



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
SAGINAW BAY DISTRICT OFFICE



C. HEIDI GREYER  
DIRECTOR

August 11, 2017

**SIGNIFICANT DEFICIENCY  
VIOLATION NOTICE**

Mr. Sylvester Jones, Administrator  
City of Flint  
1101 South Saginaw Street  
Flint, Michigan 48502

Dear Mr. Jones:

SUBJECT: Water System Sanitary Survey, WSSN: 2310  
Significant Deficiency Violation Notice

The Department of Environmental Quality (DEQ) has completed a sanitary survey of the city of Flint (City) drinking water system. The purpose of the survey is to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). In addition, the enclosed sanitary survey form was updated to gather information on the City water distribution, storage, pumping, and limited treatment systems. The sanitary survey does not include an evaluation of the water filtration plant. A complete engineering evaluation of the water filtration plant was recently completed by CDM Smith and others, and would form the basis of any future recommendations if the City elects to operate the water filtration plant.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	<b>Significant Deficiencies noted</b>
Treatment	Recommendations made
Distribution System	<b>Significant Deficiencies noted</b>
Finished Water Storage	<b>Deficiencies noted</b>
Pumps	Recommendations made
Monitoring & Reporting	Recommendations made
Management & Operations	<b>Significant Deficiencies noted</b>
Operator Compliance	<b>Deficiencies noted</b>
Security	<b>Deficiencies noted</b>
Financial	<b>Significant Deficiencies noted</b>
Other	---

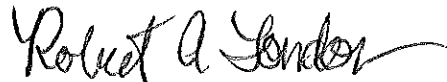
A summary of the significant deficiencies, minor deficiencies, and recommendations applicable to your water system is enclosed for your information.

Our investigation is considered complete. This significant deficiency begins as of the date of receipt of this letter and will continue until you complete corrective action. **You must complete corrective action within 120 days of receipt of this letter or be in compliance with a corrective action plan and schedule approved by this office. You are directed to contact us within 30 days of receipt of this letter to discuss appropriate corrective action.** You must also notify us in writing within 30 days of correcting the significant deficiency.

If you have any factual information you would like us to consider regarding the significant deficiencies identified in this Significant Deficiency Violation Notice please provide it in a written response by September 8, 2017.

If you have any questions or wish to discuss the sanitary survey or Significant Deficiency Violation Notice, please contact me at the phone number listed below or by email to londonr@michigan.gov.

Sincerely,



Robert A. London, P.E.  
Surface Water Treatment Engineer  
Engineering Unit  
Drinking Water and Municipal Assistance Division  
989-450-7834

bl/snh

Enclosures

cc/enc: Mr. Robert Jones, F&V Operations

Mr. Mark Adas, City of Flint

Mr. Rob Bincsik, City of Flint

cc: Mr. Eric Oswald, DEQ

Ms. Sue Maul, DEQ

1. **Source** – The city has failed to select a long-term water supply source (**significant deficiency**). In a June 15, 2017 letter from Director C. Heidi Grether, the city was directed by the DEQ to either enter into the long-term water service agreement negotiated by Mayor Karen W. Weaver with the Great Lakes Water Authority (GLWA), or offer a reasonable alternative proposal by June 26, 2017 that was protective of public health. The city's failure to do so resulted in legal action by the DEQ. The lack of a long-term source agreement has prevented the city from moving forward with several important initiatives, including infrastructure improvements, establishing water rates, securing outside funding for critical projects, ensuring reliable delivery of drinking water, and recruiting/hiring water department staff.
2. **Source** – An evaluation of the reliability of utility power and the need for an on-site emergency generator should be completed (**recommendation**). It is noted that, although the city currently purchases treated water from the GLWA, additional treatment is required at the city's Control Station II (CS-II).
3. **Treatment** – Additional features should be added to the treatment system currently in operation at CS-II to enhance treatment reliability and consistency, as well as operator safety (**recommendation**). The current treatment system was designed to be temporary in nature until a final water source decision was made, and therefore does not have standard features such as scales (for determining the weight of chemical feed). It is recommended that, if the city selects the GLWA as its long-term, primary water source, an upgraded chemical feed and storage facility should be constructed. The facility should include adequate safety features and a SCADA control system that is capable of monitoring incoming water quality from the GLWA, water quality after the city's supplemental chemical feed, flow rates, and chemical feed rates.
4. **Distribution System** – The city's cross connection control program is not being implemented in a satisfactory manner (**significant deficiency**). A cross connection is a piping arrangement where contaminated water may enter the potable water supply. A water utility is required to implement a program, including inspections and testing of backflow prevention devices, to protect the public water supply. The person responsible for implementing the program has reportedly been assigned other duties and has not conducted the required inspections for at least the last three years. Adequate staff time and resources must be allocated to this essential program.
5. **Distribution System** – The city has not provided details about maintenance and replacement programs and/or Standard Operating Procedures for hydrants, valves, meters, and galvanized service lines (**significant deficiency**). The Distribution System Optimization Study being completed by Arcadis Group should address some or all of these concerns. Under normal circumstances, a community water system should consider replacing 1.5 to 2 percent of its fire hydrants and valves, and 1 to 1.5 percent of its water mains each year. Unfortunately, in the past, the city has fallen far short of these recommended replacement rates. During the past few years, the city has implemented an aggressive hydrant and valve program, which has significantly improved distribution system reliability. Also, the city has applied for funding assistance for a major water main replacement program. Despite the city's recent increase in hydrant and valve maintenance and replacement activities, a significant amount

- of infrastructure replacement/upgrade will be necessary for the city to be completely aligned with industry best practices.
6. **Distribution System** – The city should plan financially for periodic updates of the General Plan, Asset Management Plan, and Capital Improvement Plan (**recommendation**). These documents assist the city with planning and prioritizing infrastructure improvements. The current version of these documents is being completed with the assistance of the DEQ and/or State contractors. Future updates will be the responsibility of the city.
  7. **Distribution System** – The city's Drinking Water Revolving Fund (DWRF) Project Plan cites water age and the presence of oversized water mains as contributors to water quality concerns in the distribution system. The city's water system was designed for much higher population and demands than exist currently. The design of future water main replacement projects should strongly consider water age/water main sizing (**recommendation**).
  8. **Storage** – The Cedar Street Reservoir requires an inspection; however, it cannot reasonably be inspected until the West Side Reservoir is returned to service (**minor deficiency**). Because there is uncertainty about the long-term need for the West Side Reservoir (due to water age concerns), the city has removed it from service indefinitely. Unfortunately, this prevents the city from conducting a thorough inspection of the Cedar Street Reservoir.
  9. **Storage** – A backup power supply should be provided for the Cedar Street Reservoir booster pumps (**recommendation**). Routine use of the Cedar Street Reservoir is necessary to manage water quality throughout the distribution system, and the reservoir also serves as an emergency supply of treated water in the event the supply from the GLWA is interrupted. To improve system reliability, backup power should be provided.
  10. **Pumps** – Upgrades to the Torrey Road and Cedar Street booster pumps should be completed (**recommendation**). Replacement pumps have been purchased for Torrey Road but not installed. Variable Frequency Drive (VFD) controls have been recommended for the Cedar Street pumps to reduce pressure fluctuations and water main breaks in the distribution system.
  11. **Monitoring and Reporting** – The city should begin planning financially for staff to complete all monitoring and reporting requirements (**recommendation**). Lead and copper monitoring, and preparation of the Consumer Confidence Report, have been completed with assistance from DEQ staff. The city will be fully responsible for these tasks in the future.
  12. **System Management and Operations** – The city has failed to select a long-term water source (**significant deficiency**), which has prevented several important water system initiatives from occurring. The DEQ does not have confidence that the city can continue to demonstrate the Technical, Managerial, and Financial (TMF) capacity necessary to consistently operate the water system in accordance with Act 399 after the current technical and training assistance contracts expire.
  13. **Operator Compliance** – The treatment system is currently under the supervision of a contract operations firm. The city has been unable to recruit and retain a properly-certified operator-in-charge, and is also having difficulty reaching desired staffing levels. Staffing problems (**minor deficiency**) are due, in part, to uncertainty about the city's long-term source and treatment requirements.

14. **Security** – The city has not provided an updated Emergency Response Plan (*minor deficiency*) for DEQ review. Significant changes have occurred since the plan was last reviewed.
15. **Financial** – The DEQ previously notified the city that continued failure to enter into a long-term water service agreement with GLWA or offer a reasonable alternative proposal would place the city in further financial stress. The city's failure to do so has affected the budgeting process, planning, and development of appropriate water rates (*significant deficiency*). The city should adopt an appropriate rate structure and administrative policies for the water system. The recommendations of the Flint Water Interagency Coordinating Committee (FWICC) should be used as a guideline.

Community Water Supply Section  
Engineering Unit  
Phone: 989-450-7834  
Fax: 989-891-9213

WSSN: 02310

## Drinking Water and Municipal Assistance Division

# Water System Sanitary Survey

## City of Flint Water System

(Distribution System, Limited Treatment, Storage, and Pumping)

August 7, 2017



**Sanitary Survey of Community Water Supply - Review Summary**

Water Supply: City of Flint  
 County: Genesee  
 Evaluator: Bob London

WSSN: 02310  
 District: 92  
 Date: 8/7/2017

Category	Comment	N/A	NotEv	NoD/R	Rec	Def	SigDef
<b>Source</b>							X
Construction & Maintenance	No long-term decision on primary/backup sources						X
Standby Power	Appropriate level of standby power is dependent on source selection				X		
Isolation	No concerns with current GLWA or potential KWA/GCDC sources			X			
Source Water Protection	No formal source water protection program, but no concerns			X			
Capacity	Lack of decision on source affects planning, finances, staffing, etc.						X
<b>Treatment</b>	Survey does not include filtration facilities (use is to be determined)				X		
Disinfection	Permanent facilities and improved SCADA if GLWA water used				X		
Fluoride		X					
Phosphate Addition	Permanent facilities and improved SCADA if GLWA water used				X		
Softening		X					
Iron/Manganese Removal		X					
Arsenic Removal		X					
Pretreatment		X					
Filtration (gravity or membranes)		X					
C*T		X					
Other	Permanent facilities and improved SCADA if GLWA water used				X		
<b>Distribution System</b>							X
Interconnections w/ Other WS	A mutual aid agreement is recommended with nearby utilities				X		
Hydrants & Valves	Recent efforts very good, but formal long-term program needed						X
Service Lines & Metering	Programs for meter and galvanized service replacement are needed						X
General Plan	Prepared through State contract - City needs to assume responsibility				X		
Cross Connections	No inspections conducted, inadequate administration						X
Construction & Maintenance	Age of system, water accountability, number of breaks						X
Capacity	Water age is a concern due to oversized mains/reduced demands				X		
<b>Finished Water Storage</b>	Does not include Dort Reservoir and CWH4 (use is to be determined)					X	
Construction & Maintenance	Cedar St. needs inspection, West Side off line due to condition					X	
Controls				X			
Capacity	Backup Power rec. at Cedar Street; Arcadis evaluating volumes				X		
<b>Pumps (All Pumping Facilities)</b>	Does not include pumps at water plant site (use is to be determined)				X		
Construction & Maintenance	Torrey Road pump upgrade has been delayed				X		
Controls	Electrical gear/control upgrades recommended/VFDs recommended				X		
Capacity				X			
<b>Monitoring &amp; Reporting</b>					X		
Bacteriological Monitoring				X			
Chemical Monitoring	Completed with State assistance - City needs to assume responsibility			X	X		
MOR or Annual Pumpage Report				X			
Consumer Confidence Report	Prepared with State assistance - City needs to assume responsibility			X	X		
Analytical Capabilities				X			
<b>System Management &amp; Operation</b>							X
Owner Responsibility	Lack of decision on source affects planning, finances, staffing, etc.						X
Capacity Development	Concerns with long-term source, budget, staffing/cert., plans/studies					X	
Reliability Study	Prepared with State assistance - City needs to assume responsibility				X		
Operations Oversight	Treatment - contract w/F&V Operation; Distribution - in-house staff			X			
Permits							
<b>Operator Compliance</b>						X	
Operator Certification	Difficulty hiring/retaining certified operators					X	
Technical Knowledge & Training	Training				X		
<b>Security</b>						X	
Emergency Response Plan	Status of ERP is unknown					X	
Site Security (Fences, Alarms...)				X			
<b>Financial</b>							X
Rates	Raftelis Study predicts a revenue vs. expenses gap				X		
Budget & Capital Imp. Plan	Lack of decision on source affects budget, planning, financing						X
<b>Other</b>							

N/A - Not Applicable  
 Rec - Recommendations Made

NotEv - Not Evaluated  
 Def - Deficiencies Identified

NoD/R - No Deficiencies/Recommendations Made  
 SigDef - Significant Deficiencies Identified

# WATER SYSTEM SANITARY SURVEY

## GENERAL

Basic Information					
WSSN:	02310	Supply:	City of Flint	County:	Genesee
Date:	8/7/2017	Reviewed by:	Bob London	District:	RAL/North
Primary Contact:	Sylvester Jones		Copy To:	Mark Adas	
SDWIS Role:	AC, FC		SDWIS Role:		
Title:	City Administrator		Title:	City Engineer	
Telephone:	810-766-7346 x 2025		Telephone:		
Cell Phone:			Cell Phone:	810-610-7771	
Fax:			Fax:		
e-mail:	sjones@cityofflint.com		e-mail:	madas@cityofflint.com	
Address:	1101 S. Saginaw Street Flint, MI 48502		Address:	1101 S. Saginaw Street Flint, MI 48502	
Population:	98,310	Year:	2015	Basis:	Census update

## Operator Training and Certification - Treatment

Treatment Capacity:	18 MGD			
Treatment Classification:	D-1			
Operator in Charge:	Robert Jones (F&V Operations)	Certification	D-1, F-2, S-1	Op. # 5026
Backup Operators:	Catherine Garnham (F&V)		F-1, S-1	5194
	Stewart Beach (F&V)		F-1, S-1	2273
Operations Supervisor:	Vacant			
Operations Foreman (4):	Scott Dungee		F-3, S-4	5550
	Chris Wilcox		F-4	18586
	Dominic Smoot		D-3	20034
	Vacant			
Operator/Maintainer (4):	Scott Ball		F-4	18394
	Jeff Maksymowski		None	20033
	Josh Pickett		None	
	Robert Stinson		None	
Maintenance Supv. (2):	Mike Beckley		F-4, S-4	13782
	Chris Koryciak		F-4, S-4	4653
Maintainer/Operator (2):	Vacant			
	Vacant			
Instrument Technician:	Vacant			
Lab Supervisor:	Will Bradley		F-3	11941
Lab Technicians:	Heather Kot		D-4	20031
	Vacant			
Do the operators receive adequate technical training?			Yes	
If not, explain:				

### Comments on Training and Certification:

The City entered into a contractual agreement with Fleis and Vandenbrink Operations (F&V) for Operator-In-Charge and Certified Backup Operator services for the treatment system on June 22, 2017. F&V is responsible for providing training and certification of contract operations staff.

The City is investigating a contract service agreement with Hach for analytical equipment maintenance due to the vacant Instrument Technician position. The instrument technician at the wastewater plant may also be available to provide limited assistance.

The State of Michigan has entered into several agreements for training and technical assistance for City of Flint personnel, and has provided training on several occasions at the water treatment plant for City personnel. A comprehensive list of training is contained in Appendix A. The City is responsible for providing adequate training in the future to maintain a competent and properly-certified staff.



# WATER SYSTEM SANITARY SURVEY

## GENERAL

Operator Training and Certification - Distribution				
Distribution Classification:	S-1	Certification	Op. #	Exp. Date
Operator In Charge:	Robert Bincsik	F-4, S-1	13784	1/15/2020
Backup Operator:				
Water Dist. Formen:	Howard Swickard	S-2	5091	1/15/2019
	Paul Simpson	S-2	4849	1/15/2018
	Jeff Church	S-3	12559	4/15/2020
	Curtis Brooks	None		
Senior Water Dist. Operators:	Jason Bradley	None		
	Dave Hurt	None	17277	
	Rich Johnson	None		
	Jeremy Keefer	None	16060	
	Chris Kennedy	None		
	Phil Kuczera	None		
	Brandon McNiel	None		
	Jon Mochty	None		
	Mark Pavwoski	None	13288	
	Keith Ross	None		
	Juan Sattiewhite	None		
	Don Thompson	None		
	Dan Wells	None	18922	
Water Dist. Operators:	Clarence Scott	None		
	Greg Sumner	None		
	Fabian Villareal	None		
	Nancy Prieur	None		
	Lester Muma	None	14567	
Water Dist. Op. Trainee:	Marc Arter	None		
	Jason Gutierrez	None		
	Ben Gutierrez	None	4366	
	Mark May	None		
	Vacant (8 positions)			
Do the operators receive adequate technical training?		Yes		
If not, explain:				

**Comments on Training and Certification:**

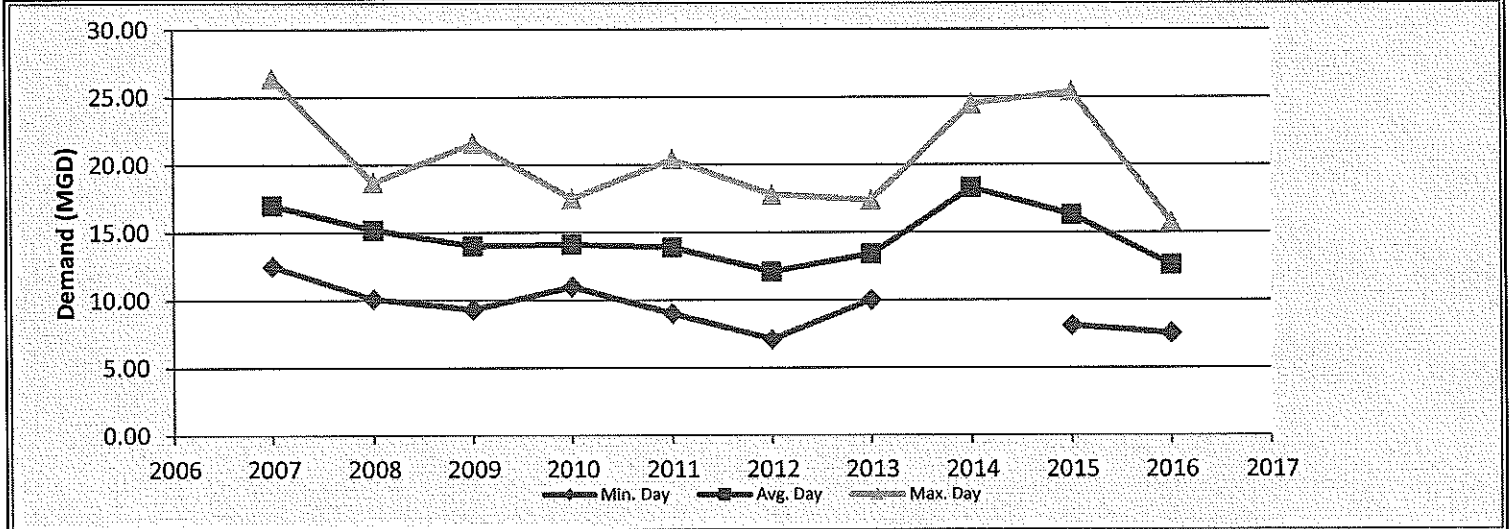
The State of Michigan has entered into several agreements for training and technical assistance for City of Flint personnel, and has provided training on several occasions at the water treatment plant for City personnel. A comprehensive list of training is contained in Appendix A. The City is responsible for providing adequate training in the future to maintain a competent and properly-certified staff.

### Ownership

Ownership:	City
Consent Agreement:	NA
Escrow Account:	NA
Annual Fee:	Active
Comments:	

**SOURCE**

Capacity									
Year	Demand (MGD)					Max/Avg	Population History	G/C/D	% unacct.H <sub>2</sub> O
	Max. Day	Date	Avg. Day	Min. Day	Date				
2007	26.4		17.0	12.50		1.55			
2008	18.7		15.2	10.10		1.23			
2009	21.6		14.0	9.30		1.54			
2010	17.5		14.1	11.00		1.24			43%
2011	20.4		13.9	9.00		1.47			39%
2012	17.8		12.1	7.10		1.47			40%
2013	17.4		13.4	10.00		1.30			50%
2014	24.5		18.3			Data from 2014/2015 includes WTP operation. Do not use for capacity determination.			
2015	25.4		16.3	8.10					
2016	15.8		12.6	7.54		1.25			



Five Year Max. Day	17.8	(Excludes 2014 and 2015, which reflects WTP operation)
Ten year Max. Day	26.4	
Five Year Avg. Day	12.7	(Excludes 2014 and 2015, which reflects WTP operation)
Max Day for capacity requirements:	18.0	(Based on original raw water contract with KWA and anticipated reduction in lost water from DWRf project)

**Purchase Contract**

Principal Parties of Contract:	GLWA, City of Flint	
Date of Contract:	10/16/2015	
Expiration Date:	9 months from execution, but extendable based on circumstances The contract was officially extended July 11, 2016	
Annual Volume Available by Contract:	593,000	Mcf (= 4.436 Bgal)
Maximum Day Available by Contract:	21.4	MGD
Maximum Hour Available by Contract:	22.4	MGD measured over one hour
Maximum Delivery Pressure Cited in Contract:	60	PSI
Minimum Delivery Pressure Cited in Contract:	40	PSI

**Comments on the Purchase Contract:**  
 A short-term agreement was reached with the Great Lakes Water Authority (GLWA) in 2015 to allow the City of Flint to discontinue routine use of its water treatment plant. The agreement with GLWA was based on the previous agreement with the Detroit Water and Sewerage Department (DWSD). The agreement was set to expire within 9 months of execution, but included provisions to extend it as necessary based on local circumstances. A 30-year purchase agreement was proposed by GLWA, but Flint City Council has not approved it as of the date of this survey. The City was required to approve the proposed agreement or propose a reasonable alternative that was protective of public health by June 26, 2017, and failed to do so. The DEQ has determined that the City's failure to act presents an immediate threat to public health. The City does not have a secure, long-term source agreement at this time.

# STORAGE

## Ground Level Storage - Construction, Controls & Maintenance

	Dort Reservoir	Clearwell No. 4
Identification	Water Treatment Plant	Water Treatment Plant
Location	Finished Water Storage	High Service Pump
Function	(currently off line but is intended for routine use)	Suction
Type	Concrete, 2-cell	Concrete
Nominal Volume (Gallons)	20,000,000	3,000,000
Calculated Usable Volume (Gallons)		
Date Constructed	1952	1954
Date Inspected		
Buried/At Grade	At grade	Buried
Floor Slab, Elevation		
Floor Relief Valves-Float Prevention (Y/N)		
Sump Area (Y/N)		
Floor Slopes to Sump (Y/N)		
Sump Floor Elevation		
Sump Dimensions		
Date Painted/Coated Inside		
Paint/Coating System		
NSF Std 61 Compliant (Y/N)		
Cathodic Protection		
Leaks (Y/N)		
Reservoir Isolation Valve		
Basin Drain (Hydrant/Pumps)		
High Alarm		
Low Alarm		
Alarm Type		
Normal High Water Level		
Normal Low Water level		
Range of Operation		
Chart recorder		
Telemetry System	Wireless/SCADA	Wireless/SCADA
Vents Screened		
Overflow Screened		
Access Hatches Locked		
Hatches Watertight and Overlap		
Overflow Splash Pad		
Site Fenced/Locked	Locked - at WTP	Locked - at WTP
Usable Storage	0	0

Comments on Ground Level Storage: At present, and as GLWA water is currently being received, the City is not capable of using the Dort Reservoir or Clearwell No. 4. A thorough inspection, and completion of any necessary maintenance/repairs, would be necessary before returning these reservoirs to service.

## STORAGE

Ground Level Storage - Construction, Controls & Maintenance		
Identification	Cedar Street Reservoir	West Side Reservoir
Location	Cedar St./Fenton Rd.	Dupont St./Jean Ave.
Function	Distribution Storage	Distribution Storage
Type	Concrete, 2-cell	Concrete, 2-cell
Nominal Volume (Gallons)	20,000,000	12,000,000
Calculated Usable Volume (Gallons)	14,000,000	0 (off line at this time)
Date Constructed	1948	1970
Date Inspected	~2000	2017
Buried/At Grade	At grade	At grade
Floor Slab, Elevation		
Floor Relief Valves-Float Prevention (Y/N)		
Sump Area (Y/N)		
Floor Slopes to Sump (Y/N)		
Sump Floor Elevation		
Sump Dimensions		
Date Painted/Coated Inside	N/A (concrete)	N/A (concrete)
Paint/Coating System	---	---
NSF Std 61 Compliant (Y/N)	---	---
Cathodic Protection	No	No
Leaks (Y/N)	No	Yes
Reservoir Isolation Valve	Yes	Yes
Basin Drain (Hydrant/Pumps)		
High Alarm	Yes	Yes
Low Alarm	Yes	Yes
Alarm Type	Noted on SCADA	Noted on SCADA
Normal High Water Level	20'	
Normal Low Water level	6'/16' (summer/winter)	
Range of Operation	Depends on season	Depends on season
Chart recorder	SCADA at WTP	SCADA at WTP
Telemetry System	Wireless/SCADA	Wireless/SCADA
Vents Screened	Yes	Yes
Overflow Screened		Yes
Access Hatches Locked		Yes
Hatches Watertight and Overlap	Yes	
Overflow Splash Pad	Storm drain w/air gap	Storm drain w/air gap
Site Fenced/Locked	Yes	Yes
Usable Storage	14,000,000	0

### Comments on Ground Level Storage:

The West Side Reservoir (WSR) was inspected in 2017. The reservoir was shut down several months ago due to a leaking link seal/coupling through the wall on the influent line. The inspection report recommends approximately \$90,000 of miscellaneous repairs such as brick work and tuck pointing, repainting of pipes and metal surfaces, replacement of downspouts, replacement of the influent line link seal, etc., to prevent the reservoir from deteriorating. There were no other major structural or sanitary concerns. The Arcadis Group will be providing a recommendation on the long-term need for the WSR. Until that recommendation is received, the City will not make a decision on whether to proceed with the repairs. The City has experienced a significant drop in the number of water main breaks since the West Side Reservoir was removed from service. Several sources have recommended that Soft Starts or VFDs be installed on the West Side booster pumps to reduce or eliminate pressure spikes within the distribution system, which may be related to main breaks.

**STORAGE**

Elevated Storage - Construction, Controls & Maintenance				
Location	WTP (elevated)			
SDWIS Facility ID (Site Code)				
Volume	2,000,000			
Type	Elevated, multi-leg			
Material	Steel			
O.F. Elevation				
Date Constructed	1952			
Date Inspected	2009			
Date Painted Inside	2009			
Paint System				
NSF Std 61 Compliant (Y/N)	Yes			
Date Painted Outside				
Cathodic Protection	Yes			
Tank Isolation Valve	Yes			
Tank Drain (Hydrant)	Yes			
Altitude Valve	Yes			
Mud Valve	Yes			
High Alarm	Yes			
Low Alarm	Yes			
Alarms Received By	Operations center			
Total Head Range (Feet)				
Normal High Water Level				
Normal Low Water level				
Normal/Average Pressure	74			
Data Recording System	SCADA			
Control Signal Type	Wireless/SCADA			
Auxiliary Power for Controls?				
Control System Adequate?	Yes			
Vents Screened				
Overflow Screened				
Access Hatches Locked				
Expansion Collar Lubricated				
Mixing System	None			
Overflow Splash Pad				
Adequate Security?	Yes - at WTP			
Operator Visit Frequency	Daily - at WTP			
Comments:				

Total Usable Storage Capacity - Ground + Elevated				
Usable Storage	2,000,000			
Total Usable Storage (gal)	16,000,000	16.0	Mgal	
Total Usable Storage/Max Day	61%			
Total Usable Storage/Avg. Day	126%			
Comments:				

# Pumping

Pumping Stations - Construction, Controls & Maintenance					
Location:	Pump Station 4 (Water Treatment Plant)				
Function:	Pumping water from the Dort Reservoir and the 3 MG reservoir to the Distribution System				
Pump Number	1	2	7	8	9
Year Installed					
Type	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.
Current Capacity (MGD)	0	0	20	20	6
Current Capacity (GPM)	0	0			
Basis	Inoperable	Inoperable			
Current TDH (FT)					
HP	800	1000	800	800	
Original Name Plate GPM					
Corresponding MGD					
Original Name Plate TDH (FT)					
Pump NPSH (FT)					
Centerline of Pump Intake Elev.					
Floor Elevation					
Electrical Controls Elevation					
Pumps/Motors Subject to Flood?					
Pump Efficiency					
Motor Efficiency					
Min. Reservoir WL					
Cavitation Problems (Y/N)					
VFDs (Y/N)					
Maintenance History	Refer to next page for maintenance history of pumps and motors				
<p>Comments on Booster Pumping:            A number of improvements would be required if the water plant is returned to operation or if the City elects to routinely use the Dort Reservoir. The improvements are included in the CDM Smith Engineering Report on the Water Treatment Plant.</p>					
<b>AUXILIARY POWER</b>					
Power Type	Dual primary feeds with auto-transfer				
Fuel Type	Starting Frequency				
Capacity (gpm)	Load Testing Frequency				
Total Pump Capacity (gpm)					mgd
Firm Pump Capacity (gpm)					mgd
Auxiliary Power Capacity (gpm)					mgd
Max Day Demand @ this location					mgd
Peak Hour @ this location					gpm (Hydropneumatic Stations)
Avg Day Demand @ this location					mgd
Firm Pump Capacity/Max Day					%
Peak Hour/Firm Pumping Capacity					% (Hydropneumatic Stations)
Aux. Power Capacity/Avg Day					%
<p>Comments:            Dual primary electrical feeds are not truly independent. If routine use of Control Station 4 is desired, on-site auxiliary power is recommended.</p>					

**Pumping**

**Pumping Stations - Construction, Controls & Maintenance**

Location: Pump Station 4 (Water Treatment Plant)  
Function: Pumping water from the Dort Reservoir and the 3 MG reservoir  
to the Distribution System

Pump Station 4 Pump 1	Pump Station 4 Pump 2	Pump Station 4 Pump 7	Pump Station 4 Pump 8	Pump Station 4 Pump 9
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## Pumping

Pumping Stations - Construction, Controls & Maintenance						
Location:	Cedar Street Reservoir					
Function:	Pump from the Cedar Street Reservoir to supply the south and west areas of the City					
Pump Number	1	2	3			
Year Installed	1948	1948	1948			
Type	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.			
Current Capacity (MGD)						
Current Capacity (GPM)	12	9	9			
Basis						
Current TDH (FT)	160'	160'	160'			
HP	500	350	350			
Original Name Plate GPM						
Corresponding MGD						
Original Name Plate TDH (FT)						
Pump NPSH (FT)						
Centerline of Pump Intake Elev.						
Floor Elevation						
Electrical Controls Elevation						
Pumps/Motors Subject to Flood?	No	No	No			
Pump Efficiency						
Motor Efficiency						
Min. Reservoir WL						
Cavitation Problems (Y/N)						
VFDs (Y/N)	No	No	No			
Maintenance History	Refer to next page for maintenance history of pumps and motors					
<p>Comments on Booster Pumping:            Some electrical components are from the 1940's and an upgrade is needed. SCADA improvements and switchgear replacement were recently completed. A permit was issued in 2012 to upgrade the pumping station to accept a portable generator feed, but the work was not completed. The pumps are controlled remotely from the Operations Center at the water plant. Filling and emptying the Cedar Street and West Side Reservoirs is controlled by Operations staff to manage flow patterns, pressures, chlorine residuals, and water age.</p>						
<b>AUXILIARY POWER</b>						
Power Type	None					
Fuel Type	Starting Frequency _____					
Capacity (gpm)	Load Testing Frequency _____					
Total Pump Capacity (gpm)	_____ mgd					
Firm Pump Capacity (gpm)	_____ mgd					
Auxiliary Power Capacity (gpm)	_____ mgd					
Max Day Demand @ this location	_____ mgd					
Peak Hour @ this location	_____ gpm (Hydropneumatic Stations)					
Avg Day Demand @ this location	_____ mgd					
Firm Pump Capacity/Max Day	_____ %					
Peak Hour/Firm Pumping Capacity	_____ % (Hydropneumatic Stations)					
Aux. Power Capacity/Avg Day	_____ %					
Comments:	In case of interruption of the GLWA supply, the Cedar Street Reservoir and booster pumping station is currently the primary source of water. Auxiliary power or, as a minimum, portable generator compatibility is strongly recommended.					



**Pumping**

**Pumping Stations - Construction, Controls & Maintenance**

Location: Cedar Street Reservoir  
 Function: Pump from the Cedar Street Reservoir to supply the south and west areas of the City

Pumps and motors are on a routine Preventive Maintenance (PM) schedule consisting of visual inspection, checking oil levels, and greasing bearings and fittings. On an as-needed basis, oil is changed, packing is adjusted, bearings are replaced, etc. Recent, non-routine work is shown below:

Cedar Street Station Pump 1	Cedar Street Station Pump 2	Cedar Street Station Pump 3
<b>10/30/13</b> - installed new pump bearings and packing, rebalanced impeller	<b>2/1/10</b> - rebuilt motor	
<b>12/5/16</b> - serviced discharge valve control cylinder	<b>1/26/16</b> - uncoupled pump and motor for motor testing	
	<b>11/16/16</b> - tested switchgear and recoupled pump and motor	
	<b>12/5/16</b> - serviced discharge valve control cylinder, placed pump back in service	

# TREATMENT

## Disinfection (sodium hypochlorite addition)

Point of Treatment	Cedar St. Booster Sta.		
Injection Point:	Reservoir inlet line		
SDWIS Facility ID (Site Code)			
Purpose:	See comments		
Year Initiated	2016		
Product:	Havasan LB-12		
Manufacturer:	Haviland		
Chemical Strength:	14-15% (12.5% nominal)		
Dilution:	N/A		
ANSI/NSF Standard 60 Approval? (Y/N)	Yes	NSF max dose:	84 mg/L
Normal Feed Rate/Dosage	See comments		
Avg Residual (Plant Tap) (mg/L)	free: 1.5		(goal)
Avg Distribution Residual (mg/L)	free:		
Frequency of Residual testing	Plant Tap: Continuous	Distribution:	Weekly
Analytical Method Used	Hach CL-17 (DPD)		

Any Overfeed Instances? (Y/N)	No	Date(s):	
Any Low Feed Instances? (Y/N)	No	Date(s):	

Pump Type:	Diaphragm	Model:	LMI C721-71FS
Number of Pumps:	1		
Pump Capacity	4 gph	gpd min:	
	psi: 100		
Chemical Storage Tank Type	55 gallon drums	Volume:	
Weight/Level Reading Method	None (relies on expected usage and visual inspection)		

### SAFETY

Separate Room	Yes	Cylinder Repair Kit	N/A
Exhaust fan		Extra Chlorinator or repair kit	N/A
Fresh Air Vent		Ammonia Bottle	N/A
Door Opens Out With Panic Bar		Self Contained Air Packs	N/A
More than 1500 # Cl <sub>2</sub> onsite	N/A	Training Programs	
Electrical Protected from Gas?	N/A	Shower/Eye Wash	

### Comments:

The free chlorine residual of water entering and leaving the Cedar Street Reservoir (CSR) is monitored continuously and is visible on the SCADA display in the Operations Center. Chlorine is added to the water when filling the CSR as appropriate to help meet the City's distribution system free chlorine residual goals. As of July 11, 2017, the chlorine feed system has flow-pacing capability, which will reduce the operational burden on City staff.

**Pumping**

Pumping Stations - Construction, Controls & Maintenance					
Location:	West Side Reservoir				
Function:	Pump from the West Side Reservoir to supply areas on the west side of the City during peak demand periods				
Pump Number	1	2	3	4	
Year Installed	1970	1970	1970	1970	
Type	VT	VT	VT	VT	
Current Capacity (MGD)	4	4	8	8	
Current Capacity (GPM)					
Basis					
Current TDH (FT)					
HP	100	100	200	200	
Original Name Plate GPM					
Corresponding MGD					
Original Name Plate TDH (FT)	142'	142'	142'	142'	
Pump NPSH (FT)					
Centerline of Pump Intake Elev.					
Floor Elevation					
Electrical Controls Elevation					
Pumps/Motors Subject to Flood?					
Pump Efficiency					
Motor Efficiency					
Min. Reservoir WL					
Cavitation Problems (Y/N)					
VFDs (Y/N)					
Maintenance History	Refer to next page for maintenance history of pumps and motors				
<p>Comments on Booster Pumping: The City has experienced a significant significant drop in the number of water main breaks since the West Side Reservoir was removed from service. Several sources have suggested that Soft Starts or VFDs be installed on the West Side booster pumps to reduce or eliminate pressure spikes within the distribution system, which may be related to main breaks.</p>					
<b>AUXILIARY POWER</b>					
Power Type	None				
Fuel Type		Starting Frequency			
Capacity (gpm)		Load Testing Frequency			
Total Pump Capacity (gpm)				mgd	
Firm Pump Capacity (gpm)				mgd	
Auxiliary Power Capacity (gpm)				mgd	
Max Day Demand @ this location				mgd	
Peak Hour @ this location				gpm (Hydropneumatic Stations)	
Avg Day Demand @ this location				mgd	
Firm Pump Capacity/Max Day				%	
Peak Hour/Firm Pumping Capacity				% (Hydropneumatic Stations)	
Aux. Power Capacity/Avg Day				%	
Comments:					

**Pumping**

**Pumping Stations - Construction, Controls & Maintenance**

Location: West Side Reservoir  
 Function: Pump from the West Side reservoir to supply area of the west side of the City during peak demand periods

Pumps and motors are on a routine Preventive Maintenance (PM) schedule consisting of visual inspection, checking oil levels, and greasing bearings and fittings. On an as-needed basis, oil is changed, packing is adjusted, bearings are replaced, etc. Recent, non-routine work is shown below:

West Side Station Pump 1	West Side Station Pump 2	West Side Station Pump 3	West Side Station Pump 4
6/7/05 - replaced motor bearings	9/1/11 - replaced upper and lower motor bearings	4/28/15 - rebuilt discharge valve control cylinder	5/26/16 - replaced 4-way valve
	4/9/12 - rebuilt motor, installed new upper shaft and coupling		

**TREATMENT**

**Disinfection (sodium hypochlorite addition)**

Point of Treatment	West Side Booster Sta.		
Injection Point:	_____		
SDWIS Facility ID (Site Code)	_____		
Purpose:	See comments		
Year Initiated	2016		
Product:	NaOCl		
Manufacturer:	~14-15%		
Chemical Strength:	_____		
Dilution:	NA		
ANSI/NSF Standard 60 Approval? (Y/N)	Yes	NSF max dose:	84 mg/L
Normal Feed Rate/Dosage	mg/L		
Avg Plant Tap Residual (mg/L)	total: _____	free: _____	
Avg Distribution Residual (mg/L)	total: _____	free: _____	
Frequency of Residual testing	Plant Tap: _____	Distribution: _____	
Analytical Method Used	_____		
Instrument:	_____		
Any Overfeed Instances? (Y/N)	No	Date(s): _____	
Any Low Feed Instances? (Y/N)	No	Date(s): _____	
Pump Type:	_____		
Number of Pumps:	_____		
Pump Capacity	gpd max: _____	gpd min: _____	
	psi: _____		
Chemical Storage Tank Type	_____		
Weight/Level Reading Method	_____		
		Volume: 220 gallons	

**SAFETY**

Separate Room	No	Cylinder Repair Kit	NA
Exhaust fan	No	Extra Chlorinator or repair kit	NA
Fresh Air Vent	No	Ammonia Bottle	NA
Door Opens Out With Panic Bar	Roll-up door	Self Contained Air Packs	NA
More than 1500 # Cl <sub>2</sub> onsite	NA	Training Programs	NA
Electrical Protected from Gas?	NA	Shower/Eye Wash	Eye wash

Comments:

## Pumping

Booster Pumping Stations - Construction, Controls & Maintenance						
Location:	Torrey Road Booster Station					
Function:	Boost pressure to the southwest portion of the City, including the Hospital area					
Pump Number	1	2				
Year Installed	1954	1954				
Type						
Current Capacity (MGD)						
Current Capacity (GPM)						
Basis						
Current TDH (FT)						
HP	40	125				
Original Name Plate GPM						
Corresponding MGD	2.8	4				
Original Name Plate TDH (FT)	65'	100'				
Pump NPSH (FT)						
Centerline of Pump Intake Elev.						
Floor Elevation						
Electrical Controls Elevation						
Pumps/Motors Subject to Flood?						
Pump Efficiency						
Motor Efficiency						
Min. Reservoir WL						
Cavitation Problems (Y/N)						
VFDs (Y/N)	No	No				
Maintenance History	Refer to next page for maintenance history of pumps and motors					
<p>Comments on Booster Pumping:            Permit 120173 was issued in 2012 for significant upgrades to the Torrey Road Booster Station. Electrical upgrades have been completed. New pumps were purchased but were not installed as planned. The City will reportedly move forward with pump installation in the near future.</p>						
<b>AUXILIARY POWER</b>						
Power Type	None	Power Rating (kWh)				
Fuel Type		Starting Frequency				
Capacity (gpm)		Load Testing Frequency				
Total Pump Capacity (gpm)						mgd
Firm Pump Capacity (gpm)						mgd
Auxiliary Power Capacity (gpm)						mgd
Max Day Demand @ this location						mgd
Peak Hour @ this location						gpm (Hydropneumatic Stations)
Avg Day Demand @ this location						mgd
Firm Pump Capacity/Max Day						%
Peak Hour/Firm Pumping Capacity						% (Hydropneumatic Stations)
Aux. Power Capacity/Avg Day						%
Comments:						

**Pumping**

**Booster Pumping Stations - Construction, Controls & Maintenance**

Location: Torrey Road Booster Pumping Station  
Function: Boost pressure to the southwest portion of the City, including the Hospital area

Pumps and motors are on a routine Preventive Maintenance (PM) schedule consisting of visual inspection, checking oil levels, and greasing bearings and fittings. On an as-needed basis, oil is changed, packing is adjusted, bearings are replaced, etc. Recent, non-routine work is shown below:

Torrey Road Station 2000 gpm pump	Torrey Road Station

**DISTRIBUTION**

**Interconnections with Other Supplies**

Is water purchased from other supplies? \_\_\_\_\_  
 If yes, list WSSN number (s): \_\_\_\_\_  
 No. of Emergency Connections: \_\_\_\_\_

Location	Main Size	Capacity	Metered?	Status (Regular/Emergency)	WSSN of Connection
----------	-----------	----------	----------	-------------------------------	-----------------------

Are valves at the interconnections exercised annually? \_\_\_\_\_  
 Are the interconnected mains routinely flushed? \_\_\_\_\_

Comments: Water is sold to the City of Flint by the Great Lakes Water Authority (GLWA). Flint is making a decision whether to continue purchasing water from GLWA or to upgrade the water treatment plant and treat raw water purchased from the Karegnondi Water Authority (KWA). Currently, water is transmitted from GLWA to the water plant site, and is master-metered through Control Station 2 (CS-2). At CS-2, the City adds NaOH, orthophosphate, and sodium hypochlorite.

**Distribution Piping**

Mains by Material	
Cast Iron	96.64%
Ductile Iron	2.64%
Steel	0.46%
Concrete	0.22%
Other	0.03%
Galvanized	0.01%

Mains by Size	
2"	0.11%
3"	0.26%
4"	4.47%
6"	51.59%
8"	23.74%
10"	0.59%
12"	8.11%
14"	0.81%
16"	3.52%
18"	1.90%
20"	0.00%
24"	3.88%
30"	0.58%
36"	0.35%
42"	0.06%
48"	0.01%
72"	0.02%

Mains by Date of Installation	
1900 to 1910	3.50%
1911 to 1920	25.90%
1921 to 1930	34.00%
1931 to 1940	6.30%
1941 to 1950	1.20%
1951 to 1960	25.00%
1961 to 1970	2.10%
1971 to 1980	0.30%
1981 to 1990	1.70%
1991 to 2000	0.20%
2001 to Present	10.80%

Estimated percent of piping with coal tar lining \_\_\_\_\_ %  
 Comments:  
 Distribution piping data is taken from the 6/28/16 draft Asset Management Report by Rowe PSC and is based on 3,079,442 feet (583.2 miles) of water main.



**DISTRIBUTION**

**Operational Concerns & Maintenance**

Are there areas where water main breaks are frequent? Yes  
If yes, identify locations: See comments

Comments:

From 2010 - 2013, the City averaged about 155 breaks per year. In 2014 - 2015, which includes the period when the water plant was in full-time operation, the City averaged about 300 breaks per year. There has been a significant reduction in the number of breaks in 2017, which may be related to taking the West Side Reservoir and pumping station off line for inspection (it is believed that surges associated with operation of pumps and valves at West Side are a significant factor in water main breaks).

<u>Year</u>	<u>Number of Breaks</u>
2012	159
2013	153
2014	316
2015	277
2016	138

The City is working toward the Partnership for Safe Water goal of not more than 15 breaks per year per 100 miles of main, which equates to 85-90 breaks per year.

Leak Detection and Condition Assessment:

The City contracted with Echologics LLC in 2015 and 2016 to conduct a leak assessment of the majority of water main in the distribution system and a condition assessment on 24 miles of critical mains (road, railroad, and waterway crossings). A water audit was also completed, GIS data points were collected, and GIS training was provided.

The leak assessment work was divided into standard "listening" at most locations and "correlation" on 15 miles of critical mains. The "listening" portion of the leak assessment identified 82 leaks with an estimated total loss of 327 gpm. The "correlation" portion of the assessment found no confirmed leaks, but identified four "Points of Interest (potential leak sites)" that require further investigation.

The condition assessment found that, of the critical pipes tested, 31% appeared to be in good condition, 15% were in moderate condition, 8% were in poor condition, and 46% did not return a result.

Are there areas where aesthetic water quality complaints are frequent?  
If yes, identify locations: \_\_\_\_\_

Comments:

Operators are currently doing a good job of meeting treatment goals, and there is a significant amount of flushing and other distribution maintenance practices taking place in an attempt to meet distribution system water quality goals; therefore, distribution system water quality is improving. Many members of the public have not regained confidence in the water system, however.

Do you receive complaints alleging illness due to the water? Yes  
If yes, identify locations: \_\_\_\_\_

Comments:

There have been complaints of lead-related and Legionella-related illnesses during and since the water crisis began.

**DISTRIBUTION**

**Operational Concerns & Maintenance**

Are there areas where customers complain of low pressure?          No         

If yes, identify locations: \_\_\_\_\_

Comments: \_\_\_\_\_

What is the procedure to respond to and track these complaints?  
 Comments:  
 There are a number of personal and online resources available to track and address complaints.

**Distribution System Capacity**

Are there areas where peak flows (including fire flow) cannot be maintained?          No         

If yes, identify locations: \_\_\_\_\_

Comments: \_\_\_\_\_

Last ISO report date? \_\_\_\_\_ Rating \_\_\_\_\_

Proposed distribution system improvements (Location and Estimated Completion Date):  
 Several neighborhoods were identified for water main replacement in a 2016 DWRP Project Plan. Proposed work areas were prioritized based on several factors including occupancy, service line material, and break history. The project is in the DWRP Fundable Range, but the City must demonstrate a long-term, secure water source to qualify for funding. If funded, work would begin in 2017 or 2018.

**Distribution System Optimization**

An *Assessment of Current Practices and Gap Analysis Technical Memorandum* is being completed by Arcadis Group. The document compares existing conditions and practices to industry best practices, identifies "gaps" where best practices are not being achieved, and recommends improvements. The evaluation includes water quality integrity, physical integrity, and hydraulic integrity. The completed analysis is expected to provide valuable operational advice.

**DISTRIBUTION**

**Hydrants**

Number of Hydrants	3605	(from 2013 Rowe Reliability Study)
Number Without Auxiliary Shut-Off Valves	_____	
Number that are Self-Draining	_____	
Number of Inoperable Hydrants	See comments	
Frequency of Hydrant inspection:	_____	
Inspection Staff:	_____	
Are there areas where additional hydrants are needed?	_____	
If yes, list locations:	_____	
Hydrant location system	_____	Accurate? _____
Are hydrants color coded for capacity?	No	
Has this information been provided to the fire department?	_____	
Frequency and seasons of hydrant flushing	Annual (fall)	
Purpose of flushing	Maintain water quality	
Is the public notified prior to flushing?	No	
Does flushing follow a specific format?	No, but a UDF program is being developed	
Is the volume of water used during flushing estimated?	No	
Do hydrants receive maintenance painting?	No	
Is a record maintained of hydrant activities?	No	
<i>Hydrant records should include: Hydrant number, location of the hydrant, type of hydrant, size of barrel, size of bottom valve, size of lead, direction of turn, operable or inoperable, auxiliary valve type and size, weep holes plugged or unplugged, condition of hydrant (caps, chains, valve operation, operating nut, leakage &amp; etc.), color coded capacity, flow data (gpm &amp; psi) flushing dates, inspection dates.</i>		
Comments: The City reported approximately 35% of hydrants being inoperable or needing repair. Recent hydrant upgrades are as follows: 2013 - 30 replaced, 11 repaired; 2014 - 12 replaced, 7 repaired; 2015 - 53 replaced, 19 repaired. Recent efforts are very good, but a high percentage still require repair or replacement.		

**Valves**

Number of Valves	8228	(From 2016 Rowe Reliability Study)
Number of inoperable valves	100	(See comments)
Are there areas where additional valves are needed?	_____	
If yes, list locations:	_____	
Valve location system	Map	Accurate? _____
Valve Turning Frequencies	Primary: _____ Others: _____	
Records Maintained?	_____	
<i>Valve records should include: valve number, location of valve(with witness points), type of valve, size of valve, normal operating status (open or closed), condition of valve (operable or inoperable), direction of turn, number of turns, and dates of operation.</i>		
Comments: The City has been aggressively identifying and repairing or replacing inaccessible and inoperable valves. The City has reported that 57 valves were replaced in 2015, 85 were replaced in 2016, and 27 were replaced through March 2017. Valve boxes have been located and cleaned out. According to the Distribution System manager, a 2015 valve study identified 900 inaccessible/inoperable/problem valves, and the City is reporting that it has addressed 800 of those, leaving about 100 in need of maintenance/repair/replacement. The City has applied for DWRF funding to replace a significant amount of water main, which would result in additional valve replacement. Recent efforts are very good; however, continued progress and a long-term plan are still needed.		

**DISTRIBUTION**

**Customer Service Information**

Number of service connections	56,038	(number of parcels in City)
Occupied parcels	43,406	(estimated number currently occupied)
Number of metered service connections		
Percentage of service line materials (all parcels):	Ownership of Service (CWS/Customer)	
Copper 48.0%	From Corp Stop to Curb Stop	City
Galvanized or lead 52.0%	From Curb Stop to Property Line	City
Unknown	From Property Line to Meter	Customer
Other ---	Meter	City

Comments: The City's FAST Start Program conservatively estimates there are 29,100 lead/galvanized service lines needing replacement. Sites with suspected lead/galvanized lines are investigated, and non-copper portions of the lines are replaced. From July 1, 2016 to June 30, 2017, the City replaced 2150 service lines. This represents slightly over 7 percent of all targeted service lines, which meets the EPA's requirement of at least 7 percent replacement each year after a lead action level exceedance.

**CUSTOMER METERS**

Types of meters Used		Detailed information regarding the city's water meters and replacement program was not available at the time of the survey, and therefore the meter program could not be evaluated.
Number of Meters with Remote Reading Devices		
Residential Meter Sizes		
Industrial/Commercial Meter Sizes		
Meter Testing/Maintenance Program		
Average Age of Meter in System		
Criteria for Changeout		
Number or Percent Changeout per Year		
Master Meter Locations		
Calibration of Master Meters		
Meter Reading Staff/Contract:		

Percent of Usage by Customer Type	Large Users - % of Use	
% Residential 80%	McLaren Regional Medical Center	1%
% Other 20%	Genesee County Jail	<1%
	Hurley Medical Center (6th and Begole)	<1%
	Hurley Medical Center (One Hurley Place)	<1%

Comments: General Motors was a former customer that is now purchasing water from Genesee County, but may reconnect to the City's water system. The City is concentrating on the replacement of lead service lines. Approximately 1200 lead lines have been replaced in the last few years.

**Water System Activity**

Year	# of Construction Permits Issued	Permitted Amount of WM Feet
2007	6	16,556
2008	4	2698
2009	4	35,273
2010	3	10,355
2011	1	13,854
2012	2	0
2013	1	31,418
2014	2	0
2015	4	18,100
2016	3	10,300

A detailed breakdown of water main permits by purpose (new vs. replacement) was not available at the time of the survey. A review of records indicates that the majority of these permitted mains are for the replacement of existing mains. Most new main is associated with transmission of raw water. Some permits included here are for pumps, controls, storage, and other improvements.

Comments: Some of the above-permitted main was not constructed.

## DISTRIBUTION

### Water Rates

What is your current rate schedule?	See comments
Are current rates adequate to support O&M and CIPS?	See comments
When was last time rates were adjusted?	2015
Has a water rate study been performed? When?	
Is there a meter charge or ready to serve charge?	Yes
Is a copy of the water rate schedule and ordinance available?	

Comments:

A rate analysis was completed in 2016 by Raftelis Financial Consultants, which indicated a "typical" monthly water bill of \$53.84 for 5 ccf of water consumption. The bill includes commodity charges, operating costs, capital costs, personnel costs, etc. The Raftelis survey identifies the commodity charge portion of a typical bill as \$15.89/month, or \$3.18/ccf (\$4.25/1000 gallons). The Raftelis survey further indicates that the current rate structure is not sufficient to meet future expenses due to a number of factors. The actual future gap between revenue and expenses is dependent on the City's final Source Selection and associated costs. The current rate was established in 2015 through a court decision.

### Repair Parts Inventory

Extra Mains (Sections for Each Size in Service)	
Repair Clamps (2 or more for each size)	
Tees, Crosses & Elbows	
Hydrants	
Valves	
Services (Corp & Curb Stops, Clamps and Lines)	
Other	

Comments:

Information about repair parts and equipment was not available at the time of the survey.

### Safety Programs

Confined Space Entry Program	
Trench Safety Program	

Comments:

Information about the city's safety program was not available at the time of the survey.

## PROGRAM COMPLIANCE

### Cross Connection Program

Ordinance No.	Ch. 46, Art. II, Div. 4	Date:	Various
Approved Program (Y/N)?		Date:	
Staff Assigned to Program, (No., Dept and/or who)			
Is Annual Cross Connection report required (Y/N)?	Yes		
Was previous year's annual report received (Y/N)?	No	Date:	
Was previous year's annual report acceptable (Y/N)?	No		
Inspection Status:	Inactive		
Assembly Testing Frequency		High Hazard:	Low Hazard:
Assembly Testing Performance			
Recordkeeping:			
Private Well Isolation/Abandonment Procedure:			
Comments:	Annual Cross Connection Report forms have not been received for 2015 or 2016. The Cross Connection Inspector has been working primarily on plumbing permits, and inspections are not being completed.		

### Annual Pumpage Report

Is Annual Pumpage Report required (Y/N)?	No	Date:	
Was previous year's annual report received (Y/N)?		Date:	
Comments:			

### Monthly Operation Reports

Are Monthly Operation Reports required (Y/N)?	Yes	Timely?	Yes
Were all previous year's reports received (Y/N)?	Yes		
Are previous year's reports acceptable (Y/N)?	Yes		
If no, describe problems:			
Comments:	The monthly operation report includes water purchased from GLWA, chemicals added at CS-II, water quality data at the water plant tap, and water quality data from the distribution system. Chemical treatment at the Cedar Street and West Side Reservoirs is reported on daily summary reports. Chemical feed data from the reservoirs should be included on the monthly operation reports once it is determined that daily summary reports are no longer required.		

### Consumer Confidence Report

Is the annual CCR required? (Y/N)	Yes	Date:	6/13/2017
Was the previous year's report received? (Y/N)	Yes		
Was the previous year's acceptable? (Y/N)	Yes		
Was the previous year's certification form received? (Y/N)	Due 10/1/17	Date:	
Comments:			

### Emergency Response Plan

Date of ERP	2013	Acceptable?	
Filed where?			
Comments:	The most recent Emergency Response Plan on record with the DEQ is from 2013. The 2013 Sanitary Survey recommended an update Emergency Response Plan due to changes in operations. Since then, significant changes to city and DEQ staffing and operational practices have occurred, and an updated plan is now required. If an updated plan exists, the DEQ should be notified of its availability.		

**PROGRAM COMPLIANCE**

**General Plan**

Date of Most Recent Plan:	Various, up to 2016	
Filed Where?	Part of Rel. Study/Asset Mgt.	Acceptable?
	General Layout	Yes
	Facility locations & capacities	See comments
	Water Main Inventory	Yes
	Identification of Service Areas	In Contract w/GLWA
	Hydraulic Analysis	See comments
	Capital Improvement Plan	In DWRF Project Plan

Comments:  
 There is an existing hydraulic model of the distribution system, but fire flow contours or similar data were not provided. The U.S. EPA is in the process of developing and calibrating a new model. A draft Asset Management report was completed in 2016, which focused on the distribution system only, pending a selection of water source. Facility locations and storage and pumping capacities are included in the Reliability Study. Treatment capacities are available in this Sanitary Survey. A limited Capital Improvement Plan was also completed by Imagine Flint in 2105.

**Reliability Study**

Date of Most Recent Study:	2016	
Filed Where?	City, MDEQ	Acceptable?
Contents:	5 & 20 Year Demand Projections	Yes
	Source Production Totals (Monthly)	
	Customer Supply Usage (Annual)	
	Res/Comm/Ind Usage (Annual)	Residential vs.other
	Water Shortage Response Plan	See comments
	Recommended Improvements	

Comments:  
 The Reliability Study projects a 20 percent population loss between 2015 and 2040, which would further affect the City's ability to raise adequate revenue through water rates. The study includes a detailed water shortage response plan, and water shortage is also addressed in Chapter 46, Article 1 of the City Ordinances. The water shortage response plan may need modification once the long-term and backup supply selection is made.

**Permits**

Applies for and obtains permits prior to construction (Y/N):	Yes	
Reviews plans prior to submittal to DEQ (Y/N):	Yes	
Standard specifications on file at CWS (Y/N):		
If applicable, adheres to contract with supplier regarding plan submittal (Y/N):	See comments	Date: _____
Follows master plan for any construction (Y/N):		
Develops as-built plans (Y/N):		
Updates general plans (Y/N):		

Comments:  
 The water contract with GLWA allows for review and approval of projects related to: new metering facilities, water mains sized 24 inches or larger, pump stations, reservoirs, water towers, and projects in proximity to GLWA facilities. It is not known whether GLWA routinely exercises its right to do so.

## PROGRAM COMPLIANCE

### Capacity Development

Comments on Capacity Development: The EPA has required (in its Administrative Order) that the City must demonstrate adequate Technical, Financial, and Managerial capacity (TMF) prior to switching to another water source (i.e., other than treated water purchased from the Great Lakes Water Authority (GLWA)). The decision whether to continue to purchase water from GLWA, begin treating raw water from the KWA, or select another source has not been finalized. Because the City's source water selection decision is not finalized, it is not known whether a formal TMF demonstration will be required. However, certain aspects of a TMF demonstration are necessary regardless of source selection.

The following components of a TMF capacity assessment warrant further discussion:

#### Technical Capacity:

**1. Source** - a water system must have an adequate quantity of water available to meet demands, either through its own production facilities or secured through contract and capable of delivery from another water system. At this time, the City only has a short-term agreement with GLWA for the purchase of treated water. The DEQ had instructed the City to either approve the long-term agreement with GLWA that was negotiated by Mayor Karen Weaver, or offer a reasonable alternative proposal to provide drinking water from another source, by June 26, 2017. The City has not done so, and therefore does not have satisfactory Technical Capacity with regard to its source.

#### Financial Capacity:

**1. Budget** - a water system must have adequate revenue to operate its water system, including operational costs, personnel costs, capital improvements, and debt retirement. As stated in the Flint Water Rate Analysis by Raffelis, operational costs and staffing levels are highly dependent on the City's final selection of a water source. Raffelis projects a future gap between revenue and expenses, although the analysis was based on routine operation of the City's water plant and other conservative assumptions. The actual future gap, if any, is dependent on source selection, the terms of any water service agreements, efforts to improve water accountability (currently around 50 percent unaccounted), availability of grants and alternative funding sources, relative levels of automation and staffing, water rates, etc. Once the source determination is made, water rates should be reviewed and, if necessary, adjusted to ensure adequate financial capacity with regard to budget. It should be noted that, in addition to other duties, water treatment/operations staff are responsible for operation of five dams on the Flint River. The time and resources needed to manage the dams must be accounted for when developing staffing and budget plans for water treatment/pumping. Also, it has been mentioned that a low pay scale is reportedly contributing to the City's difficulty in recruiting, hiring, and retaining staff.

#### Managerial Capacity:

**1. Maintaining Certified Operators** - a water system must place its treatment and distribution systems under the supervision of properly-certified operators. Operations staff may either be City employees or contractors. The operator currently supervising the distribution system is a City of Flint permanent employee. The operator in charge of the treatment system is a contractor with Fleis & Vandenbrink Operations. The City may attempt to recruit an internal or external candidate to supervise the treatment system.

**2. Sampling Plans** - a water system must prepare sampling plans, and follow the plans when conducting compliance monitoring under the Safe Drinking Water Act. The City's Total Coliform Rule sampling plan must be revised to include an additional five (5) routine sites, with associated repeat sites. The Disinfection Byproducts sampling plan is satisfactory, but may need future revisions based on the Arcadis Group distribution system optimization study. The lead and copper sampling plan is revised as necessary as additional information is obtained regarding service line materials.

**3. Cross Connection Control** - a water system must implement a program for the elimination of cross connections within its distribution system. It appears that due to personnel shortages, adequate time is not being devoted to cross connection control, and inspections and program administration are lacking.

**4. Other Plans and Studies** - a water system must complete other plans and studies as required by the Safe Drinking Water Act. The City completed a draft Reliability Study and a draft Asset Management Plan in 2016. These studies should be finalized. Their contents are used to justify the City's Drinking Water Revolving Fund (DWRF) Project Plan and funding application. Also, an Asset Management Plan, and a 5-year and 20-year Capital Improvement Plan are required components of a Water System General Plan.



**MONITORING**

<b>Bacteriological</b>	
Date of Approved Site Sampling Plan :	2/21/2017
Number of samples required each month:	100 Basis: Population
Certified Lab Used:	City of Flint water plant
MCL, Monitoring or Reporting Violation(s) in past 3 years? (Y/N)	Yes Date: 2014
	Number & Type of Violations 3 MCL violations in 2014
Public Notice Issued according to regulations? (Y/N)	Yes Date: Various
Comments: The RTRC sampling plan was approved on 3/2/17 based on 20 routine sampling sites. Five more potential routine sites, with associated repeat sites, have been identified. The suitability of the sites will be confirmed, and the sampling plan will be expanded to 25 routine sites in the near future.	

<b>Chemical</b>	
Date of Monitoring Schedule:	5/12/2017
MCL, Monitoring or Reporting Violations(s)? (Y/N)	No
Public Notice Issued according to regulations? (Y/N)	NA
Detects for inorganics > 50% of MCL? (Y/N)	No
Detects for VOCs (Y/N)	No
Detects for SOCs (Y/N)	No
DBP Sampling Done According to Approved Plan? (Y/N/Waived)	Yes
Date of Approved Disinfection Byproduct Monitoring Plan:	7/12/2016
Comments: The DBP Monitoring Plan may need to be updated based on the distribution system optimization study (in progress).	

<b>Lead and Copper Monitoring</b>	
No. of Samples Required:	60
Frequency (Semi Annual/Annual/Triennial)	See comments
Exceedance of lead or copper action level (Y/N)	See comments
	If yes, was public education issued? (Y/N) See comments Date: _____
Next Monitoring Period:	1/1/17 - 6/30/17 (final reporting in progress)
Corrosion Control Program Status, if applicable	See comments
Lead service line replacement status, if applicable	Active - see Customer Service Information page of this sanitary survey for details
Comments: The city has collected two consecutive, 6-month rounds of samples (in 2016 and 2017) meeting the lead and copper action levels. The last monitoring period that exceeded the lead action level was January-June 2016. All required responses were completed in response to exceeding the action level. Samples are collected by the City, sentinel teams, and the public, and all valid tier 1 site results are used to calculate the 90th percentile lead and copper concentrations and determine compliance. The city is practicing corrosion control treatment for the incoming water from the GLWA. A corrosion control study is currently being conducted by Cornwell Engineering Group to evaluate current conditions and evaluate future possible situations (continued purchase of finished water from GLWA, purchase of water from Genesee County, treatment of KWA raw water at the Flint Water Plant, and combinations/mixing of those sources).	

<b>Radiological Monitoring</b>	
Date of Monitoring Schedule	Not Required
	Alpha, beta, radium, uranium _____ Date: _____
	Radon _____ Date: _____
	Tritium _____ Date: _____
Detects for Rads > 50% of MCL? (Y/N)	_____ Date: _____
	If yes, list _____ Date: _____
Comments: Radiological monitoring is the responsibility of the wholesale supplier (Great Lakes Water Authority)	

**Analytical Capabilities**

Parameter	Analytical Method(s)	Calibration Frequency	Instruments Used	Method of Data Recording	Frequency of Measurements	Sampling Location	Location for Water Source	Analysis Run by	
Alkalinity	SM 2320B Titration	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Total Hardness	SM 2340C	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Calcium Hardness	SM 3500 Ca D	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
pH	SM 4500 H+B Electrometric	Daily	Hach HQ440d	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
			Hach SL1000 Hach HQ440d		Every 2 Hours Every 2 Hours				CS-II Mini Lab Tap
Conductivity	SM 2510B	Monthly	Mettler Toledo Hach SL1000	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Temperature	SM 2550B	Annually	Grade 1 Thermometer	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Fluoride	SM 4500 F-C ISE	Daily	Hach HQ440d	Manual	Daily Daily	CS-II Lab Tap	GLWA Supply Main In-Plant Piping	Lab staff	
Chlorine Residual		Daily	Hach SL1000	Manual	Twice per day Twice per day Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
			Periodic Checks by Lab Manager	Hach Pocket Colorimeter II	Manual	Every 4 Hours Every 2 Hours	CS-II Mini Lab Tap	GLWA Supply Main In-Plant Piping	Operations staff
				Hach CL-17	Manual Manual	Continuous Continuous	CS-II WTP Basement	GLWA Supply Main In-Plant Piping	Operations staff
Chloride	SM 4500 Cl-B Argentometric	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Turbidity	SM 2130B Nephelometric	Monthly - primary Daily - secondary	Hach 2100 N	Manual	Twice per day Twice per day Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Total Colform	SM 9223 B-04 Colilert	Biannual PE		Manual	Twice per day Twice per day Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
HPC	SM 9215 B IDEXX Simplate	Annual PE		Manual	Weekly Weekly Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	
Iron			Hach DR 3900	M	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff	

**Analytical Capabilities**

Parameter	Analytical Method(s)	Calibration Frequency	Instruments Used	Method of Data Recording	Frequency of Measurements	Sampling Location	Location for Water Source	Analysis Run by
Sulfate			Hach DR 3900	Manual	Daily	Lab Tap	In-Plant Piping	Lab Staff
Phosphate			Hach DR 3900	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTRC Sampling Plan	Lab Staff

**Other Notes/Observations on Laboratory Practices/Capabilities**

1. The lab is certified for Total Coliform, E. Coli, HPC, and fluoride.
2. Based on inspections and conversations between lab staff and DEQ field personnel, lab practices are generally satisfactory. Minor issues brought to the attention of the Lab Manager are addressed promptly.
3. Lab QA/QC appears to be greatly improved under the current Lab Manager, who is working on plans for further improvement.
4. The laboratory balance was last calibrated in December 2016. Scale accuracy is checked monthly using certified weights..
5. The laboratory is successfully running extra performance evaluation/proficiency testing samples each quarter for all parameters being reported to the DEQ/EPA.

# TREATMENT

## Disinfection (sodium hypochlorite addition)

Point of Treatment	Control Station 2	
Injection Point:	42-inch supply main	
SDWIS Facility ID (Site Code)		
Purpose:	See comments	
Year Initiated	2016	
Product:	Havasan LB-12	
Manufacturer:	Haviland	
Chemical Strength:	12%	
Dilution:	NA	
ANSI/NSF Standard 60 Approval? (Y/N)	Yes	NSF max dose: <u>84</u> mg/L
Target Feed Rate/Dosage	1.0 - 1.3	mg/L
Basis for Target Feed Rate	See comments	
Range of Incoming (GLWA) Residual	0.6 - 1.4	mg/L
Range of Plant Tap Free Residual	0.8 - 2.0	mg/L
Range of Distribution System Free Residual	0.2 - 2.0	mg/L
Frequency of residual testing	Incoming: <u>Continuous plus 2 confirmation grabs/day</u>	
	Plant Tap: <u>Continuous plus 2 confirmation grabs/day</u>	
	Distribution: <u>Several per week</u>	
Analytical Method Used:	<u>DPD</u>	
Instrument:	<u>Hach CL-17, Hach SL1000, Hach Pocket Colorimeter</u>	
Any Overfeed Instances? (Y/N)	<u>No</u>	Date(s): _____
Any Low Feed Instances? (Y/N)	<u>No</u>	Date(s): _____
Feed Pumps:		
	Type: <u>Diaphragm</u>	Model: <u>Milton Roy SD46-88P</u>
	Number of Pumps: <u>2</u>	
	Capacity: <u>10 gph each</u>	Discharge Head: <u>150 psi</u>
	Type: <u>Diaphragm</u>	Model: <u>LMI C721-71FS</u>
	Number of Pumps: <u>1</u>	
	Capacity: <u>4 gph</u>	Discharge Head: <u>100 psi</u>
	<u>(Note: this model is no longer manufactured, but repair parts are believed to be readily available)</u>	
Chemical Storage Tank Type	<u>Totes (from supplier)</u>	Volume: <u>220 gallons</u>
Weight/Level Reading Method	<u>Staff gage on tank wall</u>	

Comments on Sodium Hypochlorite Feed: The City purchases treated water from the GLWA, and adds sodium hypochlorite, phosphoric acid, and sodium hydroxide to meet the plant tap free chlorine residual (1.7 mg/l), orthophosphate residual (3.6 mg/l), and pH (7.5 units) goals established by the U.S. EPA's technical team. The incoming, Plant Tap, and Distribution pH ranges shown above are for the period of time when sodium hypochlorite has been fed. The feed pumps now have flow-paced controls to help maintain consistent feed rates.

The existing treatment system was designed and installed as a temporary measure while long-term treatment decisions are being made. Chemical scales may be installed at a later date. An SOP for chemical feed has been developed for both existing (temporary) and future (permanent) treatment at CS-II. Because the City has not selected a long-term water source, final decisions have not been made regarding the future treatment layout at CS-II.

Safety: The sodium hydroxide tote and sodium hypochlorite tote are stored together in a garage structure with air conditioning, a portable eye wash station, and face shield/gloves/PPE.

**TREATMENT**

**Corrosion Inhibitor (phosphoric acid addition)**

Point of Treatment	Control Station 2	
Injection Point:	42-inch supply main	
SDWIS Facility ID (Site Code)		
Purpose:	See comments	
Year Initiated	2015 (December)	
Product	Phosphoric Acid	
Manufacturer:	Brenntag	
Chemical Strength	75%	
Dilution:	None	
ANSI/NSF Standard 60 Approval? (Y/N)	Yes (NSF)	NSF max dose: <u>13</u> mg/L
Target Feed Rate/Dosage	<u>2.4 - 2.7</u>	mg/L
Basis for Target Feed Rate	See comments	
Range of Incoming (GLWA) PO4	<u>1.0 - 2.2</u>	mg/L
Range of Plant Tap PO4	<u>3.5 - 3.9</u>	mg/L
Range of Distribution System PO4	<u>2.9 - 3.9</u>	
Frequency of residual testing	Incoming: <u>Daily</u>	
	Plant Tap: <u>Daily</u>	
	Distribution: <u>Several per week</u>	
Analytical Method Used:	<u>Spectrophotometry</u>	
Instrument:	<u>Hach DR3900</u>	
Any Overfeed Instances? (Y/N)	<u>No</u>	Date(s): _____
Any Low Feed Instances? (Y/N)	<u>No</u>	Date(s): _____
Feed Pumps:	Type: <u>Diaphragm</u>	Model: <u>LMI C921-362SI</u>
	Number of Pumps: <u>2</u>	
	Capacity: <u>4 gph each</u>	Discharge Head: <u>100</u>
Chemical Storage Tank Type	<u>PE Shipping Totes</u>	Volume: <u>220 gallons</u>
Weight/Level Reading Method	<u>Scale markings on tote</u>	

Comments on Phosphoric Acid Feed: The City began feeding phosphoric acid in December 2015 to improve lead corrosion control by re-establishing an orthophosphate scale on lead surfaces within the distribution system/individual plumbing systems. The EPA has established a distribution system orthophosphate residual goal of 3.5 mg/l, and the City appears to be meeting the goal more consistently since May 2017. The incoming, Plant Tap, and Distribution PO4 residual ranges shown above are for the 12-month period covering June 1, 2016 to May 31, 2017.

The existing treatment system was designed and installed as a temporary measure while long-term treatment decisions are being made. Chemical scales may be installed at a later date. An SOP for chemical feed has been developed for both existing (temporary) and future (permanent) treatment at CS-II. Because the City has not selected a long-term water source, final decisions have not been made regarding the future treatment layout at CS-II.

Safety: The phosphoric acid tote is stored in a different bay from the sodium hydroxide and sodium hypochlorite storage/feed area in a garage structure with a portable eye wash station.

# TREATMENT

## pH Adjustment (sodium hydroxide addition)

Point of Treatment	Control Station 2	
Injection Point:	42-inch supply main	
SDWIS Facility ID (Site Code)		
Purpose:	pH adjustment	
Year Initiated	2017 (February)	
Product	Sodium hydroxide	
Manufacturer:	Brenntag	
Chemical Strength	25%	
Dilution:	None	
ANSI/NSF Standard 60 Approval? (Y/N)	Yes (NSF)	NSF max dose: <u>200</u> mg/L
Target Feed Rate/Dosage	<u>2.6</u>	mg/L
Basis for Target Feed Rate	<u>To meet the point-of-entry pH minimum goal of 7.5 units, and the distribution system goal of 7.5 +/- 0.3 units</u>	
Range of Incoming (GLWA) pH	<u>7.18 - 7.47</u>	
Range of Plant Tap pH	<u>7.17 - 7.50</u>	
Range of Distribution System pH	<u>7.14 - 7.59</u>	
Frequency of pH testing	Incoming: <u>Every 2 hours plus daily confirmation grab by lab staff</u>	
	Plant Tap: <u>Every 2 hours plus daily confirmation grab by lab staff</u>	
	Distribution: <u>Several per week</u>	
Analytical Method Used:	<u>Electrode</u>	
Instrument:	<u>Hach HQ440d, Hach SL1000</u>	
Any Overfeed Instances? (Y/N)	<u>No</u>	Date(s): _____
Any Low Feed Instances? (Y/N)	<u>No</u>	Date(s): _____
Feed Pumps:		
	Type: <u>Diaphragm</u>	Model: <u>Milton Roy SD46-88P</u>
	Number of Pumps: <u>2</u>	
	Capacity: <u>10 gph each</u>	Discharge Head: <u>150 psi</u>
	Type: <u>Diaphragm</u>	Model: <u>LMI C721-71FS</u>
	Number of Pumps: <u>1</u>	
	Capacity: <u>4 gph</u>	Discharge Head: <u>100 psi</u>
	<u>(Note: this model is no longer manufactured, but repair parts are believed to be readily available)</u>	
Chemical Storage Tank Type	<u>PE Shipping Totes</u>	Volume: <u>220 gallons</u>
Weight/Level Reading Method	<u>Scale markings on tote</u>	

Comments on Sodium Hydroxide Feed: The City began feeding sodium hydroxide in February 2017 to stabilize pH levels in the distribution system. Beginning in June 2017, the sodium hydroxide dosage was gradually increased to meet the EPA's recommended distribution system pH goal of approximately 7.5 units. The incoming, Plant Tap, and Distribution pH ranges shown above are for the period of time when sodium hydroxide has been fed. The feed pumps now have flow-paced controls to help maintain consistent feed rates.

The existing treatment system was designed and installed as a temporary measure while long-term treatment decisions are being made. Chemical scales may be installed at a later date. An SOP for chemical feed has been developed for both existing (temporary) and future (permanent) treatment at CS-II. Because the City has not selected a long-term water source, final decisions have not been made regarding the future treatment layout at CS-II.

Safety: The sodium hydroxide tote and sodium hypochlorite tote are stored together in a garage structure with air conditioning, a portable eye wash station, and face shield/gloves/PPE.

## TREATMENT

### **Corrosion Control Treatment - General Comments**

As part of the U.S. EPA's Emergency Administrative Order, the City's Optimal Corrosion Control plan must be reviewed and, if necessary, revised. To accomplish this, a contract was awarded to Arcadis Group to complete a Water Distribution System Optimization study, including a Corrosion Control Plan (CCP). The CCP is being completed by Cornwell Engineering Group as a subcontractor to Arcadis Group.

The proposed scope of the CCP (dated 12/19/16) included:

- An evaluation of the existing Flint system (purchase of treated water from Great Lakes Water Authority)
- The potential conversion to Genesee County as water supplier
- A plan for treating KWA raw water at the Flint Water Treatment Plant
- An evaluation of the interface (blending) between two sources of treated water

The DEQ recommended that the scope be flexible enough to consider other scenarios

The final CCP has not been finalized, in part due to delays caused by the City failing to select a permanent water source.

# Appendix A

## Classes offered at the Flint Water Treatment Plant, 2016-2017:

Safe Drinking Water Act Overview: September 27, 28, and 29, 2016 (2 hours each day) – Bryce Feighner (DEQ)

Basic Math and Hydraulics (condensed course): October 18, 19, and 20 (2 hours each day)

– Bob London and Jon Bloemker (DEQ)

Filtration: November 29, 30, and December 1, 2016 (2 hours each day) – Nick Pizzi

Rapid Mix, Flocculation, and Sedimentation: January 10 and 11, 2017 (2 hours each day) – Nick Pizzi

Jar Test Calculations: March 14, 2017 (2 Hours) – Nick Pizzi

Hands-on Jar Testing: March 15, 2017 (2 Hours) – Nick Pizzi

Chemical Feed: April 18, 2017 (2 Hours) – Nick Pizzi

Distribution Math: April 19, 2017 (2 Hours) – Nick Pizzi

Lime Softening Practice Math: April 19, 2017 (2 Hours) – Nick Pizzi

Ion Exchange Practice Math: April 20, 2017 (2 Hours) – Nick Pizzi

Basic Math: July 17, 2017 (2 Hours) – Nick Pizzi

Chemical Feed: July 18, 2017 (2 Hours) – Nick Pizzi