

1. Modify VN
2. SUBMIT TO EIS

Possible: SUBMIT TO OTCU (FCBM)
-would also be sent to O'Malley

4. Communication regarding the corrosion study.

OUTLINE for corrosion letter.
-federal grant, in need of a work plan
-gaps in the plan to conduct a corrosion study

-need to request a proposal from a qualified consultant for a corrosion optimization study.

Long term; update letter on the corrosion treatment

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **Catherine A. Winn** Month/Year **April-21**

F1-S1 **F1-S2**

Catherine A. Winn 5/10/21

Signature of Operator-in-Charge

Water Plant Classification

Berrien

County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.1866	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	169.67	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.97	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.93	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.88%	Percent of Treated Water

Chemical Data

Chlorine on hand:	66357	lb.	Est. supply:	293	days
Primary Coagulant (Alum (Al3+)) on hand:	65530	lb.	Est. supply:	230	days
Cost of All Chemicals per Million Gallons:	$64.74	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	87	90
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO

If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO

If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO

If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES

If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO

If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	26.495952	Avg	0.9172796	Max	1.333876	Min	0.733097

Remarks:

Catherine A. Winn is OIC for final data review only.

We continue to work with City staff on plant tap WQP analysis frequency.

WSSN 0600 CITY OF BENTON HARBOR Month/Year **April-21**

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS												
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30 NTU	>.30 NTU
														North	South
1	1.0800	331.00	1.61	4.50	5.40	0.78	3	0.07	0.07	3	0.16	0.20	6	0	0
2	1.1200	340.00	1.60	4.90	5.20	0.95	3	0.07	0.07	3	0.15	0.17	6	0	0
3	1.1050	317.00	1.51	6.30	6.90	1.40	3	0.07	0.08	3	0.16	0.18	6	0	0
4	1.1325	326.00	1.51	3.60	4.10	0.92	3	0.08	0.09	3	0.11	0.14	6	0	0
5	0.8925	254.00	1.50	3.10	5.10	0.81	3	0.08	0.08	3	0.09	0.13	6	0	0
6	0.9275	281.00	1.44	4.40	6.40	0.74	3	0.07	0.07	3	0.11	0.11	6	0	0
7	0.9150	274.00	1.58	4.30	8.00	0.76	3	0.07	0.07	3	0.08	0.08	6	0	0
8	0.9525	287.00	1.59	3.20	5.40	0.58	3	0.07	0.08	3	0.09	0.09	6	0	0
9	1.1866	399.00	1.77	5.20	6.40	0.74	3	0.08	0.09	3	0.08	0.08	6	0	0
10	1.0125	408.00	2.12	1.80	1.90	0.38	3	0.07	0.07	3	0.07	0.07	6	0	0
11	1.0500	312.00	1.56	2.00	2.00	0.49	3	0.00	0.00	3	0.07	0.07	3	0	0
12	1.0375	322.00	1.63	2.00	2.20	0.50	3	0.08	0.09	3	0.07	0.08	6	0	0
13	1.0875	313.00	1.51	2.30	2.90	0.52	3	0.08	0.08	3	0.06	0.07	6	0	0
14	0.9425	274.00	1.53	2.40	2.90	0.54	3	0.08	0.10	3	0.09	0.09	6	0	0
15	0.8925	275.00	1.62	2.80	4.30	0.48	3	0.08	0.09	3	0.09	0.10	6	0	0
16	0.9475	276.00	1.53	2.90	3.40	0.47	3	0.08	0.10	3	0.07	0.07	6	0	0
17	0.9475	288.00	1.60	3.70	6.90	0.55	3	0.09	0.12	3	0.07	0.08	6	0	0
18	0.7675	235.00	1.61	2.60	5.50	0.48	3	0.08	0.09	3	0.07	0.08	6	0	0
19	1.0050	310.00	1.62	2.40	2.70	0.78	3	0.07	0.08	3	0.07	0.07	6	0	0
20	0.7625	215.00	1.48	3.40	4.10	0.65	3	0.08	0.10	3	0.08	0.09	6	0	0
21	1.1275	343.00	1.60	3.10	3.50	0.64	3	0.08	0.09	3	0.08	0.08	6	0	0
22	1.0625	328.00	1.62	3.60	4.30	0.82	3	0.08	0.09	3	0.09	0.11	6	0	0
23	0.9150	284.00	1.63	3.10	3.60	0.70	3	0.10	0.10	3	0.09	0.10	6	0	0
24	0.9000	276.00	1.61	2.30	2.50	0.61	3	0.09	0.12	3	0.10	0.12	6	0	0
25	0.8900	274.00	1.62	3.80	4.00	0.59	3	0.08	0.08	3	0.08	0.10	6	0	0
26	0.8725	264.00	1.62	2.80	3.10	0.57	3	0.08	0.09	3	0.10	0.10	6	0	0
27	0.9175	283.00	1.62	3.20	3.70	0.77	3	0.08	0.09	3	0.07	0.07	6	0	0
28	0.9400	287.00	1.61	3.10	4.10	0.55	3	0.09	0.09	3	0.08	0.09	6	0	0
29	0.9525	289.00	1.60	2.20	2.30	0.52	3	0.08	0.07	3	0.08	0.10	6	0	0
30	0.8725	265.00	1.60	2.40	2.50	0.53	3	0.07	0.08	3	0.08	0.09	6	0	0
31											0.00	0.00	0	0	0
Total	29.2141	8930.00					90			90			177	0	0
Avg.	0.9738	297.67	1.60	3.25	4.18	0.66		0.08	0.08		0.09		Total	Total	Total
Max	1.1866	408.00	2.12	6.30	8.00	1.40		0.10	0.12		0.16	0.18	6	0	0
Min.	0.7625	215.00	1.44	1.80	1.90	0.38		0.00	0.00		0.00				

WSSN 0600 CITY OF BENTON HARBOR MONTH/YEAR **April-21**

CHEMICAL ANALYSES

			Total		Total		Non-Carb.								WQP	
			Hardness		Alkalinity		Hardness		Calcium		Magnesium		Chloride		Conductivity	Sulfate
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-			
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		umhos	mg/l
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Tap	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42		
1	8.4	8.3	186	178	156	149	30	29	53	54	13	11				
2	8.3	8.2	168	172	138	138	30	34	46	50	13	12				
3	8.4	8.2	196	174	163	136	33	38	59	55	12	9				
4	8.2	7.9	156	174	131	138	25	36	44	49	11	13				
5	8.2	8.1	172	186	129	136	43	50	41	48	17	16				
6	8.1	7.9	196	182	142	131	54	51	48	45	18	17				
7	8.1	7.8	190	182	136	129	54	53	47	45	17	17				
8	8.1	8.0	178	184	131	130	47	54	45	48	16	16	21.0	25.5	754	45
9	8.2	7.9	176	178	128	127	48	51	45	47	16	15				
10	8.2	8.1	152	156	127	127	25	29	41	46	12	10				
11	8.3	8.2	158	154	129	124	29	30	42	49	13	8				
12	8.3	8.2	156	154	131	123	25	31	42	46	12	9				
13	8.1	8.1	172	158	145	125	27	33	50	46	12	11	25.5	28.5		
14	8.2	7.9	176	166	134	124	42	42	39	38	19	17				
15	8.1	7.8	176	182	129	125	47	57	46	50	15	14				
16	8.2	8.3	152	158	124	123	28	35	42	42	12	13				
17	8.1	8.0	176	178	125	122	51	56	46	47	15	15				
18	8.1	8.0	172	168	124	119	48	49	41	42	17	15	19.5	24.0		
19	8.3	7.9	146	144	132	123	14	21	42	42	10	10				
20	8.1	7.7	168	158	139	120	29	38	48	46	12	11				
21	8.3	8.2	158	152	134	126	24	26	45	436	11	11	23.0	26.5		42
22	8.4	8.2	176	166	145	139	31	27	49	47	13	12				
23	8.5	8.3	186	168	150	137	36	31	51	47	14	12				
24	8.2	8.1	194	190	141	140	53	50	49	48	17	17				
25	8.1	7.8	196	192	138	138	58	54	48	50	18	17	21.5	26.5		
26	8.2	8.0	198	194	136	136	62	58	48	50	19	17				
27	8.1	7.9	204	194	142	132	62	62	49	47	20	18				
28	8.2	8.0	204	196	143	134	61	62	46	44	22	21				
29	8.0	8.0	204	196	137	134	67	62	49	48	20	18				
30	8.0	8.0	198	192	140	131	58	61	50	48	18	17	23.0	27.5		
31																
Avg.	8.2	8.0	178.0	174.2	136.6	130.5	41.4	43.7	46.4	60.0	15.1	14.0	22.3	26.4	754	44
Max	8.5	8.3	204.0	196.0	163.0	149.0	67.0	62.0	59.0	436.0	22.0	21.0	25.5	28.5	754	45
Min.	8.0	7.7	146.0	144.0	124.0	119.0	14.0	21.0	39.0	38.0	10.0	8.0	19.5	24.0	754	42

WSSN 0600 CITY OF BENTON HARBOR PAGE 4

MONTH/YEAR **April-21**

FLUORIDATION AND CHLORINATION

		Fluoride Analysis			Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1	0.48	0.28	0.69		0	0.00	245	3.39	46	0.64	291	4.25	2.25	1.76	2.00
2	0.48	0.36	0.70		0	0.00	244	3.25	26	0.35	270	3.60	1.84	1.56	1.76
3	0.41	0.38	0.73		0	0.00	240	3.24	35	0.47	275	4.41	2.31	1.96	2.10
4	0.46	0.29	0.78		0	0.00	242	3.19	38	0.50	280	3.68	1.49	2.01	2.19
5	0.42	0.29	0.77		0	0.00	186	3.11	50	0.84	236	4.32	1.64	2.51	2.68
6	0.41	0.24	0.77		0	0.00	183	2.95	36	0.58	219	4.05	2.07	1.82	1.98
7	0.41	0.23	0.78	0.78	0	0.00	185	3.02	54	0.88	239	4.00	0.81	3.02	3.19
8	0.49	0.38	0.77		0	0.00	189	2.96	37	0.58	226	3.91	1.84	1.91	2.07
9	0.37	0.26	0.81		0	0.00	227	2.86	26	0.33	253	2.83	0.53	2.14	2.30
10	0.47	0.23	0.74		0	0.00	234	3.45	41	0.60	275	4.19	1.77	2.20	2.42
11	0.43	0.36	0.82		0	0.00	209	2.97	37	0.53	246	4.44	2.24	2.00	2.20
12	0.47	0.34	0.76		0	0.00	205	2.95	36	0.52	241	4.09	1.84	2.00	2.25
13	0.66	0.31	0.72		0	0.00	222	3.05	38	0.52	260	3.77	1.59	1.90	2.18
14	0.64	0.27	0.73		0	0.00	197	3.12	31	0.49	228	3.81	1.94	1.72	1.87
15	0.63	0.41	0.83		0	0.00	185	3.09	38	0.64	223	4.00	1.99	1.86	2.01
16	0.51	0.50	0.90		0	0.00	187	2.95	20	0.32	207	3.33	1.50	1.63	1.83
17	0.64	0.29	0.71		0	0.00	193	3.04	38	0.60	231	3.89	1.87	1.87	2.02
18	0.61	0.27	0.69		0	0.00	147	2.86	30	0.58	177	3.60	1.70	1.74	1.90
19	0.44	0.30	0.72		0	0.00	162	2.41	33	0.49	195	3.16	0.78	2.10	2.38
20	0.59	0.31	0.79		0	0.00	151	2.96	34	0.67	185	3.77	1.97	1.60	1.80
21	0.51	0.29	0.82	0.61	0	0.00	223	2.95	45	0.60	268	3.41	1.23	1.93	2.18
22	0.50	0.40	0.84		0	0.00	220	3.09	39	0.55	259	4.00	1.97	1.79	2.03
23	0.56	0.38	0.87		0	0.00	191	3.12	26	0.42	217	3.81	2.20	1.34	1.61
24	0.76	0.30	0.87		0	0.00	211	3.50	43	0.71	254	4.67	3.01	1.51	1.66
25	0.55	0.26	0.80		0	0.00	206	3.46	40	0.67	246	4.44	2.74	1.55	1.70
26	0.55	0.26	0.68		0	0.00	203	3.47	37	0.63	240	4.26	2.35	1.75	1.91
27	0.53	0.32	0.65		0	0.00	211	3.43	41	0.67	252	4.10	1.97	1.96	2.13
28	0.69	0.22	0.67	0.84	0	0.00	214	3.40	41	0.65	255	5.05	2.57	2.31	2.48
29	0.42	0.26	0.76		0	0.00	215	3.37	42	0.66	257	3.98	1.66	2.18	2.32
30	0.43	0.24	0.76		0	0.00	176	3.01	38	0.65	214	3.77	1.68	1.94	2.09
31															
Avg.	0.52	0.31	0.76	0.74	0.00	0.00	203.43	3.12	37.20	0.58	240.63	3.95	1.84	1.92	2.11
Max	0.76	0.50	0.90	0.84	0.00	0.00	245.00	3.50	54.00	0.88	291.00	5.05	3.01	3.02	3.19
Min.	0.37	0.22	0.65	0.61	0.00	0.00	147.00	2.41	20.00	0.32	177.00	2.83	0.53	1.34	1.61

WSSN 0600 CITY OF BENTON HARBOR PAGE 5

MONTH/YEAR April-21

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	PLANT TAP		Standard Plate Count		Raw	Tap
D	No. of	Colilert			TEMP.	TEMP.
A	Samples	P/A			'C	'C
T			Raw	Tap		
E						
1	1	A	57	0	9	9.0
2	1	A	51	0	7	9.0
3	1	A	79	4	8	8.5
4	1	A	92	1	7	9.0
5	1	A	21	0	7	7.5
6	1	A	48	0	8	7.5
7	1	A	50	1	9	8.0
8	1	A	38	1	9	8.5
9	1	A	53	0	9	9.0
10	1	A	64	0	9	10.0
11	1	A	43	0	10	11.0
12	1	A	62	1	9	10.0
13	1	A	39	0	10	11.0
14	1	A	40	1	10	10.0
15	1	A	41	0	10	10.0
16	1	A	43	1	10	11.0
17	1	A	10	2	9	10.0
18	1	A	11	0	8	9.5
19	1	A	19	0	9	10.0
20	1	A	24	0	9	9.5
21	1	A	28	0	9	10.0
22	1	A	46	0	9	9.0
23	1	A	30	0	10	10.0
24	1	A	22	1	10	10.5
25	1	A	23	0	9	9.5
26	1	A	46	1	9	9.5
27	1	A	35	0	9.8	9.5
28	1	A	36	1	10.5	10.0
29	1	A	57	0	10.5	10.5
30	1	A	31	0	10.5	11.0
31						
AVG.	1	A	41	1	9	10
Max			92	4	11	11
Min			10	0	7	8

WSSN 0600 CITY OF BENTON HARBOR PAGE 6

MONTH/YEAR **April-21**

Distrubution Flow and Corrosion Treatment

	Ortho P System					Distrubution flow and Corrosion Treatment			
D	City Hall	Wolfs	Bait Shed	Sunny Spot	B&Z				
A	Ortho P	Ortho P	Ortho P	Ortho P	Ortho P	High Lift		PO4	Ortho P
T	Residual	Residual	Residual	Residual	Residual	To	Lbs PO4	Treatment	Residual
E	mg/L	mg/L	mg/L	mg/L	mg/L	Distribution		mg/L	mg/L
1						0.7238	98	5.36	3.11
2						0.7084	105	5.86	2.94
3						0.6314	113	7.08	2.93
4						0.7392	96	5.14	3.27
5						0.5082	87	6.77	3.24
6						0.4774	92	7.63	3.29
7	3.30		3.21	3.09	3.07	0.5082	96	7.47	3.16
8						0.5236	137	10.35	3.15
9						0.9394	99	4.17	3.25
10						0.6622	83	4.96	3.12
11						0.4620	87	7.45	3.14
12						0.5082	103	8.02	3.10
13						0.6314	93	5.83	3.25
14	3.27	3.00	3.29	3.15	3.14	0.4774	101	8.37	3.19
15						0.5852	86	5.81	4.08
16						0.5698	98	6.81	3.08
17						0.4928	100	8.03	3.36
18						0.4928	88	7.07	3.74
19						0.5544	98	6.99	2.99
20						0.4928	117	9.39	4.00
21	3.10	3.10	3.24	3.07	2.96	0.8316	99	4.71	3.14
22						0.5544	108	7.71	3.09
23						0.4928	99	7.95	3.10
24						0.4774	95	7.87	3.11
25						0.4928	65	5.22	3.21
26						0.4928	59	4.74	3.04
27						0.9185	96	4.14	3.14
28	2.93	2.54	2.60	1.59	2.57	0.5698	109	7.57	4.28
29						0.5698	107	7.43	4.24
30						0.5544	106	7.57	4.44
31									
Totals						17.6429	2920.0		
AVG.	3.15	2.88	3.09	2.73	2.94	0.5881	97.3	6.83	3.35
Max	3.30	3.10	3.29	3.15	3.14	0.9394	137.0	10.35	4.44
Min	2.93	2.54	2.60	1.59	2.57	0.4620	59.0	4.14	2.93

CITY OF BENTON HARBOR PAGE 7

DISTRIBUTION SYSTEM MONITORING WSSN 0600 April-21

Chlorine Residual at Bacteriological Monitoring Stations mg/l

	City Hall		Wolf Marine	470 W. Main	Sunny Spot		B&Z
DATE	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6							
7	1.26		1.24	1.28	0.75		1.09
8							
9							
10							
11							
12							
13							
14	1.20		1.25	1.25	0.44		0.89
15							
16							
17							
18							
19							
20							
21	1.13		0.89	1.13	0.81		0.44
22							
23							
24							
25							
26							
27							
28	1.61		1.35	1.24	1.04		0.46
29							
30							
31							

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

	Avg.	Max.	Min.
Chlorine Residuals, mg/L	**1.04**	1.61	0.44
Total number of routine distribution samples analyzed	**20**		
Total number of positive routine distribution samples	0		
Total number of routine distribution samples required	10		
Total number of check samples	**6**		
Total number of positive check samples	**0**		

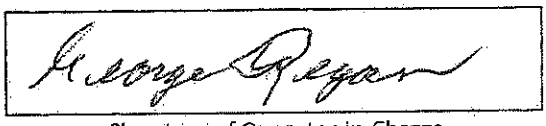
MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: CITY OF BENTON HARBOR

WSSN:600

Operator-in-Charge: George Regan
F-1/S-2

Month/Year: February-21
F1-S2



Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.396	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	104.88	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.98	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.02	Gallons Per Square Feet per Minute
Average Wash Water Use:	1.67%	Percent of Treated Water

Chemical Data

Chlorine on hand:	72831	lb.	Est. supply:	298	days
Primary Coagulant (Alum (Al3+)) on hand:	58778	lb.	Est. supply:	263	days
Cost of All Chemicals per Million Gallons:	$64.07	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	81	81
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	25.483492	Avg	0.9362938	Max	1.310021	Min	0.71353

OIC in review of final data only. Phosphate residuals average good, at greater than 3.0 mg/l (distribution).
Remarks: We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

WSSN 0600 CITY OF BENTON HARBOR Month/Year **February 2021**

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	Samples	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30 NTU	>.30 NTU
														North	South
1	0.7750	250.00	1.70	3.40	4.80	1.30	3	0.08	0.09	3	0.08	0.08	3	0	0
2	0.7850	254.00	1.70	3.70	5.20	1.20	3	0.08	0.09	3	0.07	0.07	3	0	0
3	0.7525	257.00	1.80	4.80	7.50	1.20	3	0.08	0.09	3	0.08	0.10	3	0	0
4	0.8175	295.00	1.90	4.50	7.60	1.10	3	0.07	0.08	3	0.08	0.10	3	0	0
5	0.8850	280.00	1.66	7.20	9.70	1.50	3	0.09	0.10	3	0.08	0.09	3	0	0
6	0.9750	269.00	1.51	4.40	4.90	1.40	3	0.09	0.10	3	0.11	0.12	3	0	0
7	0.8775	277.00	1.66	5.70	7.00	1.40	3	0.07	0.07	2	0.09	0.09	2	0	0
8	0.7425	227.00	1.61	3.90	4.60	1.50	3	0.08	0.08	3	0.08	0.09	3	0	0
9	0.9300	301.00	1.70	5.00	8.40	1.30	3	0.07	0.08	3	0.07	0.09	3	0	0
10	0.9325	301.00	1.70	3.60	4.80	1.40	3	0.09	0.10	3	0.09	0.09	3	0	0
11	0.8950	277.00	1.63	2.60	3.10	1.60	3	0.09	0.10	3	0.11	0.12	3	0	0
12	0.9725	297.00	1.61	2.70	3.50	1.50	3	0.07	0.08	3	0.13	0.16	3	0	0
13	0.8050	246.00	1.61	3.70	4.90	1.40	3	0.07	0.07	2	0.12	0.14	2	0	0
14	0.7850	240.00	1.61	4.60	6.20	1.40	3	0.07	0.07	2	0.17	0.18	2	0	0
15	1.3960	333.00	1.26	9.90	15.40	4.60	3	0.18	0.22	3	0.16	0.18	3	0	0
16	1.2565	357.00	1.49	11.90	20.10	2.80	3	0.09	0.09	3	0.11	0.15	3	0	0
17	1.0350	318.00	1.62	3.40	4.70	1.60	3	0.08	0.10	3	0.11	0.11	3	0	0
18	0.7275	228.00	1.65	3.60	5.70	1.70	3	0.08	0.11	3	0.11	0.14	3	0	0
19	0.9650	323.00	1.76	2.40	3.30	1.30	3	0.07	0.08	3	0.11	0.15	3	0	0
20	0.9775	325.00	1.75	2.00	3.20	1.10	3	0.08	0.09	3	0.13	0.16	3	0	0
21	0.9875	329.00	1.75	1.90	3.40	0.93	3	0.08	0.09	3	0.14	0.18	3	0	0
22	1.0900	336.00	1.62	1.80	1.90	0.85	3	0.08	0.08	3	0.16	0.18	3	0	0
23	1.1425	367.00	1.69	1.40	2.60	0.86	3	0.07	0.08	3	0.14	0.15	3	0	0
24	1.1325	349.00	1.62	1.50	3.00	0.64	3	0.09	0.10	3	0.17	0.20	3	0	0
25	1.2650	432.00	1.80	1.70	3.10	0.95	3	0.08	0.09	3	0.12	0.15	3	0	0
26	1.1250	354.00	1.80	0.98	1.70	0.82	3	0.09	0.12	3	0.12	0.13	3	0	0
27	1.0750	329.00	1.61	0.93	1.20	0.72	3	0.08	0.09	3	0.11	0.14	3	0	0
28	1.2566	432.00	1.81	1.80	3.40	0.87	3	0.10	0.11	3	0.11	0.12	3	0	0
29															
30															
31															
Total	27.3616	8583.00					84			81			81	0	0
Avg.	0.9772	306.54	1.66	3.75	5.53	1.39		0.08	0.09		0.11		3	0	0
Max	1.3960	432.00	1.90	11.90	20.10	4.60		0.18	0.22		0.17	0.20	3	0	0
Min.	0.7275	227.00	1.26	0.93	1.20	0.64		0.07	0.07		0.07		2		

CHEMICAL ANALYSES

			Total		Total		Non-Carb.							
			Hardness		Alkalinity		Hardness		Calcium		Magnesium		Chloride	
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.1	7.9	176	170	123	119	53	51	43	42	17	17		
2	8.0	8.0	178	174	123	120	55	54	41	40	18	18		
3	8.0	7.8	176	172	124	118	52	54	40	38	18	18		
4	8.0	7.8	184	174	127	115	57	59	43	42	18	17		
5	8.2	8.1	154	150	124	120	30	30	47	47	9	8	23.0	24.5
6	8.1	8.1	150	146	123	118	27	28	46	45	8	8		
7	8.1	8.0	148	144	121	120	27	24	46	47	8	6		
8	8.1	7.9	198	172	132	116	66	56	50	42	18	16	19.0	24.0
9	8.1	8.0	178	166	136	119	42	47	39	38	19	17		
10	8.3	8.1	162	158	138	128	24	30	51	51	8	8		
11	8.3	8.0	182	176	152	126	30	50	59	54	8	10		
12	8.2	8.1	184	172	131	135	53	37	55	49	11	12		
13	8.2	8.1	172	168	134	129	38	39	57	51	7	10		
14	8.1	8.1	168	166	134	137	34	29	55	54	7	8		
15	8.1	8.0	164	162	134	134	30	28	49	47	10	11		
16	8.3	8.2	162	164	127	133	35	31	44	46	13	12	23.0	24.5
17	8.1	7.8	206	176	154	124	52	52	50	43	20	17		
18	8.1	7.9	218	180	161	129	57	51	51	47	22	15	22.0	26.0
19	8.1	8.0	206	186	151	134	55	52	49	45	20	18	22.0	26.5
20	8.1	7.8	202	194	144	138	58	56	46	44	21	20	23.5	28.5
21	8.1	8.0	190	188	135	135	55	53	46	45	18	18	21.0	25.5
22	8.2	8.2	150	154	126	136	24	18	49	51	7	6	22.0	25.0
23	8.1	8.0	150	158	123	128	27	30	49	52	7	7		
24	8.0	8.0	156	154	130	125	26	29	47	46	9	9		
25	8.2	8.0	154	150	128	125	26	25	47	49	9	7		
26	8.0	8.0	158	156	133	129	25	27	50	51	8	7		
27	8.1	8.1	178	170	130	124	48	46	43	42	17	16	20.0	24.5
28	8.1	7.9	182	180	124	123	58	57	48	46	15	16	19.0	23.5
29														
30														
31														
Avg.	8.1	8.0	174.5	167.1	132.9	126.3	41.6	40.8	47.9	46.2	13.2	12.6	21.5	25.3
Max	8.3	8.2	218.0	194.0	161.0	138.0	66.0	59.0	59.0	54.0	22.0	20.0	23.5	28.5
Min.	8.0	7.8	148.0	144.0	121.0	115.0	24.0	18.0	39.0	38.0	7.0	6.0	19.0	23.5

MONTH/YEAR **February 2021**

FLUORIDATION AND CHLORINATION

		Fluoride Analysis			Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	mg/L	PPD	mg/L	PPD	mg/L	PPD	mg/L	Demand	Free	Total
E													mg/L	mg/l	mg/l
1	0.47	0.34	0.50		0	0.00	147	2.83	20	0.39	167	3.40	1.36	1.88	2.04
2	0.57	0.34	0.62		0	0.00	150	2.85	69	1.31	219	4.21	1.39	2.65	2.82
3	0.76	0.35	0.57	0.47	0	0.00	153	3.04	51	1.01	204	3.81	1.18	2.47	2.63
4	0.57	0.31	0.66		0	0.00	156	2.85	28	0.51	184	3.78	1.83	1.78	1.95
5	0.50	0.24	0.70		0	0.00	172	2.90	25	0.42	197	3.12	1.34	1.53	1.78
6	0.42	0.32	0.71		0	0.00	175	2.68	29	0.44	204	4.27	2.32	1.84	1.95
7	0.73	0.21	0.69		0	0.00	168	2.86	30	0.51	198	3.41	1.38	1.79	2.03
8	0.58	0.11	0.61		0	0.00	149	3.00	53	1.07	202	3.21	1.62	1.43	1.59
9	0.50	0.20	0.64		0	0.00	186	2.99	37	0.59	223	3.08	1.14	1.79	1.94
10	0.60	0.25	0.70	0.56	0	0.00	189	3.03	34	0.54	223	4.59	2.31	2.06	2.28
11	0.55	0.39	0.65		0	0.00	176	2.94	29	0.48	205	3.37	1.10	2.16	2.27
12	0.57	0.34	0.69		0	0.00	195	2.99	46	0.71	241	4.60	2.55	1.95	2.05
13	0.66	0.39	0.76		0	0.00	160	2.97	22	0.41	182	3.57	1.57	1.78	2.00
14	0.56	0.33	0.77		0	0.00	153	2.91	25	0.48	178	3.02	1.22	1.62	1.80
15	0.30				0	0.00	256	2.74	16	0.17	272	4.72	2.89	1.59	1.83
16	0.40	0.37	0.73		0	0.00	250	2.97	39	0.46	289	5.29	3.17	1.97	2.12
17	0.74	0.38	0.62		0	0.00	214	3.09	41	0.59	255	3.83	1.89	1.78	1.94
18	0.61	0.29	0.73	0.82	0	0.00	150	3.08	23	0.47	173	3.42	1.37	1.89	2.05
19	0.56	0.08	0.74		0	0.00	198	3.06	32	0.50	230	3.71	1.64	1.91	2.07
20	0.60	0.44	0.78		0	0.00	196	2.99	73	1.11	269	3.85	1.54	2.15	2.31
21	0.57	0.43	0.83		0	0.00	189	2.86	35	0.53	224	3.18	0.92	2.09	2.26
22	0.54	0.35	0.81		0	0.00	195	2.67	45	0.62	240	3.32	0.83	2.18	2.49
23	0.43	0.44	0.90		0	0.00	199	2.60	40	0.52	239	3.12	0.88	2.04	2.24
24	0.54	0.38	0.85	0.70	0	0.00	198	2.61	46	0.61	244	3.08	0.72	2.08	2.36
25	0.49	0.48	0.76		0	0.00	228	2.69	48	0.57	276	3.40	1.09	2.04	2.31
26	0.57	0.49	0.83		0	0.00	205	2.72	47	0.62	252	3.21	0.92	2.08	2.29
27	0.61	0.44	0.81		0	0.00	194	2.69	37	0.51	231	3.32	1.38	1.78	1.94
28	0.50	0.49	0.90		0	0.00	222	2.64	37	0.44	259	2.95	1.06	1.74	1.89
29															
30															
31															
Avg.	0.55	0.34	0.72	0.64	0.00	0.00	186.54	2.87	37.75	0.59	224.29	3.64	1.52	1.93	2.12
Max	0.76	0.49	0.90	0.82	0.00	0.00	256.00	3.09	73.00	1.31	289.00	5.29	3.17	2.65	2.82
Min.	0.30	0.08	0.50	0.47	0.00	0.00	147.00	2.60	16.00	0.17	167.00	2.95	0.72	1.43	1.59

WSSN 0600 CITY OF BENTON HARBOR PAGE 5

MONTH/YEAR **February 2021**

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	PLANT TAP		Standard Plate Count		Raw	Tap
D	No. of	Colilert			TEMP.	TEMP.
A	Samples	P/A			'C	'C
T			Raw	Tap		
E						
1	1	A	36	0	2	3.0
2	1	A	36	0	2	3.5
3	1	A	33	0	2	3.5
4	1	A	24	0	2	3.5
5	1	A	39	0	2	4.0
6	1	A	14	0	3	4.0
7	1	A	21	10	3	4.5
8	1	A	19	0	1	3.5
9	1	A	16	0	2	2.5
10	1	A	23	0	2	3.0
11	1	A	29	1	2	3.0
12	1	A	30	0	2	3.0
13	1	A	36	0	2	3.0
14	1	A	12	0	2	3.0
15	1	A	22	1	2	3.0
16	1	A	37	0	2	3.5
17	1	A	27	0	1	2.0
18	1	A	54	0	2	2.5
19	1	A	48	0	2	2.0
20	1	A	47	0	2	2.0
21	1	A	66	0	1	2.0
22	1	A	56	0	2	3.0
23	1	A	40	0	2	3.5
24	1	A	18	0	2	3.0
25	1	A	17	1	2	3.5
26	1	A	15	0	2	3.0
27	1	A	21	0	2	2.0
28	1	A	43	0	2	2.5
29						
30						
31						
AVG.	1	A	31	0	2	3
Max			66	10	3	5
Min			12	0	1	2

WSSN 0600 CITY OF BENTON HARBOR PAGE 6

MONTH/YEAR **February 2021**

Distrubution Flow and Corrosion Treatment

	Ortho P System					Distrubution flow and Corrosion Treatment			
D	City Hall	Wolfs	Bait Shed	Sunny Spot	B&Z				
A	Ortho P	Ortho P	Ortho P	Ortho P	Ortho P	High Lift		PO4	Ortho P
T	Residual	Residual	Residual	Residual	Residual	To	Lbs PO4	Treatment	Residual
E	mg/L	mg/L	mg/L	mg/L	mg/L	Distribution		mg/L	mg/L
1						0.4466	83	7.33	3.15
2						0.4774	84	7.00	3.10
3	2.98	3.22	3.05	3.04	3.17	0.4928	85	6.82	3.15
4						0.4774	94	7.75	3.24
5						0.6314	84	5.26	3.17
6						0.4774	90	7.43	3.25
7						0.6160	93	5.95	3.26
8						0.5852	62	4.16	3.06
9						0.7238	71	3.89	3.09
10	2.95	3.19	3.16	3.29	2.87	0.4928	84	6.75	3.17
11						0.5390	74	5.43	2.95
12						0.4466	76	6.71	3.01
13						0.4466	79	7.03	3.22
14						0.5390	75	5.48	3.11
15						0.5082	60	4.70	3.01
16						0.5852	89	6.04	2.71
17						0.7084	58	3.24	2.98
18	2.88	2.54	2.95	2.89	2.75	0.4620	76	6.49	2.88
19						0.6930	80	4.56	2.70
20						0.7392	73	3.89	2.72
21						0.6468	77	4.73	3.04
22						0.6622	97	5.78	2.76
23						0.7546	97	5.07	3.07
24	3.03	3.07	3.02	3.07	2.80	0.7700	120	6.16	3.16
25						0.7700	119	6.12	3.19
26						0.6930	116	6.63	3.19
27						0.7084	114	6.36	3.00
28						0.9086	96	4.20	2.86
29									
30									
31									
Totals						17.0016	2404.5		
AVG.	2.96	3.01	3.05	3.07	2.90	0.6072	85.9	5.69	3.04
Max	3.03	3.22	3.16	3.29	3.17	0.9086	119.8	7.75	3.26
Min	2.88	2.54	2.95	2.89	2.75	0.4466	58.0	3.24	2.70

CITY OF BENTON HARBOR PAGE 7

DISTRIBUTION SYSTEM MONITORING WSSN 0600 February 2021

Chlorine Residual at Bacteriological Monitoring Stations mg/l

	City Hall		Wolf Marine	470 W. Main	Sunny Spot		B&Z
DATE	1	2	3	4	5	6	7
1							
2							
3	1.99		1.93	2.09	1.48		1.33
4							
5							
6							
7							
8							
9							
10	1.60		1.46	1.22	1.74		1.34
11							
12							
13							
14							
15							
16							
17							
18	1.41		1.57	1.94	1.61		1.16
19							
20							
21							
22							
23							
24	1.53		1.30	1.36	1.46		1.37
25							
26							
27							
28							
29							
30							
31							

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

	Avg.	Max.	Min.
Chlorine Residuals, mg/L	**1.54**	2.09	1.16
Total number of routine distribution samples analyzed	**20**		
Total number of positive routine distribution samples	0		
Total number of routine distribution samples required	10		
Total number of check samples	**0**		
Total number of positive check samples	**0**		

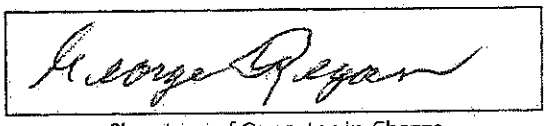
MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: CITY OF BENTON HARBOR

WSSN:600

Operator-in-Charge: George Regan
F-1/S-2

Month/Year: February-21
F1-S2



Signature of Operator-in-Charge

Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.396	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	104.88	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.98	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	2.02	Gallons Per Square Feet per Minute
Average Wash Water Use:	1.67%	Percent of Treated Water

Chemical Data

Chlorine on hand:	72831	lb.	Est. supply:	298	days
Primary Coagulant (Alum (Al3+)) on hand:	58778	lb.	Est. supply:	263	days
Cost of All Chemicals per Million Gallons:	$64.07	dollars			
Total Power Cost per Million Gallons:		dollars			

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	81	81
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	25.483492	Avg	0.9362938	Max	1.310021	Min	0.71353

OIC in review of final data only. Phosphate residuals average good, at greater than 3.0 mg/l (distribution).
Remarks: We have begun to feed Orthopolyphosphate (OPP) 70/30 Carus 8600 33% March 25, 2019
This report has an updated Bacteria Page for Metered flow and OPP treat and residuals.

WSSN 0600 CITY OF BENTON HARBOR Month/Year **February 2021**

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	Samples	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30 NTU	>.30 NTU
														North	South
1	0.7750	250.00	1.70	3.40	4.80	1.30	3	0.08	0.09	3	0.08	0.08	3	0	0
2	0.7850	254.00	1.70	3.70	5.20	1.20	3	0.08	0.09	3	0.07	0.07	3	0	0
3	0.7525	257.00	1.80	4.80	7.50	1.20	3	0.08	0.09	3	0.08	0.10	3	0	0
4	0.8175	295.00	1.90	4.50	7.60	1.10	3	0.07	0.08	3	0.08	0.10	3	0	0
5	0.8850	280.00	1.66	7.20	9.70	1.50	3	0.09	0.10	3	0.08	0.09	3	0	0
6	0.9750	269.00	1.51	4.40	4.90	1.40	3	0.09	0.10	3	0.11	0.12	3	0	0
7	0.8775	277.00	1.66	5.70	7.00	1.40	3	0.07	0.07	2	0.09	0.09	2	0	0
8	0.7425	227.00	1.61	3.90	4.60	1.50	3	0.08	0.08	3	0.08	0.09	3	0	0
9	0.9300	301.00	1.70	5.00	8.40	1.30	3	0.07	0.08	3	0.07	0.09	3	0	0
10	0.9325	301.00	1.70	3.60	4.80	1.40	3	0.09	0.10	3	0.09	0.09	3	0	0
11	0.8950	277.00	1.63	2.60	3.10	1.60	3	0.09	0.10	3	0.11	0.12	3	0	0
12	0.9725	297.00	1.61	2.70	3.50	1.50	3	0.07	0.08	3	0.13	0.16	3	0	0
13	0.8050	246.00	1.61	3.70	4.90	1.40	3	0.07	0.07	2	0.12	0.14	2	0	0
14	0.7850	240.00	1.61	4.60	6.20	1.40	3	0.07	0.07	2	0.17	0.18	2	0	0
15	1.3960	333.00	1.26	9.90	15.40	4.60	3	0.18	0.22	3	0.16	0.18	3	0	0
16	1.2565	357.00	1.49	11.90	20.10	2.80	3	0.09	0.09	3	0.11	0.15	3	0	0
17	1.0350	318.00	1.62	3.40	4.70	1.60	3	0.08	0.10	3	0.11	0.11	3	0	0
18	0.7275	228.00	1.65	3.60	5.70	1.70	3	0.08	0.11	3	0.11	0.14	3	0	0
19	0.9650	323.00	1.76	2.40	3.30	1.30	3	0.07	0.08	3	0.11	0.15	3	0	0
20	0.9775	325.00	1.75	2.00	3.20	1.10	3	0.08	0.09	3	0.13	0.16	3	0	0
21	0.9875	329.00	1.75	1.90	3.40	0.93	3	0.08	0.09	3	0.14	0.18	3	0	0
22	1.0900	336.00	1.62	1.80	1.90	0.85	3	0.08	0.08	3	0.16	0.18	3	0	0
23	1.1425	367.00	1.69	1.40	2.60	0.86	3	0.07	0.08	3	0.14	0.15	3	0	0
24	1.1325	349.00	1.62	1.50	3.00	0.64	3	0.09	0.10	3	0.17	0.20	3	0	0
25	1.2650	432.00	1.80	1.70	3.10	0.95	3	0.08	0.09	3	0.12	0.15	3	0	0
26	1.1250	354.00	1.80	0.98	1.70	0.82	3	0.09	0.12	3	0.12	0.13	3	0	0
27	1.0750	329.00	1.61	0.93	1.20	0.72	3	0.08	0.09	3	0.11	0.14	3	0	0
28	1.2566	432.00	1.81	1.80	3.40	0.87	3	0.10	0.11	3	0.11	0.12	3	0	0
29															
30															
31															
Total	27.3616	8583.00					84			81			81	0	0
Avg.	0.9772	306.54	1.66	3.75	5.53	1.39		0.08	0.09		0.11		3	0	0
Max	1.3960	432.00	1.90	11.90	20.10	4.60		0.18	0.22		0.17	0.20	3	0	0
Min.	0.7275	227.00	1.26	0.93	1.20	0.64		0.07	0.07		0.07		2		

CHEMICAL ANALYSES

			Total		Total		Non-Carb.							
			Hardness		Alkalinity		Hardness		Calcium		Magnesium		Chloride	
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.1	7.9	176	170	123	119	53	51	43	42	17	17		
2	8.0	8.0	178	174	123	120	55	54	41	40	18	18		
3	8.0	7.8	176	172	124	118	52	54	40	38	18	18		
4	8.0	7.8	184	174	127	115	57	59	43	42	18	17		
5	8.2	8.1	154	150	124	120	30	30	47	47	9	8	23.0	24.5
6	8.1	8.1	150	146	123	118	27	28	46	45	8	8		
7	8.1	8.0	148	144	121	120	27	24	46	47	8	6		
8	8.1	7.9	198	172	132	116	66	56	50	42	18	16	19.0	24.0
9	8.1	8.0	178	166	136	119	42	47	39	38	19	17		
10	8.3	8.1	162	158	138	128	24	30	51	51	8	8		
11	8.3	8.0	182	176	152	126	30	50	59	54	8	10		
12	8.2	8.1	184	172	131	135	53	37	55	49	11	12		
13	8.2	8.1	172	168	134	129	38	39	57	51	7	10		
14	8.1	8.1	168	166	134	137	34	29	55	54	7	8		
15	8.1	8.0	164	162	134	134	30	28	49	47	10	11		
16	8.3	8.2	162	164	127	133	35	31	44	46	13	12	23.0	24.5
17	8.1	7.8	206	176	154	124	52	52	50	43	20	17		
18	8.1	7.9	218	180	161	129	57	51	51	47	22	15	22.0	26.0
19	8.1	8.0	206	186	151	134	55	52	49	45	20	18	22.0	26.5
20	8.1	7.8	202	194	144	138	58	56	46	44	21	20	23.5	28.5
21	8.1	8.0	190	188	135	135	55	53	46	45	18	18	21.0	25.5
22	8.2	8.2	150	154	126	136	24	18	49	51	7	6	22.0	25.0
23	8.1	8.0	150	158	123	128	27	30	49	52	7	7		
24	8.0	8.0	156	154	130	125	26	29	47	46	9	9		
25	8.2	8.0	154	150	128	125	26	25	47	49	9	7		
26	8.0	8.0	158	156	133	129	25	27	50	51	8	7		
27	8.1	8.1	178	170	130	124	48	46	43	42	17	16	20.0	24.5
28	8.1	7.9	182	180	124	123	58	57	48	46	15	16	19.0	23.5
29														
30														
31														
Avg.	8.1	8.0	174.5	167.1	132.9	126.3	41.6	40.8	47.9	46.2	13.2	12.6	21.5	25.3
Max	8.3	8.2	218.0	194.0	161.0	138.0	66.0	59.0	59.0	54.0	22.0	20.0	23.5	28.5
Min.	8.0	7.8	148.0	144.0	121.0	115.0	24.0	18.0	39.0	38.0	7.0	6.0	19.0	23.5

MONTH/YEAR **February 2021**

FLUORIDATION AND CHLORINATION

		Fluoride Analysis			Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	mg/L	PPD	mg/L	PPD	mg/L	PPD	mg/L	Demand	Free	Total
E													mg/L	mg/l	mg/l
1	0.47	0.34	0.50		0	0.00	147	2.83	20	0.39	167	3.40	1.36	1.88	2.04
2	0.57	0.34	0.62		0	0.00	150	2.85	69	1.31	219	4.21	1.39	2.65	2.82
3	0.76	0.35	0.57	0.47	0	0.00	153	3.04	51	1.01	204	3.81	1.18	2.47	2.63
4	0.57	0.31	0.66		0	0.00	156	2.85	28	0.51	184	3.78	1.83	1.78	1.95
5	0.50	0.24	0.70		0	0.00	172	2.90	25	0.42	197	3.12	1.34	1.53	1.78
6	0.42	0.32	0.71		0	0.00	175	2.68	29	0.44	204	4.27	2.32	1.84	1.95
7	0.73	0.21	0.69		0	0.00	168	2.86	30	0.51	198	3.41	1.38	1.79	2.03
8	0.58	0.11	0.61		0	0.00	149	3.00	53	1.07	202	3.21	1.62	1.43	1.59
9	0.50	0.20	0.64		0	0.00	186	2.99	37	0.59	223	3.08	1.14	1.79	1.94
10	0.60	0.25	0.70	0.56	0	0.00	189	3.03	34	0.54	223	4.59	2.31	2.06	2.28
11	0.55	0.39	0.65		0	0.00	176	2.94	29	0.48	205	3.37	1.10	2.16	2.27
12	0.57	0.34	0.69		0	0.00	195	2.99	46	0.71	241	4.60	2.55	1.95	2.05
13	0.66	0.39	0.76		0	0.00	160	2.97	22	0.41	182	3.57	1.57	1.78	2.00
14	0.56	0.33	0.77		0	0.00	153	2.91	25	0.48	178	3.02	1.22	1.62	1.80
15	0.30				0	0.00	256	2.74	16	0.17	272	4.72	2.89	1.59	1.83
16	0.40	0.37	0.73		0	0.00	250	2.97	39	0.46	289	5.29	3.17	1.97	2.12
17	0.74	0.38	0.62		0	0.00	214	3.09	41	0.59	255	3.83	1.89	1.78	1.94
18	0.61	0.29	0.73	0.82	0	0.00	150	3.08	23	0.47	173	3.42	1.37	1.89	2.05
19	0.56	0.08	0.74		0	0.00	198	3.06	32	0.50	230	3.71	1.64	1.91	2.07
20	0.60	0.44	0.78		0	0.00	196	2.99	73	1.11	269	3.85	1.54	2.15	2.31
21	0.57	0.43	0.83		0	0.00	189	2.86	35	0.53	224	3.18	0.92	2.09	2.26
22	0.54	0.35	0.81		0	0.00	195	2.67	45	0.62	240	3.32	0.83	2.18	2.49
23	0.43	0.44	0.90		0	0.00	199	2.60	40	0.52	239	3.12	0.88	2.04	2.24
24	0.54	0.38	0.85	0.70	0	0.00	198	2.61	46	0.61	244	3.08	0.72	2.08	2.36
25	0.49	0.48	0.76		0	0.00	228	2.69	48	0.57	276	3.40	1.09	2.04	2.31
26	0.57	0.49	0.83		0	0.00	205	2.72	47	0.62	252	3.21	0.92	2.08	2.29
27	0.61	0.44	0.81		0	0.00	194	2.69	37	0.51	231	3.32	1.38	1.78	1.94
28	0.50	0.49	0.90		0	0.00	222	2.64	37	0.44	259	2.95	1.06	1.74	1.89
29															
30															
31															
Avg.	0.55	0.34	0.72	0.64	0.00	0.00	186.54	2.87	37.75	0.59	224.29	3.64	1.52	1.93	2.12
Max	0.76	0.49	0.90	0.82	0.00	0.00	256.00	3.09	73.00	1.31	289.00	5.29	3.17	2.65	2.82
Min.	0.30	0.08	0.50	0.47	0.00	0.00	147.00	2.60	16.00	0.17	167.00	2.95	0.72	1.43	1.59

WSSN 0600 CITY OF BENTON HARBOR PAGE 5

MONTH/YEAR **February 2021**

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	PLANT TAP		Standard Plate Count		Raw	Tap
D	No. of	Colilert			TEMP.	TEMP.
A	Samples	P/A			'C	'C
T			Raw	Tap		
E						
1	1	A	36	0	2	3.0
2	1	A	36	0	2	3.5
3	1	A	33	0	2	3.5
4	1	A	24	0	2	3.5
5	1	A	39	0	2	4.0
6	1	A	14	0	3	4.0
7	1	A	21	10	3	4.5
8	1	A	19	0	1	3.5
9	1	A	16	0	2	2.5
10	1	A	23	0	2	3.0
11	1	A	29	1	2	3.0
12	1	A	30	0	2	3.0
13	1	A	36	0	2	3.0
14	1	A	12	0	2	3.0
15	1	A	22	1	2	3.0
16	1	A	37	0	2	3.5
17	1	A	27	0	1	2.0
18	1	A	54	0	2	2.5
19	1	A	48	0	2	2.0
20	1	A	47	0	2	2.0
21	1	A	66	0	1	2.0
22	1	A	56	0	2	3.0
23	1	A	40	0	2	3.5
24	1	A	18	0	2	3.0
25	1	A	17	1	2	3.5
26	1	A	15	0	2	3.0
27	1	A	21	0	2	2.0
28	1	A	43	0	2	2.5
29						
30						
31						
AVG.	1	A	31	0	2	3
Max			66	10	3	5
Min			12	0	1	2

WSSN 0600 CITY OF BENTON HARBOR PAGE 6

MONTH/YEAR **February 2021**

Distrubution Flow and Corrosion Treatment

	Ortho P System					Distrubution flow and Corrosion Treatment			
D	City Hall	Wolfs	Bait Shed	Sunny Spot	B&Z				
A	Ortho P	Ortho P	Ortho P	Ortho P	Ortho P	High Lift		PO4	Ortho P
T	Residual	Residual	Residual	Residual	Residual	To	Lbs PO4	Treatment	Residual
E	mg/L	mg/L	mg/L	mg/L	mg/L	Distribution		mg/L	mg/L
1						0.4466	83	7.33	3.15
2						0.4774	84	7.00	3.10
3	2.98	3.22	3.05	3.04	3.17	0.4928	85	6.82	3.15
4						0.4774	94	7.75	3.24
5						0.6314	84	5.26	3.17
6						0.4774	90	7.43	3.25
7						0.6160	93	5.95	3.26
8						0.5852	62	4.16	3.06
9						0.7238	71	3.89	3.09
10	2.95	3.19	3.16	3.29	2.87	0.4928	84	6.75	3.17
11						0.5390	74	5.43	2.95
12						0.4466	76	6.71	3.01
13						0.4466	79	7.03	3.22
14						0.5390	75	5.48	3.11
15						0.5082	60	4.70	3.01
16						0.5852	89	6.04	2.71
17						0.7084	58	3.24	2.98
18	2.88	2.54	2.95	2.89	2.75	0.4620	76	6.49	2.88
19						0.6930	80	4.56	2.70
20						0.7392	73	3.89	2.72
21						0.6468	77	4.73	3.04
22						0.6622	97	5.78	2.76
23						0.7546	97	5.07	3.07
24	3.03	3.07	3.02	3.07	2.80	0.7700	120	6.16	3.16
25						0.7700	119	6.12	3.19
26						0.6930	116	6.63	3.19
27						0.7084	114	6.36	3.00
28						0.9086	96	4.20	2.86
29									
30									
31									
Totals						17.0016	2404.5		
AVG.	2.96	3.01	3.05	3.07	2.90	0.6072	85.9	5.69	3.04
Max	3.03	3.22	3.16	3.29	3.17	0.9086	119.8	7.75	3.26
Min	2.88	2.54	2.95	2.89	2.75	0.4466	58.0	3.24	2.70

CITY OF BENTON HARBOR PAGE 7

DISTRIBUTION SYSTEM MONITORING WSSN 0600 February 2021

Chlorine Residual at Bacteriological Monitoring Stations mg/l

	City Hall		Wolf Marine	470 W. Main	Sunny Spot		B&Z
DATE	1	2	3	4	5	6	7
1							
2							
3	1.99		1.93	2.09	1.48		1.33
4							
5							
6							
7							
8							
9							
10	1.60		1.46	1.22	1.74		1.34
11							
12							
13							
14							
15							
16							
17							
18	1.41		1.57	1.94	1.61		1.16
19							
20							
21							
22							
23							
24	1.53		1.30	1.36	1.46		1.37
25							
26							
27							
28							
29							
30							
31							

DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

	Avg.	Max.	Min.
Chlorine Residuals, mg/L	**1.54**	2.09	1.16
Total number of routine distribution samples analyzed	**20**		
Total number of positive routine distribution samples	0		
Total number of routine distribution samples required	10		
Total number of check samples	**0**		
Total number of positive check samples	**0**		

MONTHLY OPERATION REPORT OF
THE CITY OF BENTON HARBOR WATER TREATMENT PLANT

SUPPLY NAME: **CITY OF BENTON HARBOR**

WSSN:600

Operator-in-Charge **George Regan** **F1-S2**

Month/Year **January 2021**

George Regan

Signature of Operator-in-Charge

F1-S2
Water Plant Classification

Berrien
County

Treatment Rate and Filter Data

Maximum Treatment Rate:	1.0925	Million Gallons per Day
Rated Plant Capacity:	12	Million Gallons per Day
Average Filter Run:	180.25	Hours
Average Head Loss:	NA	Feet
Average Filtration Rate:	0.85	Gallons Per Square Feet per Minute
Maximum Filtration Rate:	1.89	Gallons Per Square Feet per Minute
Average Wash Water Use:	0.71%	Percent of Treated Water

Chemical Data

Chlorine on hand:	74740	lb.	Est. supply:	308 days
Primary Coagulant (Alum (Al3+)) on hand:	59573	lb.	Est. supply:	279 days
Cost of All Chemicals per Million Gallons:	$64.51	dollars		
Total Power Cost per Million Gallons:		dollars		

Remarks

	North Filter	South Filter
Number of filter confluence samples > 0.3 NTU:	0	0
Number of filter confluence samples collected:	85	85
Percent of filter confluence samples > 0.3 NTU:	0%	0%
Number of filter confluence samples > 1 NTU	0	0

Did any individual filter exceed:

1.0 NTU in two consecutive measurements taken 15 minutes apart? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

2.0 NTU in two consecutive measurements taken 15 minutes apart for 2 consecutive months? NO
If yes, attach specific filter(s) information and indicate required follow-up status.

Was continuous (every 15 minutes) filter monitoring equipment off-line during the month? NO
If yes, indicate date(s), duration, and individual filter grab sampling frequency on a separate sheet.

Did POE disinfectant residual fall below 0.2 ppm during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Was minimum C*T credit achieved for the entire month? YES
If no, indicate on a separate sheet the date(s) not achieved.

Was continuous POE chlorine residual monitoring equipment off-line during the month? NO
If yes, indicate date(s) and duration on a separate sheet.

Distribution	Total	24.531959	Avg	0.8158492	Max	1.243107	Min	0.673007

George Regan is OIC for final data review only.
Fluoride chemical feed system was off-line from December 18, 2020 to January 24, 2021 due to issues with the transfer pump.
No Plant Tap ortho-phosphorus value was recorded on the bench sheet for January 17, 2021.

WSSN 0600 CITY OF BENTON HARBOR Month/Year **January 2021**

COAGULATION PARAMETERS

	MIL.		ALUM	TURBIDITY UNITS											
D	GAL.	Dry	as Al3+	RAW		Applied	#	FILTERED NORTH		#	FILTERED SOUTH		2 Hour Compliance Periods		
A	TREAT.	Al2(SO3)4	mg/l	Avg.	Max.	Avg.	ample	Avg.	Max.	Samples	Avg.	Max.	# of	#of	#of
T		Pounds											Periods	Periods	Periods
E		Add												>.30NTU	>.30NTU
														North	South
1	0.8300	262.00	1.66	4.20	4.70	1.30	3	0.08	0.09	2	0.08	0.09	4	0	0
2	0.9125	262.00	1.51	6.10	9.50	0.87	3	0.07	0.10	3	0.07	0.08	6	0	0
3	0.8125	249.00	1.61	5.90	8.80	1.00	3	0.08	0.08	3	0.07	0.08	6	0	0
4	0.9025	278.00	1.62	4.10	6.30	1.54	3	0.08	0.10	3	0.10	0.11	6	0	0
5	0.8525	274.00	1.69	4.50	7.70	1.10	3	0.09	0.10	3	0.09	0.09	6	0	0
6	0.7750	225.00	1.86	2.70	3.40	0.99	3	0.08	0.09	3	0.09	0.10	6	0	0
7	0.9550	314.00	1.73	3.40	6.00	0.85	3	0.07	0.08	3	0.08	0.08	6	0	0
8	0.7475	245.00	1.72	3.00	5.00	1.00	3	0.08	0.09	3	0.08	0.09	6	0	0
9	1.0150	323.00	1.67	3.30	3.60	1.20	3	0.07	0.07	3	0.07	0.07	6	0	0
10	0.7400	243.00	1.73	3.50	4.40	1.10	3	0.08	0.08	2	0.09	0.09	4	0	0
11	1.0800	338.00	1.65	4.00	6.60	1.20	3	0.08	0.09	3	0.07	0.08	6	0	0
12	1.0850	349.00	1.69	4.00	6.30	0.97	3	0.08	0.08	3	0.08	0.08	6	0	0
13	1.0925	347.00	1.67	4.20	7.90	1.20	3	0.08	0.08	3	0.08	0.09	6	0	0
14	0.9300	302.00	1.71	2.30	3.30	1.00	3	0.07	0.08	3	0.09	0.10	6	0	0
15	0.7275	240.00	1.74	2.90	5.60	1.10	3	0.08	0.11	3	0.09	0.11	6	0	0
16	0.7700	231.00	1.58	2.40	2.80	0.85	3	0.08	0.08	2	0.08	0.08	4	0	0
17	0.9050	284.00	1.65	2.90	3.40	0.95	3	0.08	0.08	3	0.09	0.11	6	0	0
18	0.8675	291.00	1.76	2.80	5.30	0.82	3	0.08	0.08	3	0.08	0.09	6	0	0
19	0.7700	256.00	1.75	2.50	2.90	0.76	3	0.08	0.09	2	0.08	0.09	4	0	0
20	0.8400	262.00	1.64	3.70	5.00	0.76	3	0.09	0.10	2	0.11	0.12	4	0	0
21	0.8175	249.00	1.60	4.00	4.00	1.00	3	0.08	0.08	2	0.08	0.09	4	0	0
22	0.7900	234.00	1.56	4.90	6.70	1.10	3	0.07	0.07	2	0.08	0.08	4	0	0
23	0.7350	216.00	1.55	6.00	6.20	1.10	3	0.08	0.10	3	0.09	0.11	6	0	0
24	0.7900	246.00	1.64	3.40	5.20	1.40	3	0.08	0.09	3	0.09	0.10	6	0	0
25	0.8850	275.00	1.63	3.60	7.20	0.88	3	0.09	0.10	3	0.08	0.09	6	0	0
26	0.7200	210.00	1.63	4.30	5.60	0.96	3	0.09	0.10	3	0.09	0.12	6	0	0
27	0.8300	273.00	1.73	4.90	9.10	1.00	3	0.08	0.08	3	0.07	0.08	6	0	0
28	0.7800	235.00	1.59	4.90	5.90	0.99	3	0.09	0.09	2	0.07	0.07	4	0	0
29	0.7850	252.00	1.69	5.10	5.90	1.80	3	0.09	0.10	3	0.10	0.12	6	0	0
30	0.7825	228.00	1.53	4.00	5.90	1.30	3	0.08	0.09	3	0.09	0.12	6	0	0
31	0.9300	297.00	1.68	3.30	4.50	1.30	3	0.08	0.09	3	0.08	0.09	6	0	0
Total	26.4550	8290.00					93			85			170	0	0
Avg.	0.8534	267.42	1.66	3.90	5.64	1.08		0.08	0.09		0.08	0.09	Total	Total	Total
Max	1.0925	349.00	1.86	6.10	9.50	1.80		0.09	0.11		0.11	0.12	6	0	0
Min.	0.7200	210.00	1.51	2.30	2.80	0.76		0.07	0.07		0.07	0.07			

CHEMICAL ANALYSES

			Total		Total		Non-Carb.							
			Hardness		Alkalinity		Hardness		Calcium		Magnesium		Chloride	
D	pH		as CaCO3		as CaCO3		as CaCO3		as Ca++		as Mg++		as Cl-	
A			mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
T	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap	Raw	Tap
E	29.	30.	31.	32.	33.	34.	35.	36.	37	38	39	40	41	42
1	8.0	7.9	184	170	153	134	31	36	59	51	9	10		
2	8.1	7.9	178	170	130	126	48	44	43	42	17	16		
3	8.1	8.1	196	178	127	129	69	49	51	45	17	16	21.5	26.5
4	8.0	8.0	218	179	165	132	53	47	52	43	21	17	19.5	24.0
5	8.1	7.9	194	188	143	135	51	53	49	46	17	17	20.5	25.0
6	8.0	8.0	196	192	137	132	59	60	46	47	19	18	20.0	24.5
7	8.1	7.9	196	182	145	129	51	53	46	43	19	18	22.5	25.5
8	8.2	7.9	194	186	137	132	57	54	46	45	19	18		
9	8.1	7.8	152	156	123	136	29	20	45	49	10	8	21.0	25.5
10	8.1	7.9	172	166	143	133	29	33	50	49	12	11		
11	8.2	8.0	198	176	152	126	46	50	41	45	23	16		
12	8.0	7.8	178	192	121	130	57	62	41	46	18	18	19.0	23.5
13	8.0	7.8	192	178	132	122	60	56	46	43	19	17		
14	8.0	8.0	184	174	131	123	53	51	44	42	18	17		
15	8.1	7.9	182	188	127	125	55	63	41	44	19	19	18.0	22.5
16	8.1	8.0	164	156	134	132	30	24	53	48	8	8		
17	8.0	7.9	152	150	131	123	21	27	47	49	8	7	21.5	23.0
18	8.0	7.9	152	150	132	116	20	34	48	51	8	5		
19	8.1	8.0	148	152	119	122	29	30	46	47	8	8		
20	8.2	7.8	142	146	115	117	27	29	47	49	6	6		
21	8.0	8.0	146	144	111	109	35	35	42	42	10	9		
22	8.0	7.8	146	142	105	103	41	39	43	42	9	9		
23	8.1	7.9	168	156	119	98	49	58	43	39	15	15		
24	8.1	8.1	182	178	127	121	55	57	43	40	18	19		
25	8.0	8.0	154	152	86	84	68	68	46	45	10	10	23.0	26.0
26	8.0	7.9	182	172	132	122	50	50	46	45	17	15	19.0	24.0
27	8.0	7.8	176	172	123	120	53	52	42	41	17	17	19.0	24.0
28	8.2	8.2	156	152	125	118	31	34	43	46	12	9		
29	8.1	8.1	150	148	127	122	23	26	43	42	10	10		
30	8.0	8.0	186	176	131	119	55	57	43	42	19	17		
31	8.0	7.9	178	176	128	119	50	57	41	40	18	18	18.5	23.5
Avg.	8.1	7.9	173.9	167.4	129.4	122.3	44.5	45.0	45.8	44.9	14.4	13.3	20.4	24.5
Max	8.2	8.2	218.0	192.0	165.0	136.0	69.0	68.0	59.0	51.0	23.0	19.0	23.0	26.5
Min.	8.0	7.8	142.0	142.0	86.0	84.0	20.0	20.0	41.0	39.0	6.0	5.0	18.0	22.5

MONTH/YEAR **January 2021**

FLUORIDATION AND CHLORINATION

		Fluoride Analysis			Chlorine Application And Chlorine Residual in mg/L										
D	Fluoride		mg/l												
A	Applied				INTAKE		Pre Treat Raw Line		FILTERED		Total NaOCl Use			TAP	
T	as Fmg/l	Raw	Tap	Dist.	PPD	Free	PPD	Free	PPD	Free	PPD	Free	Demand	Free	Total
E						mg/l		mg/l		mg/l		mg/l	mg/L	mg/l	mg/l
1		0.31	0.48		0	0.00	180	3.24	30	0.54	210	4.13	1.69	2.30	2.44
2		0.29	0.45		0	0.00	197	3.22	32	0.52	229	3.68	1.83	1.69	1.85
3		0.36	0.44		0	0.00	164	3.01	23	0.42	187	3.76	1.77	1.84	1.99
4		0.34	0.38		0	0.00	182	3.01	47	0.78	229	3.75	0.64	2.94	3.11
5		0.29	0.41		0	0.00	167	2.92	17	0.30	184	3.45	1.41	1.88	2.04
6		0.28	0.39		0	0.00	161	3.10	33	0.64	194	3.69	1.66	1.88	2.03
7		0.34	0.49		0	0.00	186	2.91	28	0.44	214	3.25	1.33	1.76	1.92
8		0.34	0.44		0	0.00	146	2.92	73	1.46	219	4.70	2.37	2.18	2.33
9		0.36	0.52		0	0.00	195	2.87	26	0.38	221	4.41	2.46	1.74	1.95
10		0.39	0.51		0	0.00	150	3.03	25	0.50	175	3.76	1.72	1.81	2.04
11		0.26	0.46		0	0.00	214	2.96	32	0.44	246	2.95	1.14	1.68	1.81
12		0.29	0.38	0.44	0	0.00	205	2.82	68	0.94	273	4.05	1.61	2.27	2.44
13		0.22	0.42		0	0.00	215	2.94	37	0.51	252	3.50	1.51	1.84	1.99
14		0.30	0.44		0	0.00	177	2.84	29	0.47	206	3.67	1.54	1.97	2.13
15		0.33	0.42		0	0.00	138	2.83	21	0.43	159	3.39	1.48	1.76	1.91
16		0.31	0.42		0	0.00	149	2.89	19	0.37	168	3.73	2.10	1.43	1.63
17		0.33	0.55		0	0.00	180	2.97	16	0.26	196	3.35	1.64	1.44	1.71
18		0.25	0.45		0	0.00	177	3.05	9	0.15	186	3.88	2.15	1.50	1.73
19		0.33	0.49		0	0.00	154	2.99	7	0.14	161	3.10	1.49	1.46	1.61
20		0.38	0.49		0	0.00	167	2.97	20	0.36	187	3.55	1.71	1.70	1.84
21		0.41	0.46		0	0.00	163	2.98	33	0.60	196	3.92	1.74	1.98	2.18
22		0.37	0.52		0	0.00	155	2.93	28	0.53	183	3.79	1.62	2.00	2.17
23		0.27	0.39		0	0.00	155	3.15	32	0.65	187	4.14	2.09	1.90	2.05
24	0.78	0.32	0.48		0	0.00	158	2.99	26	0.49	184	3.21	1.17	1.88	2.04
25	0.68	0.24	0.55		0	0.00	181	3.05	34	0.57	215	3.91	1.59	2.09	2.32
26	0.56	0.30	0.48		0	0.00	146	3.03	89	1.85	235	5.21	1.84	3.20	3.37
27	0.53	0.28	0.50		0	0.00	156	2.81	23	0.41	179	2.91	0.71	2.04	2.20
28	0.62	0.40	0.63	0.43	0	0.00	148	2.83	22	0.42	170	3.20	1.42	1.57	1.78
29	0.60	0.40	0.63		0	0.00	148	2.81	12	0.23	160	2.98	1.31	1.55	1.67
30	0.81	0.28	0.50		0	0.00	153	2.92	29	0.55	182	3.89	2.01	1.73	1.88
31	0.59	0.31	0.54		0	0.00	181	2.91	37	0.59	218	3.80	1.89	1.76	1.91
Avg.	0.65	0.32	0.47	0.44	0.00	0.00	168.90	2.97	30.67	0.54	199.57	3.70	1.62	1.90	2.07
Max	0.81	0.41	0.63	0.44	0.00	0.00	215.00	3.24	89.00	1.85	273.00	5.21	2.46	3.20	3.37
Min.	0.00	0.22	0.38	0.43	0.00	0.00	138.00	2.81	7.00	0.14	159.00	2.91	0.64	1.43	1.61

WSSN 0600 CITY OF BENTON HARBOR PAGE 5

MONTH/YEAR **January 2021**

BACTERIOLOGICAL AND PHYSICAL PARAMETERS

	PLANT TAP		Standard Plate Count		Raw	Tap
D	No. of	Colilert			TEMP.	TEMP.
A	Samples	P/A			'C	'C
T			Raw	Tap		
E						
1	1	A	71	0	4.0	6.0
2	1	A	25	0	3.8	4.5
3	1	A	72	0	3.7	4.5
4	1	A	27	0	3.5	4.5
5	1	A	33	0	3.7	4.5
6	1	A	41	0	3.7	4.5
7	1	A	23	0	3.7	4.5
8	1	A	38	0	3.7	4.5
9	1	A	19	0	5.0	6.0
10	1	A	41	0	4.0	5.0
11	1	A	27	0	3.8	4.5
12	1	A	32	0	3.7	4.5
13	1	A	34	0	3.2	4.5
14	1	A	19	0	3.7	4.5
15	1	A	49	0	3.7	4.5
16	1	A	21	0	4.0	5.0
17	1	A	19	0	4.0	5.0
18	1	A	50	0	4.0	5.5
19	1	A	19	0	4.0	5.0
20	1	A	36	0	4.0	5.5
21	1	A	49	1	3.0	5.0
22	1	A	21	0	3.0	5.0
23	1	A	28	0	2.8	4.0
24	1	A	47	0	3.0	4.0
25	1	A	16	2	3.0	5.0
26	1	A	29	0	2.5	4.0
27	1	A	27	0	2.8	3.5
28	1	A	26	1	2.5	4.0
29	1	A	30	0	3.0	4.0
30	1	A	23	0	2.3	3.5
31	1	A	27	0	2.2	3.0
AVG.	1	A	32	0	3.4	4.5
Max			72	2	5.0	6.0
Min			16	0	2.2	3.0

WSSN 0600 CITY OF BENTON HARBOR PAGE 6

MONTH/YEAR **January 2021**

Distrubution Flow and Corrosion Treatment

	Ortho P System					Distrubution flow and Corrosion Treatment			
D	City Hall	Wolfs	Bait Shed	Sunny Spot	B&Z				
A	Ortho P	Ortho P	Ortho P	Ortho P	Ortho P	High Lift		PO4	Ortho P
T	Residual	Residual	Residual	Residual	Residual	To	Lbs PO4	Treatment	Residual
E	mg/L	mg/L	mg/L	mg/L	mg/L	Distribution		mg/L	mg/L
1						0.7594	78	4.06	3.08
2						0.9294	67	2.85	3.13
3						0.7429	79	4.23	3.12
4						0.9116	79	3.43	3.00
5						0.7955	83	4.13	3.04
6	3.14	3.18	2.71	2.81	2.36	0.7846	86	4.34	3.25
7						0.9844	77	3.08	3.14
8						0.6954	74	4.22	3.03
9						0.7474	84	4.45	3.09
10						0.6940	118	6.75	3.03
11						1.2431	109	3.46	3.28
12	2.96	2.87	2.92	2.41	2.59	1.0063	135	5.33	3.25
13						1.0759	82	3.02	3.19
14						0.8387	89	4.21	2.94
15						0.7010	76	4.25	2.88
16						0.6731	83	4.88	3.16
17						0.8726	77	3.48	
18						0.7159	87	4.82	3.22
19						0.7758	94	4.79	3.24
20	3.20	3.14	3.26	2.89	2.55	0.7861	89	4.45	3.21
21						0.7466	88	4.54	3.24
22						0.7204	83	4.56	3.24
23						0.6743	90	5.30	3.17
24						0.8558	71	3.29	3.11
25						0.8206	68	3.29	3.25
26						0.6730	89	5.26	3.08
27						0.9186	86	3.69	3.09
28	3.29	2.75	3.14	2.85	2.87	0.7928	89	4.43	3.14
29						0.8014	86	4.22	3.27
30						0.6981	89	5.06	3.11
31						0.8565	78	3.61	3.01
Totals						23.1535	2663.3		
AVG.	3.15	2.99	3.01	2.74	2.59	0.7469	85.9	4.25	3.13
Max	3.29	3.18	3.26	2.89	2.87	2.6026	135.4	6.75	3.28
Min	2.96	2.75	2.71	2.41	2.36	0.6730	67.1	2.85	2.88

CITY OF BENTON HARBOR PAGE 7

DISTRIBUTION SYSTEM MONITORING WSSN 0600 January 2021

Chlorine Residual at Bacteriological Monitoring Stations mg/l

	City Hall		Wolf Marine	470 W. Main	Sunny Spot		B&Z
DATE	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
6	1.21		1.65	1.67	1.73		2.20
7							
8							
9							
10							
11							
12	1.56		1.71	1.13	2.20		1.36
13							
14							
15							
16							
17							
18							
19							
20	1.30		1.26	1.22	1.02		1.10
21							
22							
23							
24							
25							
26							
27							
28	1.58		1.76	1.65	2.20		1.35
29							
30							
31							

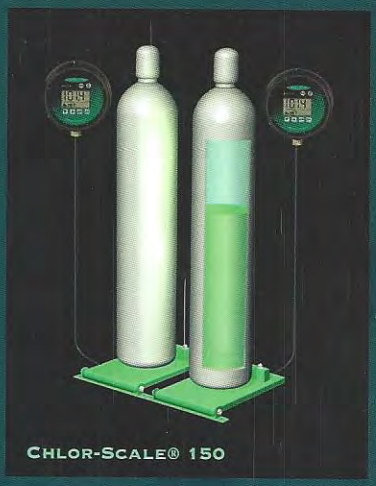
DISTRIBUTION SAMPLES -- BACTERIOLOGICAL SUMMARY

	Avg.	Max.	Min.
Chlorine Residuals, mg/L	1.54	2.20	1.02
Total number of routine distribution samples analyzed	**20**		
Total number of positive routine distribution samples	0		
Total number of routine distribution samples required	**10**		
Total number of check samples	0		
Total number of positive check samples	0		

SOLO® XT WITH CROSS TECHNOLOGY™

BULLETIN 514

BATTERY POWERED DIGITAL WEIGHT INDICATOR



CHLOR-SCALE® 150

CARBOY-SCALE™

PERFORMANCE GUARANTEED 5 YEAR WARRANTY™

- NO AC POWER NEEDED
- 4-20MA OUTPUT FOR REMOTE MONITORING
- LEVEL ALARM OUTPUT RELAY
- LARGE DIGITAL DISPLAY

THE SOLO® XT WEIGHT INDICATOR FROM FORCE FLOW NOW FEATURES KEYPAD CONTROL, BATTERY BACKUP FOR THE 4-20MA OUTPUT MODEL, A BAR GRAPH DISPLAY AND A LEVEL ALARM RELAY. COMBINE THE SOLO XT WITH OUR CHEMICAL MONITORING SCALES TO ACCURATELY TRACK CHEMICAL USAGE AND REMAINING AMOUNTS.

THE SOLO XT USES OUR PROVEN DURABLE HYDRAULIC LOAD CELL FOR WEIGHT SENSING AND HAS A BATTERY POWERED DISPLAY SO NO AC POWER IS REQUIRED. THIS ELIMINATES THE NEED FOR A COSTLY ELECTRICIAN DURING INSTALLATION AND SCALE LIFE IS MAXIMIZED SINCE NO ELECTRONIC COMPONENTS ARE LOCATED ON THE FLOOR.

TWO STANDARD C CELL FLASHLIGHT BATTERIES POWER THE SOLO XT FOR UP TO 4000 HOURS WHEN USED IN CONTINUOUS DISPLAY MODE. IN ORDER TO FURTHER EXTEND BATTERY LIFE, THE LCD DISPLAY CAN BE ACTIVATED BY THE ON/OFF BUTTON. ONCE ACTIVATED, THE DISPLAY AUTOMATICALLY POWERS DOWN AFTER A USER SELECTED AMOUNT OF TIME OR CAN BE INSTANTLY SHUT OFF BY PRESSING THE BUTTON AGAIN. IN THIS DISPLAY-ON-DEMAND™ MODE, THE BATTERIES WILL LAST UP TO THREE YEARS. THE DISPLAY ON THE 4-20MA MODEL REMAINS ON CONTINUOUSLY, POWERED BY THE 12 TO 36 VOLT DC LOOP WITH THE BATTERIES ACTING AS AN AUTOMATIC BACKUP IF LOOP POWER IS UNAVAILABLE.

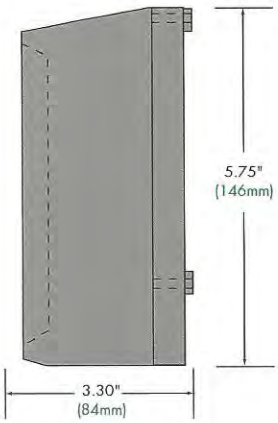
THE SOLO XT CAN BE USED WITH MOST FORCE FLOW SCALES AND CAN EASILY REPLACE AN EXISTING CENTURY HYDRAULIC DIAL TO CREATE A DIGITAL SCALE SYSTEM.

FORCE FLOW®

WWW.FORCEFLOW.COM

BULLETIN 514

SOLO® XT WEIGHT INDICATOR WITH CROSS TECHNOLOGY™



DIMENSIONS: INCHES (MILLIMETERS) SEE BULLETINS 204, 205 & 512 FOR PLATFORM DIMENSIONS

SOLO XT – BATTERY POWERED

MODEL NUMBER		DESCRIPTION
STANDARD	**METRIC**	
CYLINDER SCALES		
XT150-1	XT100K-1	SINGLE CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT150-2	XT100K-2	DUAL CYLINDER SCALE FOR 150 LB. CHLORINE & SO2 CYLINDERS
XT400AS	XT200KAS	SINGLE CYLINDER SCALE FOR 150 LB. AMMONIA CYLINDERS

CARBOY-SCALES™		CAPACITY	TANK DIAMETER	PLATFORM MATERIAL
XT200	XT100K	200 LB (100KG)	8"-16" (200-400MM)	PVC W/ TUF-COAT™
XT400	XT200K	400 LB (200KG)	14"-19" (355-485MM)	PVC W/ TUF-COAT™
XT600	XT300K	600 LB (300KG)	18"-24" (460-610MM)	PVC W/ TUF-COAT™
DRUMM-SCALE™				
XT10DS	XT5KDS	1000 LBS (500 KG)	18"-24" (460-610MM)	WELDED STEEL W/ TUF-COAT™

4-20MA OUTPUT MODELS

LOOP POWERED W/ BATTERY BACKUP
ADD THE LETTERS "MA" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT600MA

LEVEL ALARM RELAY MODELS

INCLUDES 4-20MA OUTPUT & BATTERY BACKUP
ADD THE LETTERS "MAR" TO THE END OF THE MODEL NUMBERS ABOVE. EXAMPLE: XT150-1MAR

THE SOLO-XT CAN ALSO BE USED WITH CHEM-SCALES TO MONITOR LARGER DAY TANKS AND CHLOR-SCALES FOR CHLORINE TON CONTAINERS. CONTACT FACTORY FOR MODEL NUMBERS.

TECHNICAL DATA

CHANNELS
- ONE

RESOLUTION
- USER SELECTABLE: 0.1 OR 1.0

POWER
- TWO (2) C CELL BATTERIES

ENCLOSURE
- NEMA 4X POLYPROPYLENE

INPUT
- HYDRAULIC LOAD CELL

DISPLAY
- 0.8" CHARACTERS
- 5 DIGIT
- NET WT, TARE WT, GROSS WT, BAR GRAPH

TARE ADJUSTMENT
- ENTER TARE WT OR ENTER NET WT

OUTPUTS
- 4-20MA FOR REMOTE MONITORING
- 1.0A LEVEL ALARM OR SETPOINT RELAY

TYPICAL SPECIFICATION FOR DIGITAL SCALE

A QUANTITY OF _____ SCALES (CYLINDER, CARBOY OR DRUM) SHALL BE PROVIDED AND SHALL BE OF THE DIGITAL READOUT/HYDRAULIC LOAD CELL TYPE. FOR REDUNDANCY, EACH WEIGHING PLATFORM SHALL HAVE A SOLE AND SEPARATE WEIGHT INDICATOR WITH NO SHARED INTERNAL COMPONENTS. SCALE PLATFORM COATING SYSTEM SHALL BE A MINIMUM DRY THICKNESS OF 80 MILS AND BE RESISTANT TO MOISTURE, CHEMICALS, ABRASION, IMPACT AND UV LIGHT. SCALE SHALL BE OF THE SINGLE HYDRAULIC LOAD CELL DESIGN. LOAD CELL SHALL BE OF THE TEMPERATURE STABLE, ROLLING DIAPHRAGM TYPE. FLEXIBLE TUBING SHALL CONNECT LOAD CELL TO INDICATOR TO ALLOW EASY REMOTE INSTALLATION OF THE DIGITAL INDICATOR. TUBING LENGTH SHALL BE _____ FT. (METERS) (6' CARBOY/CYLINDER OR 5' DRUM STANDARD) IN LENGTH.

INDICATOR SHALL UTILIZE CROSS TECHNOLOGY™ TO CONVERT THE HYDRAULIC LOAD CELL SIGNAL INTO A DIGITALLY DISPLAYED WEIGHT VALUE. INDICATOR SHALL BE BATTERY OPERATED AND SHALL NOT RELY ON ANY TYPE OF EXTERNAL POWER FOR DISPLAY OPERATION. BATTERIES SHALL PROVIDE APPROXIMATELY 4000 HOURS OF DISPLAY TIME. INDICATOR SHALL BE HOUSED IN A NEMA 4X ENCLOSURE WITH 6 FUNCTION KEYS FOR INDICATOR OPERATION. NET WEIGHT SHALL BE DISPLAYED IN TWO WAYS: A NUMERICAL DISPLAY WITH .81 INCH HIGH CHARACTERS AND AN ANALOG 0-100% BAR GRAPH DISPLAY. A THIRD DISPLAY LINE SHALL PROMPT THE USER THROUGH ROUTINE USER OPERATIONS.

USER SHALL BE ABLE TO SET THE NET WEIGHT EITHER BY SCROLLING IN THE NET CHEMICAL WEIGHT, OR SCROLLING IN THE TANK TARE WEIGHT. A MENU KEY SHALL PROVIDE ACCESS TO THE FOLLOWING 5 FUNCTIONS: 1) ZERO INDICATOR, 2) SET BAR GRAPH & 4-20 MA CAPACITY, 3) SET DISPLAY AUTO-OFF TIME, 4) SET ALARM RELAY VALUES AND 5) SET DECIMAL POINT.

FULL SCALE ACCURACY SHALL BE BETTER THAN 1%. SCALE SHALL HAVE TUF-COAT™ COATING SYSTEM AND SOLO® XT DIGITAL DISPLAY INDICATOR, MODEL XT_____ AS MANUFACTURED BY FORCE FLOW, 1150-D BURNETT AVENUE, CONCORD, CA 94520 USA (WWW.FORCEFLOW.COM), OR EQUAL.

TYPICAL SPECIFICATIONS, DRAWINGS AND BROCHURES CAN BE DOWNLOADED FROM OUR EXTENSIVE WEBSITE AT
WWW.FORCEFLOW.COM

4-20 MA ANALOG OUTPUT

INDICATOR SHALL HAVE A LOOP-POWERED (12-36 VOLTS DC BY OTHERS) 4-20 MA OUTPUT PROPORTIONAL TO NET WEIGHT. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

LEVEL ALARM RELAY

INDICATOR SHALL HAVE A 1.0 AMP LEVEL ALARM SET POINT THAT CAN BE CONFIGURED FOR EITHER A HIGH OR LOW LEVEL ALARM CONDITION. AN 18 INCH FLYING LEAD SHALL BE PROVIDED FOR TERMINATION IN A USER SUPPLIED JUNCTION BOX.

SCALE SHALL CARRY A FULL FIVE (5) YEAR WARRANTY. "LIMITED" WARRANTIES SHALL BE CONSIDERED UNACCEPTABLE.

FORCE FLOW®

SPECIFICATIONS

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