# Addendum to June 2014 Final Remedial Action Plan/Corrective Measures Implementation Plan

## *Warner-Lambert Company LLC Former Manufacturing Facility (MID 006 013 643)*

Prepared for

Pfizer

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# Addendum to June 2014 Final Remedial Action Plan/Corrective Measures Implementation Plan

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# Abbreviations

| | |
|---|---|
| RAP | Remedial action plan |
| CMIP | Corrective measures implementation plan |
| MDEQ | Michigan Department of Environmental Quality |
| EGLE | Michigan Department of Environment, Great Lakes, and Energy |
| GWTS | Groundwater treatment system |
| POTW | Publicly owned treatment works |
| BPW | Holland Board of Public Works |
| HCS | Hydraulic containment system |
| RCRA | Resource Conservation and Recovery Act |
| TSDF | Treatment, storage, and disposal facility |
| U.S. EPA | United States Environmental Protection Agency |
| PCP | Post-closure plan |
| CACO | Corrective action consent order |
| HSWA | Hazardous and Solid Waste Amendments |
| SWMU | Solid waste management unit |
| RFA | RCRA facility assessment |
| IW | Injection well |
| UIC | Underground injection control |

# 1 Introduction

This Addendum describes certain modifications to the Remedial Action Plan (RAP)/Corrective Measures Implementation Plan (CMIP) approved by the Michigan Department of Environmental Quality (MDEQ), now the Michigan Department of Environment, Great Lakes, and Energy (EGLE), in June 2014 as a final remedy under Parts 111 and 201 of Michigan's Natural Resources and Environmental Protection Act (Public Act 451 of 1994, as amended) to address conditions at the Warner-Lambert Company LLC (Warner-Lambert) former manufacturing facility in Holland, Michigan (MID 006 013 643).

Specifically, this addendum proposes construction and operation of a new ground water treatment system (GWTS) that would serve to pre-treat ground water extracted from within the existing hydraulic containment system prior to permitted discharge to the local publicly owned treatment works (POTW) operated by the City of Holland Board of Public Works (BPW). The proposed GWTS is intended to supplement the existing deep-well disposal system that was approved as part of the June 2014 Final RAP/CMIP to provide operational flexibility regarding management of extracted groundwater in the short-term, and likely replace the deep wells in the long-term. The GWTS would serve only to alter the manner and method used to treat/dispose of the ground water extracted from within the existing hydraulic containment system (HCS) to increase operational flexibility. There are no changes proposed in this Addendum that would modify the remedial performance objectives (and associated performance monitoring/reporting) for the HCS that were approved as part of the June 2014 RAP/CMIP.

## 1.1 Site Description

### 1.1.1 Location/Description

The 24-acre former pharmaceutical manufacturing plant (Plant Site) associated with Warner-Lambert's former operations is located at 188 Howard Avenue in Holland Township, Ottawa County, Michigan. The property is located on the north shore of the Macatawa River near the river's confluence with Lake Macatawa (Large Figure 1).

The corrective action facility boundary established through consultation with the MDEQ in 2007 includes the Plant Site and other related parcels. This RAP/CMIP addendum is only relevant to the Plant Site, which represents the portion of the facility that was historically operated as a permitted treatment, storage and disposal (TSD) facility under Part 111 and RCRA.

### 1.1.2 Ownership and Use Histories

Parke, Davis & Company LLC (Parke Davis) took title to about 24 acres of property along the shores of the Macatawa River and commenced its pharmaceutical manufacturing activities on what is referred to as the Plant Site in the early 1950s.

Warner-Lambert Company LLC acquired Parke Davis in 1970. Pfizer Inc. acquired Warner-Lambert in 2000. Warner-Lambert is the entity that operated the existing permitted TSD facility and with whom the MDEQ executed a Post-Closure Plan/Corrective Action Consent Order in February 2002. Warner-Lambert

Company LLC is a wholly owned subsidiary of Pfizer Inc. and Parke, Davis & Company LLC is a wholly owned subsidiary of Pfizer International LLC. Parcel designations are illustrated on Large Figure 2.

The Plant Site occupied approximately 24 acres with the principal street address of 188 Howard Avenue. It was occupied from the late 1800's until 1950 by a succession of companies engaged in tannery operations. Tannery operations were conducted in the older structures located on the northern portion of the Plant Site. Based on historical aerial photographs and the results of soil investigations, the southern and western portions of the Plant Site were filled with various materials including byproducts from tannery operations. At least two types of residuals generated by tannery operations have been identified on the Plant Site: bark residue from the extraction of tannic acid and lime cake from the neutralization of hides. Subsequent construction activities may have redistributed these tannery wastes on the Plant Site.

Much of the southern half of the Plant Site along the river was low-lying marsh at the time of acquisition by Parke Davis in 1950. This area was filled between the early 1950's and 1984. The Macatawa River channel adjoining the Plant Site was altered in the early 1950's from a meandering river mouth to a linear channel to accommodate shipping of coal to the newly constructed municipal electric power plant on the south side of the channel. In the 1950's the Army Corps of Engineers dredged the Macatawa River (then the Black River) and deposited the dredge spoils along the shoreline of the Plant Site. The dredge spoils were not chemically characterized prior to placement on the Plant Site.

The Plant Site continued to manufacture bulk active pharmaceutical ingredients and isolated intermediates, which were mostly processed and/or packaged off-site at other facilities. These chemicals were manufactured by batch processes that typically included charging raw materials, chemical synthesis in reactors and other equipment, separation, drying, and packaging of bulk products and intermediates. During portions of the Plant Site's history, Parke Davis also engaged in limited contract manufacturing, as well as final dosage packaging.

Manufacturing activities on the Plant Site ceased in the first quarter of 2007 and the Plant Site was decommissioned in 2007. Demolition of structures on the Plant Site was completed in early 2009. A Hydraulic Containment System (HCS) was constructed at the Plant Site in 2010. The HCS, which consists of a subsurface ground water flow barrier wall fully encircling the perimeter of the Plant Site, a ground extraction system, and deep well injection system, prevents off-site migration of constituents in ground water from the upper and lower sand aquifers at the Plant Site. It was approved by the MDEQ as a final remedy with respect to ground water-surface water interface pathways in March 2009 and then later codified as part of the final remedy in the final RAP/CMIP approved for the site in June 2014.

The Plant Site is currently vacant and devoid of improvements except for structures housing two deep injection wells and a structure (Building #91) housing infrastructure for managing and treating ground water extracted from within the HCS prior to deep well injection. Access to the property is restricted by a perimeter fence.

## 1.2 Site Background

### 1.2.1 RCRA/Part 111 Permitting History

Parke Davis filed a Notice of Regulated Waste Activity (Part A Permit) for the Plant Site in 1980. Warner-Lambert applied for a RCRA Part B permit/Act 64 (now Part 111) operating license in 1985. The U.S. EPA and MDEQ jointly issued a HSWA/Part 111 operating license for the Plant Site in October 1990 to permit two greater than 90-day hazardous waste container storage areas and several hazardous waste storage and treatment tanks.

The Plant Site ceased to operate as a hazardous waste treatment, storage, or disposal facility (TSDF) in September 1999 pursuant to new administrative rules under Part 111 which exempted facilities that treat only process wastes generated on-site (as was the case at the Plant Site) from the permitting requirements applicable to TSDFs. Based on this regulatory development, the Plant Site commenced closure activities for all of its regulated units.

The MDEQ certified closure of the current and former regulated units in a letter, dated September 14, 1999 and the site subsequently operated under Large Quantity Generator status for the remainder of its active manufacturing life. Although the MDEQ determined that the permitted hazardous waste management units at the Plant Site were closed, it also determined that soil and ground water impacted from these units would require continued long-term ground water monitoring and corrective action. In this manner, the MDEQ deferred RCRA closure of the belowground portions of the former regulated units to the corrective action program.

A Post-Closure Plan (PCP), specifying post-closure care and corrective action requirements, a schedule and tasks for completing these requirements, and financial assurance mechanism, was submitted to the MDEQ in September 2001. The PCP was incorporated into a Corrective Action Consent Order (CACO) on February 25, 2002. The CACO and PCP specify the remaining corrective action requirements as well as the post-closure requirements associated with the regulated units for which the aboveground elements were certified as closed in 1999. The PCP was most recently modified in 2015 following EGLE approval of the Final RAP/CMIP to incorporate the long-term operation, maintenance and monitoring and financial assurance requirements associated with the final remedial measures, including the HCS.

### 1.2.2 Corrective Action Facility Designation/SWMU Boundaries

The U.S. EPA conducted a RCRA Facility Assessment (RFA) in April 1989 in preparation for issuance of the RCRA Part B/HSWA permits. Fourteen solid waste management units (SWMUs) were identified in the RFA, but the number was reduced to seven in the HSWA permit because hydrogeological data collected at the Plant Site revealed that several identified SWMUs were located within, or partially within, areas that were known to have been impacted by historical fill activities and/or residuals from historical tannery operations. This arrangement made it impossible to distinguish potential releases attributable to SWMUs from other historical source areas. Consequently, several SWMUs were combined into a single SWMU (SWMU G, referred to as "Historical Industrial Use and Fill Areas"). The SWMUs are summarized briefly below, and detailed in the 2014 RAP/CMIP:

- *SWMU A - Former Underground Fuel Oil Storage Tanks*: Three 30,000-gallon underground storage tanks that were removed in May 1989.
- *SWMU B - Former Biological Treatment System and Rainwater Collection Tank*: A biological treatment system was formerly located immediately east of the old Chemical Waste Treatment System. The system was in use from 1951 until 1992. The biological treatment system and the old Chemical Waste Treatment System shared a common secondary containment system.
- *SWMU C - Underground Injection Wells*: Two deep injection wells (IW-1 and IW-2), used to inject treated aqueous chemical pharmaceutical wastes, which were completed at depths of 1,643 and 1,946 feet respectively, were plugged in 1978 and 1981. Three new UIC permitted deep injection wells (IW-3, IW-4, and IW-5), completed at depths of 5,945 feet, 5,946 feet, and 6,027 feet respectively were later permitted and installed in accordance with Underground Injection Control (UIC) regulations. Injection of process wastewater into these three wells was terminated in 2008 following the cessation of manufacturing activities and restarted in 2010 to accommodate remedial wastewater generated by the Hydraulic Containment System. IW-3 was plugged and abandoned in 2021. No surficial releases from these wells have been documented.
- *SWMU D - Former Used Equipment Storage Area*: The former used equipment storage area of approximately 10,000 square feet where reusable equipment was stored from 1951 until the mid-1970's.
- *SWMU E - Former Underground Solvent Storage Tank Farm:* Solvents were stored in 18 underground storage tanks, with capacities from 2,000 to 15,000 gallons, from 1951 until July 1988 when the tanks were emptied and removed.
- *SWMU F - Solvent Recovery Tank Farm*: 34 aboveground tanks with capacities of 2,000 to 15,000 gallons were used to store spent process solvents for less than 90 days prior to recovery on-site via distillation and fractionation in Building 7.
- *SWMU G - Historical Industrial Use and Fill Areas:* Based on historical aerial photographs and the results of soil investigations, fill material of varying thickness is present on approximately the southern two-thirds of the Plant Site. Investigations indicate that at least two types of solid wastes (bark residue from the extraction of tannic acid and lime cake from the neutralization of hides) were buried in various locations on the site during its use as a tannery between the early 1900's and 1950. Similarly, dredge spoils were placed on the site during dredging activities conducted by the U.S. Army Corps of Engineers in the 1950's.

### 1.2.3 2014 Final RAP/CMIP

The final RAP/CMIP for the site was submitted and approved by the EGLE in June 2014. It describes remedial actions for the Plant Site as well as other properties that lie within the corrective action facility boundary (e.g., the "Greenbelt" property located east of the Plant Site). The primary remedy for the former Plant Site is the HCS and associated cap. These remedial measures, along with certain institutional controls, prevent exposure to chemical constituents present in soil and ground water. The final EGLE approval letter is included as Attachment A.

### 1.2.4 Description of Current HCS

The hydraulic containment system was designed to prevent potential off-site migration of chemical constituents in ground water from both the upper sand and lower sand aquifers in the Plant Site. It consists of the following primary elements:

- A subsurface ground water flow barrier wall at the perimeter of the Plant Site that intersects both the upper and lower sand aquifers;
- A network of five ground water extraction wells and transmission piping to convey extracted ground water from the wells to a treatment system;
- A ground water pretreatment system to filter the water to remove solids;
- A pump to discharge treated ground water to two on-site deep injection wells permitted by the U.S. EPA under the UIC program;
- Appurtenant equipment, including instruments, process controls, power supply, valves and piping, as necessary to facilitate operation of the above-referenced equipment (housed in a groundwater treatment building designated "Building #91"); and
- A network of 11 piezometer pairs designed to demonstrate and monitor the effectiveness of the hydraulic containment remedy.

The layout of the components of the HCS are illustrated on Large Figure 3.

The HCS is operated and maintained in accordance with an Operation & Maintenance (O&M) Manual included with the original RAP/CMIP document and incorporated into the 2015 Post-Closure Plan. Remedial performance objectives are monitored by routine collection of water levels in the 11 piezometer pairs (located inside and outside the barrier wall) to assure that an inward gradient is maintained.

EGLE approved the HCS as a final remedy for venting ground water at the former Plant Site on March 17, 2009. The approval process included a public participation process and was codified in an October 2009 revision to the Post Closure Plan. Construction of the hydraulic containment system was completed in 2010. The HCS was subsequently incorporated as an element of the Final RAP/CMIP which was approved by EGLE in June 2014. Performance monitoring conducted since 2010 start-up has documented that the HCS is meeting all remedial performance objectives specified in the EGLE approvals for the system.

## 1.3 Proposed Modification

### 1.3.1 Purpose

This addendum proposes modification of the HCS through the addition of an alternate groundwater treatment system (GWTS) that would pre-treat ground water extracted from within the HCS prior to discharge to the local publicly owned treatment works (POTW) operated by the Holland Board of Public Works (BPW). The proposed GWTS is intended to supplement the existing deep-well disposal system to

provide short-term operational flexibility and likely long-term replacement of deep well injection. Large Figure 3 illustrates the HCS and deep injection well infrastructure at the Plant Site as well as the location of Building 91 and the proposed GWTS expansion (including an addition to Building #91 to house pre-treatment equipment and a force main to lift water from the treatment building to the sanitary sewer in Howard Avenue.

## 1.4 Organization of Addendum

Section 2 provides a summary of the proposed GWTS, including previous studies evaluating different groundwater management alternatives, pilot testing outcomes, permitting status, and performance objectives. Section 3.0 summarizes operation, maintenance, and monitoring of the GWTS, which is detailed in the attached OM&M manual. Section 4 describes integration with the existing extraction wells and deep well infrastructure. Section 5 outlines implementation details and project and permitting schedules.

# 2 Alternate Groundwater Treatment System (GWTS)

## 2.1 Alternatives Evaluated

In 2018, Barr completed an evaluation of extracted groundwater management alternatives that could be implemented to address age and performance issues associated with the deep injection wells which were causing an increase in injection pressures and associated increases in operation and maintenance (O&M) costs. Four groundwater management alternatives were evaluated:

- Deep well injection (baseline case/current conditions)
- On site treatment with surface water discharge to the Macatawa River
- On-site pre-treatment with POTW discharge
- Zero liquid discharge

The results of the alternatives evaluation are summarized in Large Table 1. As noted in Large Table 1, the four alternatives were evaluated based on administrative feasibility, implementability, effectiveness, and cost. Implementability was assessed based on site conditions and the availability of potential discharge locations. Effectiveness was evaluated based on the ability of potential treatment technologies to meet anticipated regulatory requirements for the various discharge options. Costs were evaluated based on capital costs for equipment and infrastructure necessary to implement the option as well as operation and maintenance costs over a 30-year operating life.

The preliminary engineering evaluation recommended that groundwater be treated on-site using a newly constructed treatment system and subsequently discharged to surface water or the POTW. While on-site treatment requires initial capital investment to design and build the GWTS, it is expected to reduce the long-term operation and management cost associated with the HCS.

## 2.2 Pilot Test Outcomes

A five-month pilot test was conducted onsite by Barr, using biologically active GAC, with pretreatment by biologically active gravel and sand filters. This pilot test demonstrated the ability of biologically active GAC to meet treatment targets for POTW discharge and reduce the aquatic toxicity of groundwater. This pilot test was documented in Barr report "Pilot-Scale Treatment of Extracted Groundwater" issued September 2019. Based on significant fouling observed in treatment equipment during the pilot due to buildup of iron and biomass, Barr completed follow-up bench-scale testing for alternate pretreatment and updated the conceptual design of water treatment operations to include chemical pretreatment and settling instead of media filtration. Bench testing also demonstrated that non-biological GAC is able to meet treatment targets for POTW discharge, suggesting that a system would not need to wait for biological acclimation to occur prior to discharge of treated water.

## 2.3 Discharge Permitting

Pfizer applied for a permit to discharge treated groundwater to the POTW operated by the Holland BPW, including coordination with Holland Charter Township to verify the capacity of the portions of the sanitary

sewer system owned and operated by Holland Charter Township to convey water from the site to the POTW. Holland Charter Township provided e-mail verification in December 2020 that sewer discharge would be acceptable given the planned water quality and monitoring requirements. The Holland BPW issued a discharge permit to be activated following GWTS construction. This permit is included as Appendix B. Specific permit requirements and GWTS operational strategy to meet these requirements are further described in the GWTS Operations, Maintenance, and Monitoring (OM&M) Manual included as Appendix D.

## 2.4 Full-Scale Design

The GWTS was designed to consistently meet pre-treatment objectives. Issue-for-bid detailed design documents were submitted for EGLE review on April 8, 2021. Full-scale design incorporated lessons learned from the pilot-scale and bench-scale tests. Specific improvements on the pilot processes include increasing backwash hydraulic loading rate and frequency, adding a backwash clarifier to settle solids, replacing a cone-bottom sedimentation tank with a clarifier, and adding variable frequency drives to pumps to control flow rates and working water volumes. Equipment included in full-scale design are:

- Alum and pH adjustment mixing tank
- Flocculation tank
- Process clarifier
- Multimedia pressure filter (MMPF)
- 2 granulated activated carbon (GAC) vessels, one lead, one lag.
- Sludge thickening tank
- Backwash settling tank
- Filter press
- Chemical feed storage and pump for each of these chemicals:
    - Caustic for pH adjustment
    - Inorganic coagulant (alum) for iron coagulation
    - Polymer (flocculant) to flocculate process particles
    - Polymer (filter press) to improve solids dewatering characteristics
    - Sodium bisulfite to quench tap water disinfectant prior to bio-GAC backwash
- 4" force main connecting to existing, abandoned force main
- 36" monitoring manhole, located on force main on Warner-Lambert property near intersection with sewer lateral

To maintain the hydraulic gradient onsite, the flow of extracted groundwater requiring treatment is anticipated to range between 15 and 20 gpm based on recent historical operation of the HCS. The system was designed to treat up to 28 gpm extracted groundwater, such that the gradient can be proactively managed, which allows for system downtime. It is assumed that the existing groundwater extraction system has the capacity to be down for two weeks without prior notice and up to one month with several months advance warning. Designed process capacity also includes capacity to handle internal recycle flows from media backwash.

## 2.5 Performance Objectives

The objective of the HCS is to prevent off-site migration of ground water from the former Plant Site. It accomplishes this objective through extraction of ground water from within the containment barrier at a rate sufficient to maintain an inward gradient. The effectiveness of the HCS is monitored in accordance with the methods specified in the Performance Monitoring Plan (PMP) contained in Appendix H of the facility's Post-Closure Plan.

Addition of the GWTS does not change the overall performance objective for the HCS. It simply modifies how and where extracted water is managed and ultimately disposed of. Therefore, no changes are required to the facility's Performance Monitoring Plan. The GWTS will provide an additional management option for extracted groundwater from the HCS. The deep wells will remain operational in the near term to provide redundant management options. The GWTS will achieve the pre-treatment requirements specified in the BPW permit through regular process monitoring, targeted process automation, and operating guidelines.

# 3 GWTS Operation, Maintenance, and Monitoring

This section outlines how the GWTS will be operated, maintained and monitored once it is constructed and operational. A preliminary operation and maintenance manual is provided Appendix D. This document will be supplemented once the GWTS is constructed.

## 3.1 GWTS Operation

### 3.1.1 Description/Objective/Basis of Design

The objective of the new groundwater treatment system (GWTS) will be to remove constituents from extracted site groundwater prior to discharge to the Holland Board of Public Works' (BPW) publicly owned treatment works (POTW). The GWTS discharge to the POTW may ultimately replace the existing deep-well injection management of groundwater which is derived from the existing site hydraulic containment system. The existing ground water recovery system (consisting of five extraction wells located along the southern site perimeter, groundwater flow meters, metering valves and an existing equalization tank) will be retained.

The groundwater will be treated using granular activated carbon (GAC) with pretreatment consisting of iron oxidation, coagulation, and sedimentation. A layout of the GWTS building addition is included as Large Figure 6, and a simplified process flow diagram for the system is included as Large Figure 7. GAC vessels will be allowed to develop biofilms to enhance treatment and reduce operating costs associated with GAC changeout. The GWTS will be designed to remove suspended solids, volatile organic compounds (VOCs) and active pharmaceutical ingredients (APIs) to comply with BPW treatment requirements before discharge from the facility. Per- and poly-fluoroalkyl substances (PFAS) have also been detected in the extracted groundwater at low concentrations. The GAC adsorption process included in the GWTS is also the best available technology for treating PFAS and could be adapted in the future to meet new water quality standards for additional PFAS constituents, if warranted.

The GWTS will be implemented pursuant to the facility's corrective action obligations under Part 111 ("Hazardous Waste Management") of 1994 Michigan PA 451, as amended (Part 111 of Act 451) and in conjunction with appropriate discharge permitting and associated regulations established pursuant to Part 31 of Act 451. EGLE granted conditional approval to commence construction of the GWTS in August 2021 (Attachment E). Construction of the alternate GWTS can commence at any time based on Pfizer's sole discretion; however, start up of the system may not be initiated until the following conditions are satisfied:

(1) An Addendum to the June 2014 Final RAP/CMIP describing the alternate GWTS system has been approved by EGLE;

(2) An amended Post-Closure Plan is submitted and is approved by EGLE; and

(3) Documentation is forwarded to EGLE that the City of Holland has activated the POTW discharge permit approved in August 2021.

### 3.1.2 Construction

GWTS construction will be conducted by a general contractor in accordance with local building codes, with oversight by Pfizer. The updated site plan with GWTS infrastructure is shown on Large Figure 5.

### 3.1.3 Start-Up/Prove-In

Extracted water from the HCS will continue to be routed to deep well injection until the GWTS is fully proved-in. Following construction, the GWTS will undergo a series of start-up/prove-in tests to optimize operating parameters to meet treatment objectives. The biological GAC process is expected to take 2-4 months to fully acclimate to the site water quality and thereby become less reliant on adsorption and more reliant on biological degradation as a primary constituent removal mechanism.

### 3.1.4 Regular Operation

Groundwater will continue to be extracted from the site using the existing shallow extraction wells. The existing extraction wells manifold into a header in Building 91 which will be routed to a break tank in the building expansion when the GWTS is operating.

Water from the break tank will be pumped to a vented rapid mix tank. The rapid mix tank will be equipped with an agitator to increase dissolved oxygen (DO) and oxidize iron. It will be sized to oxidize at least 95% of the dissolved iron in the extracted groundwater. The tank will be vented outdoors by means of an exhaust fan to route any volatilized organics and hydrogen sulfide out of the building. Caustic [50% (wt.) NaOH solution] will be dosed upstream of the rapid mix tank to increase the groundwater pH to approximately 7.5 and speed up iron oxidation. Aluminum sulfate (alum) will be added to the effluent of the rapid mix tank to facilitate agglomeration of oxidized iron solids. Flow will be routed to a downstream process clarifier with a flocculation chamber where polymer flocculant will be added and the mixture will be slowly mixed to encourage floc formation. Process clarifier underflow will be pumped to a sludge thickening tank. The underflow from the thickening tank will be pumped to a filter press for dewatering. The sludge will be dewatered such that the filter cake passes a paint filter test and is therefore suitable for landfill disposal. A polymer will be injected upstream of the filter press to aid with the dewatering process. Filtrate from the filter press will be collected in a sump and pumped to the rapid mix tank.

Process clarifier overflow water will flow to a clarifier overflow tank. Clarifier overflow is expected to contain substantially less iron and TOC than extracted groundwater. The clarified water from the overflow tank will be pumped to a multimedia pressure filter (MMPF) vessel for fine screening ahead of contact with lead-lag GAC adsorbers for removal of organic constituents. Following contact with GAC adsorbers, effluent water will be discharged to the Holland BPW POTW through the municipal sanitary sewer system.

The GAC will remove organic compounds, including VOCs, SVOCs, and some APIs. Over time, the GAC media is expected to become colonized by beneficial microbes that accomplish removal of organics via biological degradation, rather than relying solely on adsorption. GAC media may be changed out intermittently, with the lead bed replaced and the former lag bed swapped into the lead position. Change-out of lead vessels will be determined by concentrations of constituents observed between the

lead and lag vessels. Change-out frequency required to maintain sorptive capacity is expected to be between six months and three years, based on preliminary modeling completed by Barr and the sustainability of biological operation. GAC will be backwashed periodically as dictated by pressure drop across the vessels to maintain pore spaces and remove excess biomass. Backwash water will be potable city water dechlorinated with sodium bisulfite to facilitate biofilm growth on the media.

The MMPF will be backwashed as needed with city water, and backwash from both media processes will be routed to a backwash settling tank. Backwash will then be routed to a backwash clarifier tank. Decant from the backwash clarifier is not expected to contain detectable levels of contaminants and will be routed to the Holland POTW discharge. Underflow from the backwash clarifier will be pumped to the filter press.

### 3.1.5 Alarm/Shutdown/Upset Conditions

Non-standard operating conditions associated with alarms and upset conditions, including those that will lead to process shutdowns, are described in the OM&M Manual in Appendix D. Briefly, alarm conditions associated with tank levels will be designed to prevent spillage of raw or treated groundwater and equipment damage associated with pumps running dry. Additional process monitoring is included to maintain system performance.

### 3.1.6 Management of Change

The groundwater water treatment system will use a management of change (MOC) process for any changes to the system. The MOC will be used to ensure that the environmental, health, and safety risks are carefully evaluated before implementing significant changes, including changes in treatment chemicals, equipment, and operating procedures. MOC is further described, with a documentation template in the OM&M Manual in Appendix D.

## 3.2 GWTS Maintenance

Maintenance activities are described in more detail in the OM&M Manual in Appendix D, and briefly summarized below.

### 3.2.1 Routine Maintenance

Routine GWTS maintenance includes the following types of activities:

- Check instrumentation for calibration or connections
- Remove solids and clean tanks
- Inspect integrity and ventilation of tanks
- Assess the water level setpoints to determine if they should be changed to better reflect current operating conditions
- Check for obstructions our orientation issues of mixers
- Conduct specific preventative maintenance activities recommended by equipment vendors

### 3.2.2 Non-Routine Maintenance

Non-routine GWTS maintenance includes the following types of activities:

- Plant restart after upset conditions
- Replacement of pumps, tanks, mixers, or instrumentation
- Alternate media cleaning/backwash activities
- GAC media changeout

## 3.3 GWTS Monitoring

Monitoring activities are described in more detail in the OM&M Manual in Appendix D, and briefly summarized below. Specific permit limits are included as Large Figure 3.

### 3.3.1 Monitoring during Start-Up/Prove-In

When the GWTS system is started up, it will undergo a prove-in period, during which effluent will continue to be routed to the deep wells for disposal. Once compliance with discharge requirements is demonstrated, expected to be primarily via adsorption mechanisms for removal of constituents of concern, GWTS effluent will be routed to the sanitary sewer for discharge. The prove-in period will continue until steady state conditions are established, anticipated to be demonstrated through consistent generation of biomass from the GAC vessels, demonstrating that constituent removal is primarily accomplished via biological processes, rather than adsorption. Process monitoring during start-up and prove-in will meet the following goals:

- Evaluate process and operational changes needed to meet permit limits
- Evaluate when steady-state operation is reached through assessment of backwash frequency and qualitative assessment of biomass quantity in backwash streams

Process and operational modifications to be evaluated during start-up and prove-in through process monitoring include:

- Chemical feed and mixing optimizations for rapid mix tank and process clarifier
- Chemical feed and mixing optimizations for backwash clarifier
- Backwash automation and frequencies for MMPF pressure vessels
- Backwash automation and frequencies for GAC pressure vessels
- Filter press operation, including potential filter cloth modifications and filter aid use

Steady-state operation monitoring will primarily be conducted through influent and effluent COD measurements of the biological GAC vessels. Once COD removal across the vessels reaches a constant efficiency, the system will be considered to be at steady state.

### 3.3.2 System Monitoring

After start-up and prove-in, operators will continue to monitor the process as needed to maintain performance of and troubleshoot specific operational concerns.

### 3.3.3 Discharge Monitoring

Discharge monitoring samples will be collected monthly and reported to the Holland BPW in monthly discharge monitoring reports (DMRs). Treated effluent samples will be collected via 24-hour composites using a composite sampling device acceptable to both the BPW and Holland Charter Township, which operates the sewer system at the point of discharge.

Additional samples may be collected by the Holland BPW and Holland Charter Township. The sampling manhole near the property boundary was designed to facilitate easy flow readouts and the ability to store a composite sampler and connect it to the flow meter for flow-weighted composite sampling. The location of the discharge line and sampling manhole are shown on Large Figure 2. Both entities will be provided with access to this manhole as well as the flow readout located inside.

# 4 Integration with Existing Infrastructure

## 4.1 Integration with Existing Extraction Wells

The tie-in with existing extraction wells is diagrammed on Large Figure 4. The GWTS will be connected to the extraction well line upstream of the deep well injection break tank. Extraction well operation will not change apart from water routing, which will be directed either to the GWTS or the deep well injection system via a manual valve.

## 4.2 Integration with Existing Deep Well Disposal System

The GWTS will feature a separate set of controls and a separate human machine interface (HMI) and programmable logic controller (PLC) from the existing deep well system. Controls for the two systems will remain entirely separate and they will be operated according to separate operational plans. An updated OM&M manual for the deep injection system will be provided in the PCP amendment to document changes made since the original plan was approved in 2014. The tie-in between the GWTS and the extraction wells will feature a manual valve such that either the GWTS or the deep well system will operate as the disposal method, but not both.

## 4.3 Operational Plan/Sequence of Operations

Following GWTS start-up and prove-in the GWTS may operate as the primary discharge method, with deep well injection retained as a back up option. At some point in the future, the remaining deep wells may be abandoned, with the GWTS retained as the sole method for management of extracted groundwater at the site. EGLE will be notified prior to permanent shutdown/abandonment of the deep wells.

# 5 Implementation Details and Schedule

This section describes the implementation details and schedule for the remedial measures described in Sections 2, 3, and 4 of this Remedial Action Plan (RAP)/Corrective Measures Implementation Plan (CMIP).

## 5.1 Administrative Mechanisms

The long-term reliability, protectiveness and effectiveness of the GWTS will be assured through amendment of the 2015 Post-Closure Plan (PCP). The 2015 PCP, together with a Corrective Action Consent Order executed with EGLE in 2002, provides a mechanism for legally enforcing the various post-closure care and operation, maintenance, and monitoring activities necessary to reliably restrict exposures and/or preserve the integrity of active remedial elements and other engineering controls at the Site. It will be amended to include all operation, maintenance and monitoring activities associated with the GWTS.

## 5.2 Financial Assurance Mechanism Cost Estimate Update

The PCP will also be amended to update the FAM cost estimate to reflect costs associated with the new GWTS. This will assure that the monies necessary to fund the OM&M activities associated with the GWTS are available.

Preliminary estimates of O&M costs to operate the new GWTS are provided in Appendix E. These costs, which are based on third party estimates to perform the required activities, will be incorporated into the FAM CE contained in the PCP Amendment under concurrent development. The updated FAM CE for O&M of the HCS in the PCP will be sufficient to provide for management of extracted ground water by either the existing deep well system or the new GWTS.

The O&M costs for the new GWTS will be updated following start up/prove in and, if warranted, revisions will be made to the financial assurance instrument pursuant to Rule 299.9712 to reflect the amount of financial resources necessary for implementation and ongoing operation of the HCS. This modification will be implemented in accordance with the amendment procedures described in Section 7.0 of the PCP.

## 5.3 Implementation Schedule

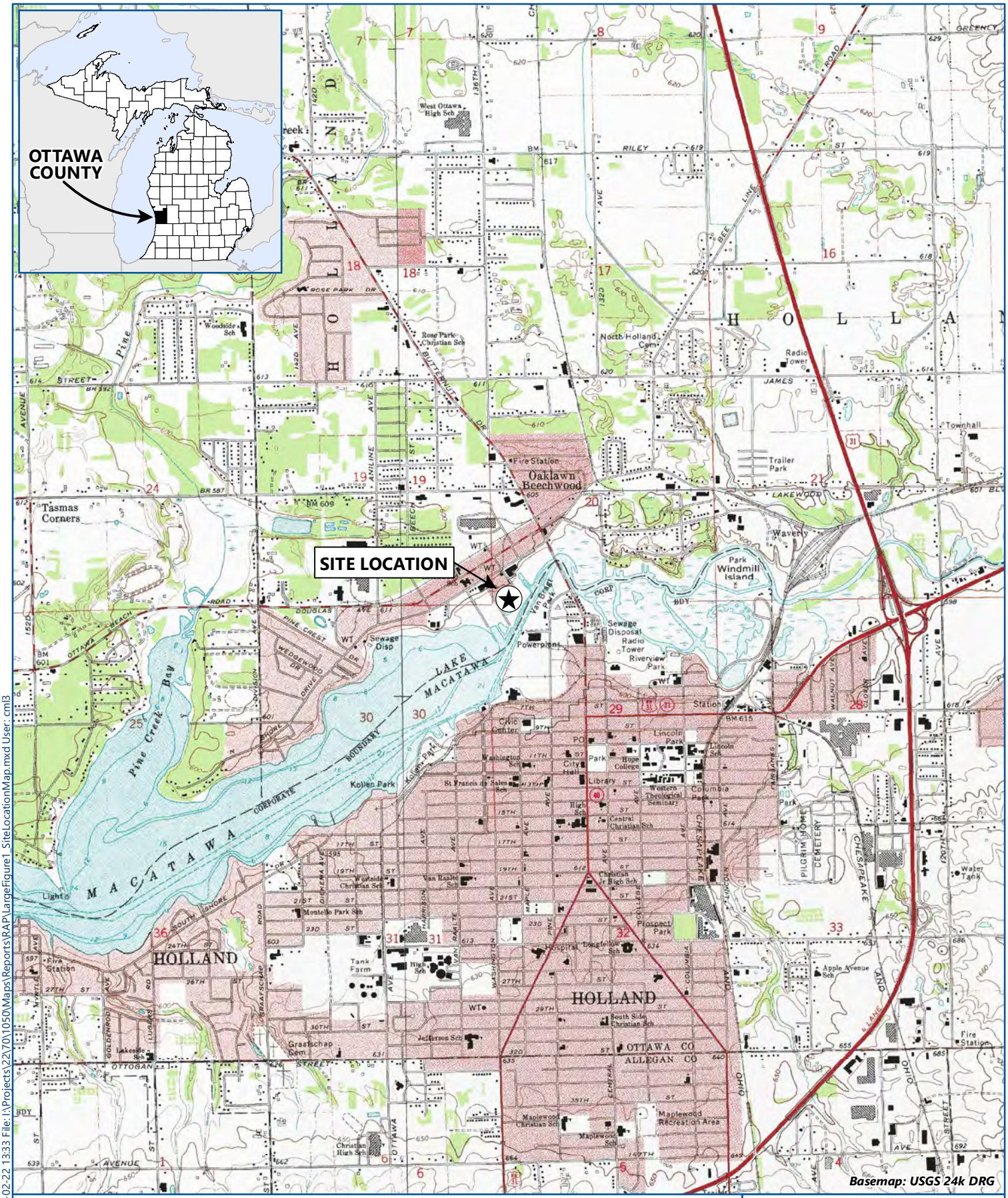
The attached implementation schedule (Large Figure 8) describes specific tasks necessary to implement this RAP/CMIP addendum and the relationships and dependencies between them. EGLE indicated in the conditional approval, dated August 25, 2021, that construction of the system could begin at any time, but that discharge could not be commenced until this Addendum and necessary modifications to the Post-Closure Plan had been approved. That letter is included as Appendix C. As a result, the most significant regulatory dependency presented is that the start-up of the system will not be implemented until the Final RAP/CMIP receives final approval. The Holland BPW has issued a discharge permit for the GWTS. It will need to be activated following completion of construction, but prior to start-up.

## 5.4 Remedial Completion Documentation

A Remedial Completion Report will be prepared and submitted to EGLE within 120 days of completion of the remedial/construction activities described in this RAP/CMIP Addendum. The Remedial Completion Report will include the following information:

- Site plans, including final surveys documenting the horizontal and vertical locations of the building addition, the monitoring manhole, and the re-aligned stormwater pipeline and newly installed manhole.
- A description of site grading activities and cover and cap replacement and repair activities, including implementing contractors, fill quantities, and survey/topographic control data evidencing that minimum cover thicknesses have been achieved.
- Identification of sources of imported material for excavation backfill/site grading and associated clearance testing results.
- As-built drawings of completed GWTS building, process equipment, and monitoring manhole.
- Any deviations from final engineering plans/specifications

# Large Figures




Site Location

N

0 3,000

Feet

BARR

**SITE LOCATION MAP**
WARNER-LAMBERT FORMER MANUFACTURING SITE
Holland, MI

LARGE FIGURE 1

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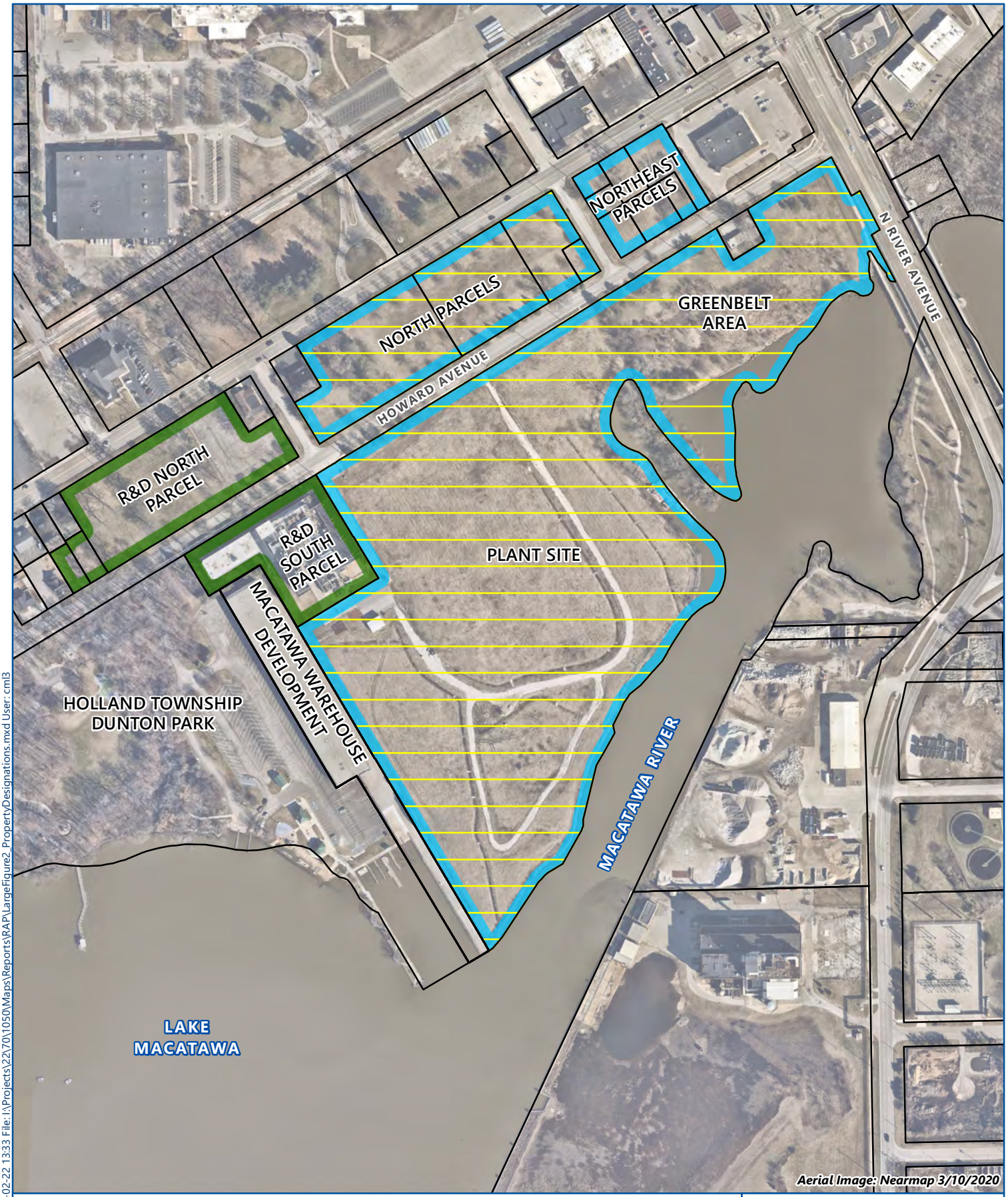



Parcel Boundary
Corrective Action Facility Property
MSU Property
Pfizer or Pfizer Subsidiary Property

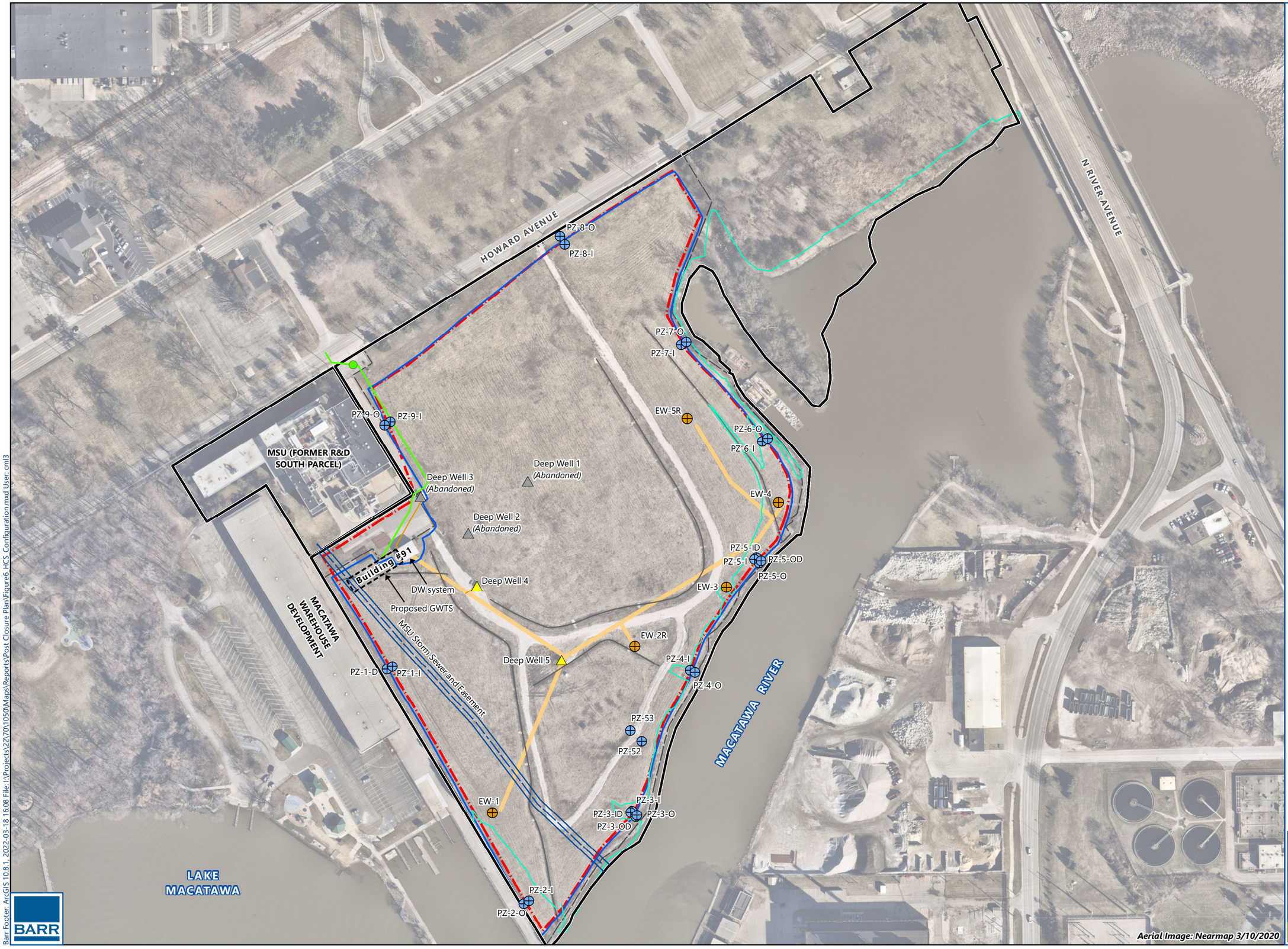
N

0 350
Feet

**PROPERTY DESIGNATIONS AND RCRA CORRECTION ACTION FACILITY BOUNDARY**
WARNER-LAMBERT FORMER MANUFACTURING SITE
Holland, MI

LARGE FIGURE 2

Barr Footer: ArcGIS 10.8.1, 2022-02-22 13:33 File: I:\Projects\22\70\1050\Maps\Reports\RAP\LargeFigure2_PropertyDesignations.mxd User: cmi3

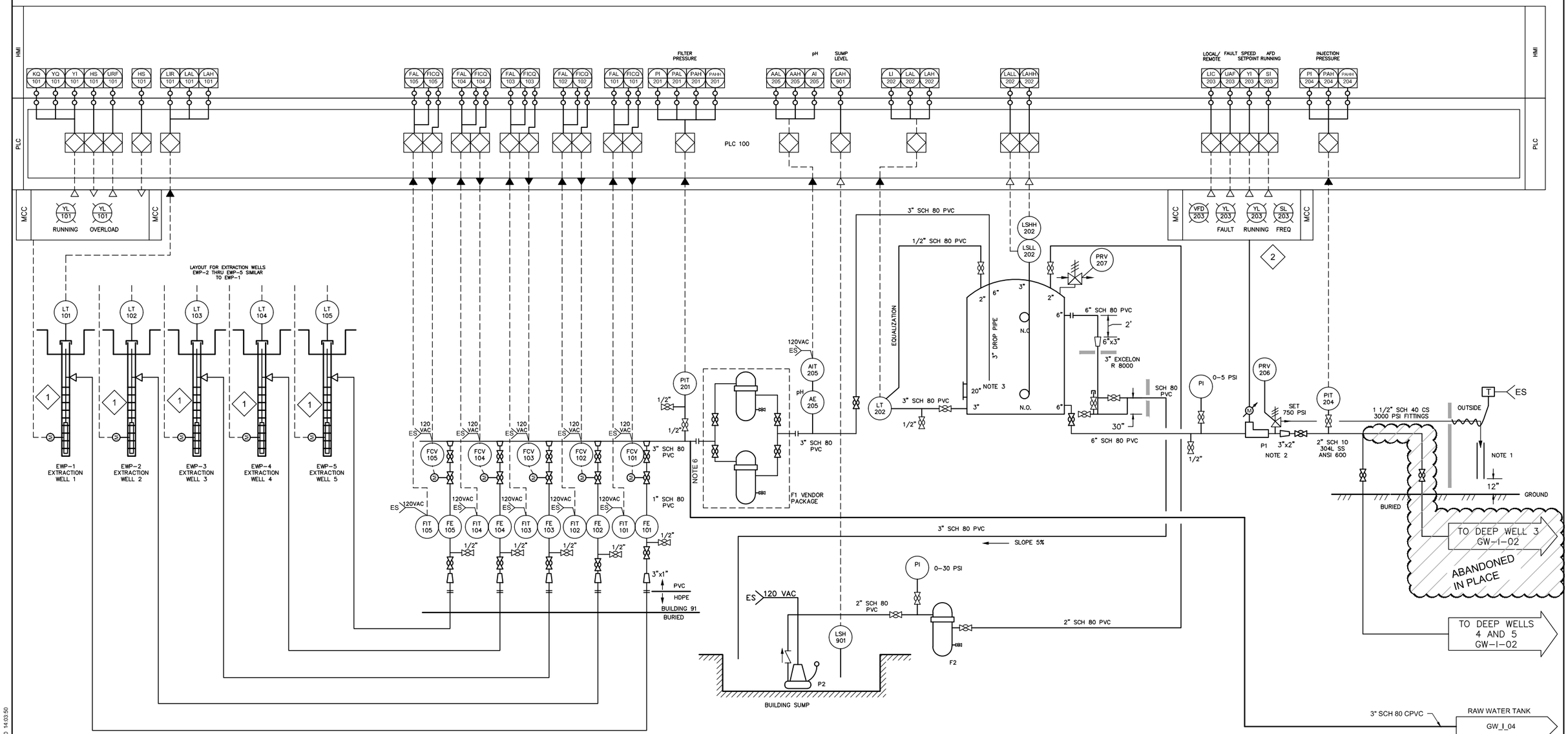



- Property Boundary
- Hydraulic Containment Wall
- Geomembrane Cap
- Extraction Well Transmission Line
- Deep Well Transmission Line
- Drainage Swale
- 100-Year Floodplain Limit
- Fence
- Force main to sanitary sewer discharge
- Discharge Monitoring Manhole
- Deep Well
- Abandoned Deep Well
- Extraction Well
- Piezometer
- GWTS Building Expansion

0 200
Feet

**HCS CONFIGURATION (WITH PROPOSED GWTS)**
WARNER-LAMBERT FORMER MANUFACTURING SITE
Holland, MI
LARGE FIGURE 3

BARR




| EQUIPMENT NO. | EWP-1 | EWP-2 | EWP-3 | EWP-4 | EWP-5 | T1 | P1 | P2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|
| NAME | EXTRACTION WELL PUMP | EXTRACTION WELL PUMP | EXTRACTION WELL PUMP | EXTRACTION WELL PUMP | EXTRACTION WELL PUMP | PUMP TANK | INJECTION PUMP | SUMP PUMP | DUPLEX BAG FILTER | BAG FILTER |
| MANUFACTURER | GRUNDFOS | GRUNDFOS | GRUNDFOS | GRUNDFOS | GRUNDFOS | BELDING | NETZSCH | BERKELEY | ROSEDALE | ROSEDALE |
| MODEL NO. | 16S05-5 | 16S05-5 | 16S05-5 | 16S05-5 | 16S05-5 | C-CFV | NM045SY08S48V | EH750 (NOTE 4) | D8303F1150SESPB | 8302F2150SESPB |
| MATERIAL | SS | SS | SS | SS | SS | FRP | 304 SS/BUNA N | CAST IRON | 304 SS/EPDM | 304 SS/EPMD |
| SIZE | 4" DIA., 1.25"NPT | 4" DIA., 1.25"NPT | 4" DIA., 1.25"NPT | 4" DIA., 1.25"NPT | 4" DIA., 1.25"NPT | 60" DIA. X 84" SS | 6" x 3" NOTE 2 | 2" NPT | 2" 150# | 2" 150# |
| CAPACITY | 16 GPM | 16 GPM | 16 GPM | 16 GPM | 16 GPM | 1000 GAL | 50 GPM | 20 GPM | 30" BAGS | 30" BAG |
| TEMP/PRESS | 140' TDH | 140' TDH | 140' TDH | 140' TDH | 140' TDH | ± 3 PSI | 700 PSI | 55' TDH | 150 PSI | 150 PSI |
| HP/V/RPM | 0.5/480/3450 | 0.5/480/3450 | 0.5/480/3450 | 0.5/480/3450 | 0.5/480/3450 | | 30/480/1800 | 0.5/120/3450 | d | |
| WEIGHT | 27 | 27 | 27 | 27 | 27 | 1000 | 1200d | 62 | 300 | 100 |

NOTES:

1. INSTALL 4" SCH 40 CS AS SHIELD TO 12" ABOVE GRADE. PAINT TO MATCH.
2. PUMP P1 HAS 6" CLASS 125 INLET FLANGE; 3" CLASS 900 OUTLET FLANGE.
3. INLET DROP PIPE TO HAVE 1/2± INCH ANTI-SYPHON HOLE
4. WITH FLOAT SWITCH WITH PIGGY BACK PLUG.
5. REFER TO SECTION 409400 FOR INTERLOCK DESCRIPTIONS.
6. CONTRACTOR TO INSTALL A TEE.
7. ALL EQUIPMENT AND PIPING ON THIS DRAWING IS EXISTING EXCEPT THAT LABELED 3.C.

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Ph: 1-800-632-2277
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Fax: (616) 554-3211
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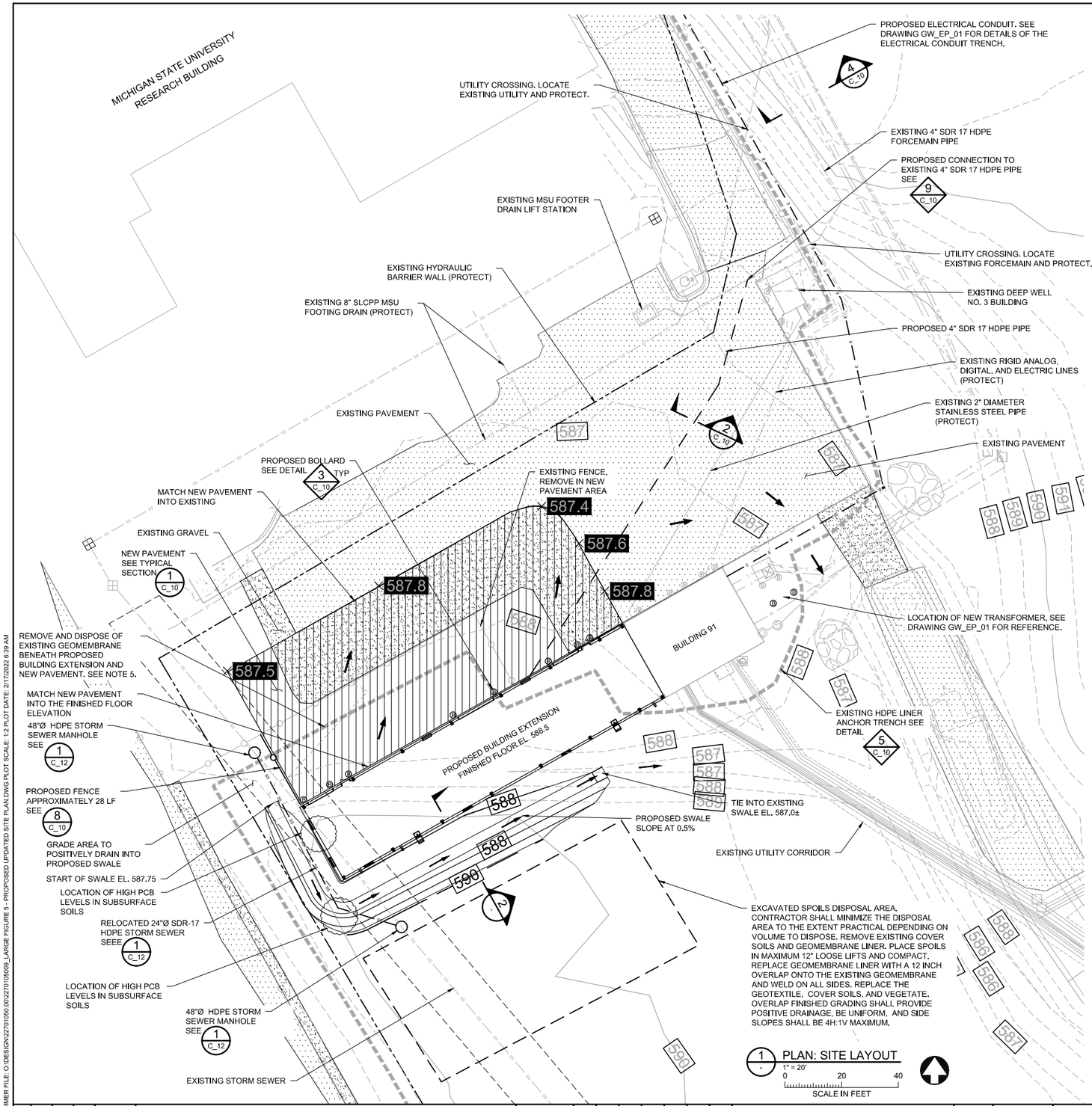
WARNER LAMBERT, LLC

FORMER MANUFACTURING PLANT SITE
HOLLAND, MI

LARGE FIGURE 4
HCS PROCESS SCHEMATIC WITH PROPOSED GWTS TIE-IN

BARR PROJECT No. 22701050.09
CLIENT PROJECT No.
DWG. No. -
REV. No. A

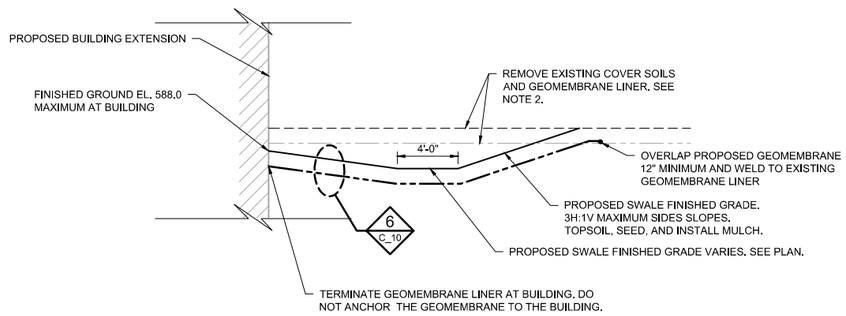



## LEGEND

- EXISTING SPOT ELEVATION
- EXISTING SANITARY MANHOLE
- EXISTING CLEAN OUT
- EXISTING CATCH BASIN
- EXISTING HAND HOLE
- EXISTING BOLLARD
- PROPOSED BOLLARD
- FLOW ARROW
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING FENCE LINE
- PROPOSED FENCE LINE
- EXISTING EASEMENT LINE
- EXISTING COMMUNICATIONS LINE
- EXISTING ELECTRICAL LINE
- PROPOSED ELECTRICAL LINE
- EXISTING SANITARY SEWER LINE
- EXISTING 8" SLCPP MSU FOOTING DRAIN
- PROPOSED SANITARY SEWER LINE
- EXISTING WATERMAIN LINE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- EXISTING HYDRAULIC BARRIER WALL
- EXISTING GEOMEMBRANE COVER LIMITS
- EXCAVATED SPOILS DISPOSAL AREA
- EXISTING PAVEMENT
- PROPOSED PAVEMENT
- EXISTING GRAVEL

NOTES:

1. EXISTING TOPSOIL AND COVER SOILS ABOVE THE EXISTING HDPE LINER SHALL BE STRIPPED AND STOCKPILED FOR REUSE.
2. REMOVE AND DISPOSE OF THE EXISTING HDPE LINER BENEATH THE EXISTING BUILDING EXTENSION AS NECESSARY TO COMPLETE THE WORK. CUT THE EXISTING HDPE LINER USING A METHOD THAT DOES NOT DAMAGE THE EXISTING HDPE LINER BY STRETCHING, TEARING, OR RIPPING.
3. WHERE SOIL BENEATH THE EXISTING HDPE LINER REQUIRES EXCAVATION, THIS SOIL SHALL BE STOCKPILED IN A LOCATION APPROVED BY OWNER. THESE SOILS SHALL BE PLACED IN A LOCATION DESIGNATED BY OWNER AND RECAPPED WITH HDPE LINER AND COVER SOIL MATERIAL.
4. FOR ALL DISTURBED SURFACES, UNLESS OTHERWISE SHOWN, PLACE AND SMOOTH GRADE TOPSOIL, SEED, AND MULCH.
5. THE EXISTING GEOMEMBRANE COVER SHALL BE REMOVED FROM BENEATH THE PROPOSED BUILDING EXTENSION AND PROPOSED PAVEMENT AREA. WHERE THE EXISTING GEOMEMBRANE COVER IS ADJACENT TO THE PROPOSED PAVEMENT, A 2 FOOT FLAP OF GEOMEMBRANE SHALL REMAIN AND EXTEND BENEATH THE PROPOSED PAVEMENT. SEE SECTION 1 ON DRAWING GW_C_10.

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Fax: (616) 554-3211
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WARNER LAMBERT, LLC.

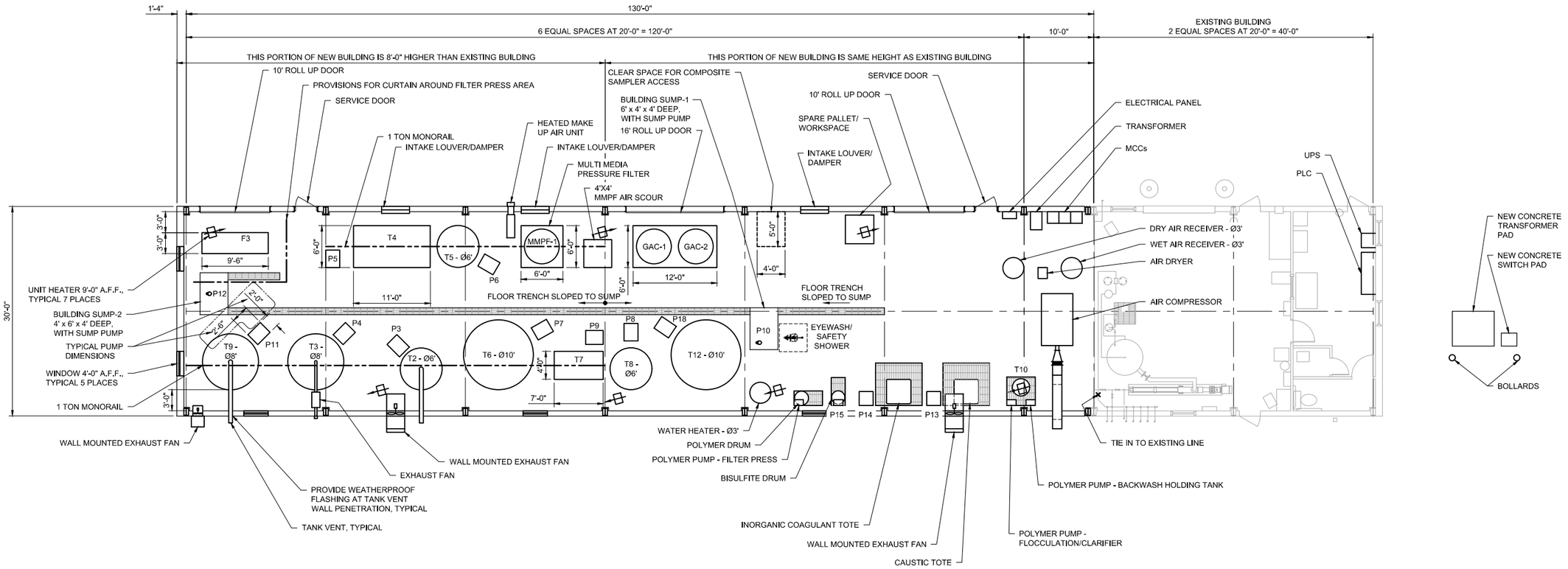
FORMER MANUFACTURING PLANT SITE
HOLLAND, MICHIGAN

LARGE FIGURE 5
PROPOSED UPDATED SITE PLAN

BARR PROJECT No. 22701050.09
CLIENT PROJECT No.
DWG. No. -
REV. No. A

NOTES:

1. FOOTPRINT OF EQUIPMENT IS APPROXIMATE.
2. TANK DIAMETER IS SUBJECT TO CHANGE BASED ON STANDARD DIMENSIONS OFFERED BY SELECTED TANK MANUFACTURER.
3. CLARIFIER, FILTER PRESS, MMPF, AND GAC VESSEL LENGTH AND WIDTH SUBJECT TO CHANGE BASED ON STANDARD DIMENSIONS OFFERED BY SELECTED EQUIPMENT SUPPLIER.




1 / - PLAN: GENERAL ARRANGEMENT
1/8"=1'-0"

| EQUIPMENT P&ID NUMBER | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T12 | MMPF-1 | GAC-1 | GAC-2 | FP1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NAME | RAW WATER TANK | RAPID MIX TANK | FLOCCULATION / CLARIFIER | CLARIFIER OVERFLOW TANK | BACKWASH HOLDING TANK | BACKWASH CLARIFIER | TREATED WATER TANK | SLUDGE HOLDING TANK | POLYMER TANK | BACKWASH WATER SUPPLY TANK | MULTI MEDIA PRESSURE FILTER | GRANULAR ACTIVATED CARBON VESSEL | GRANULAR ACTIVATED CARBON VESSEL | FILTER PRESS |

| PUMP P&ID NUMBER | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P11 | P12 | P13 | P14 | P15 | P18 | P19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NAME | RAPID MIX TANK FEED PUMP | FLOCCULANT TANK FEED PUMP | SLUDGE BLEED PUMP | MMPF FEED PUMP | BACKWASH CLARIFIER FEED PUMP | TREATED WATER DISCHARGE PUMP | BACKWASH CLARIFIER SLUDGE BLEED PUMP | BUILDING SUMP-1 PUMP | FILTER PRESS FEED PUMP | BUILDING SUMP-2 PUMP | CAUSTIC FEED PUMP | COAGULANT FEED PUMP | SODIUM BISULFITE FEED PUMP | BACKWASH PUMP | PROCESS SLUDGE RECYCLE TANK |

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WARNER LAMBERT, LLC

FORMER MANUFACTURING PLANT SITE
HOLLAND, MI

LARGE FIGURE 6
PROPOSED GWTS LAYOUT

BARR PROJECT No. 22701050.09
CLIENT PROJECT No.
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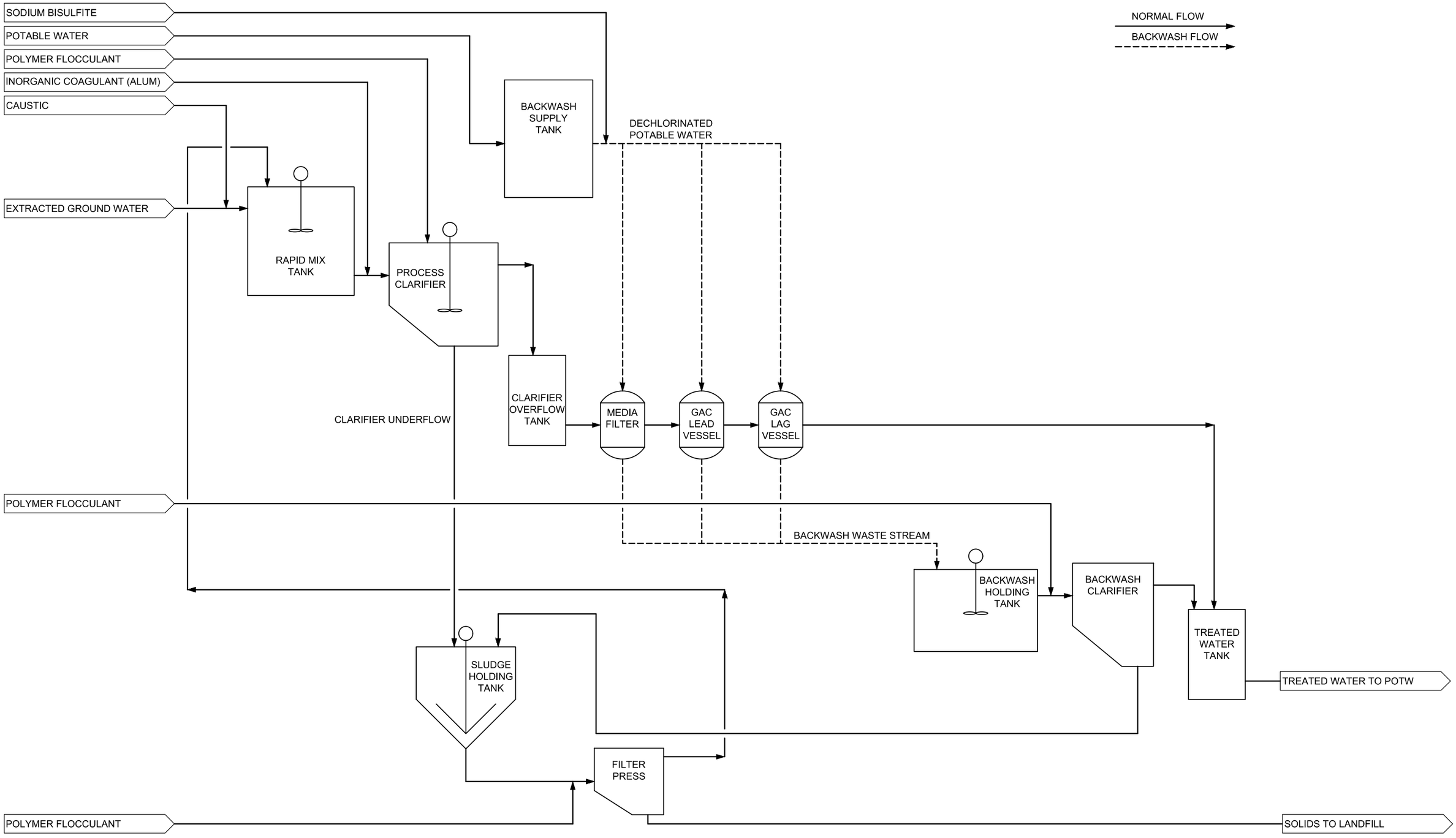
REV. No. A

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WARNER LAMBERT, LLC

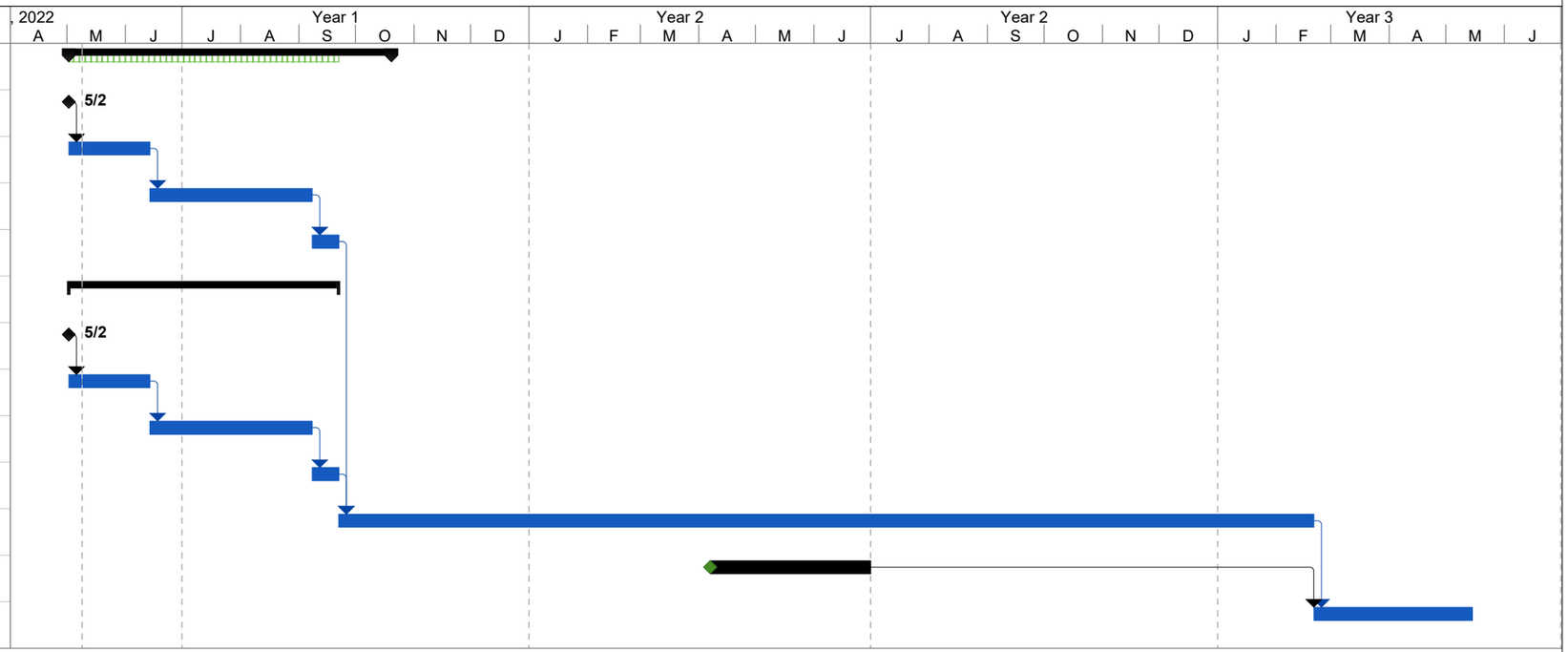
FORMER MANUFACTURING PLANT SITE
HOLLAND, MI

LARGE FIGURE 7
PROCESS FLOW DIAGRAM

BARR PROJECT No. 22701050.09
CLIENT PROJECT No.
DWG. No. -
REV. No. A

Warner-Lambert Groundwater Treatment System Implementation Schedule - Mon 5/9/22

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | **EGLE RAP/CMIP Addendum** | **120 days** | **Mon 5/2/22** | **Wed 10/19/22** |
| 2 | Submit RAP/CMIP Addundem to EGLE | 0 days | Mon 5/2/22 | Mon 5/2/22 |
| 3 | EGLE Review of RAP/CMIP Addundem | 30 days | Mon 5/2/22 | Mon 6/13/22 |
| 4 | Public Notice/Comment Period | 60 days | Tue 6/14/22 | Wed 9/7/22 |
| 5 | CMIP Modification/PCP Amendment Finalized | 10 days | Thu 9/8/22 | Wed 9/21/22 |
| 6 | **EGLE PCP Modification** | **100 days** | **Mon 5/2/22** | **Wed 9/21/22** |
| 7 | Sumbit PCP Modification to EGLE | 0 days | Mon 5/2/22 | Mon 5/2/22 |
| 8 | EGLE Review of PCP Modification | 30 days | Mon 5/2/22 | Mon 6/13/22 |
| 9 | Public Notice/Comment Period | 60 days | Tue 6/14/22 | Wed 9/7/22 |
| 10 | CMIP Modification/PCP Amendment Finalized | 10 days | Thu 9/8/22 | Wed 9/21/22 |
| 11 | GWTS Bidding and Construction | 364 days | | |
| 12 | Activate BPW Discharge Permit | 60 days | | |
| 13 | Start-up/Prove-In | 60 days | | |




Project: Design Schedule
Date: Mon 5/9/22

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Task | External Tasks | Inactive Summary | Start-only | Deadline |
| Split | External Milestone | Manual Task | Finish-only | |
| Milestone | Inactive Task | Duration-only | External Tasks | |
| Summary | Inactive Milestone | Manual Summary Rollup | External Milestone | |
| Project Summary | Inactive Milestone | Manual Summary | Progress | |

# Large Table

**Large Table 1 Groundwater Management Alternatives Screening Table**

| Topic/Evaluation Criterion | Deep Well Injection (Baseline) | Treatment and Direct Surface Water Discharge | Treatment and POTW Discharge | Zero Liquid Discharge |
|---|---|---|---|---|
| Description of Management Alternative | Extracted groundwater is discharged to existing deep injection wells | Extracted groundwater is treated to remove iron, copper and organic constituents and discharged to the Macatawa River | Extracted groundwater is pretreated to remove iron and organic constituents and discharged to the POTW operated by the Holland BPW | Extracted groundwater is evaporated using an evaporator and crystallizer and the resultant salt is transported off-site for disposal |
| Performance Uncertainties | • Frequency of well rehabilitation events<br>• Efficacy of well rehabilitation events<br>• Useful lifespan of injection wells | • Ability to meet NPDES discharge requirements (pilot-scale testing required)<br>• Upset of microbial community due to temperature shifts or presence of toxic substrates | • Ability to meet POTW discharge requirements (pilot-scale testing completed))<br>• Upset of microbial community due to temperature shifts or presence of toxic substrates | • Scaling and/or corrosion of internal components<br>• Degree of concentration achievable |
| Regulatory Uncertainties | Changes in UIC regulation | • Level and frequency of analytical monitoring for surface water discharge<br>• Most stringent effluent requirements of all options | Need for headworks analysis to establish POTW discharge limits | Regulation of final disposal of produced salt and air emissions |
| Technical Effectiveness | Medium – effective, but risk of future deep well deterioration observed with other, decommissioned wells | Medium – surface water effluent limits most stringent of all options | High – likely to meet POTW discharge standards | High – residuals likely suitable for landfill disposal |
| Implementability | High – existing system | High – would use established technology, surface water discharge location nearby | High – would use established technology, sanitary sewer connection readily available | High – would use established technology |
| Administrative Feasibility | High – under existing UIC permit | High – need approval/permits from EGLE on RAP/PCP and NPDES | High – need approval/permits from EGLE on RAP/PCP and city/township on POTW discharge | Medium – need approval/permits from EGLE on RAP/PCP and likely air/solids disposal review with disposal facility |
| Relative Capital Cost | Low – existing infrastructure | Medium – for equipment and construction | Medium – for equipment and construction | High – high equipment costs |
| Relative OM&M Cost | Medium – expensive maintenance | Low – mostly operating cost | Low – discharge fees and operating cost | High – high power/fuel costs |
| Recommendation | **Maintain for near-term, decommission for long-term** | Remove from consideration | **Retain for consideration as long-term management solution** | Remove from consideration |

# Appendices

# Appendix A

## Final RAP/CMIP Approval Letter

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

June 20, 2014

Mr. Thomas Donohue
Senior Manager
Pfizer Inc.
100 Route 206 North
Peapack, New Jersey 07977

Dear Mr. Donohue:

SUBJECT: Approval of Final Remedial Action Plan/Corrective Measures Implementation Plan (Final RAP/CMIP); Pfizer, Inc./Warner-Lambert Company, LLC (Warner-Lambert), Holland, Michigan; MID 006 013 643

The Michigan Department of Environmental Quality (MDEQ), Office of Waste Management and Radiological Protection (OWMRP), has reviewed the Final RAP/CMIP dated April 21, 2014, as revised through June 12, 2014. The Final RAP/CMIP was reviewed for compliance with the requirements of the Revised Post Closure Plan approved on December 21, 2009, and Part 111, Hazardous Waste Management, of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, and its administrative rules, and the applicable sections of Part 201, Environmental Remediation, of Act 451. A public meeting was held on the Final RAP/CMIP on May 14, 2014. No public comments were received during the public comment period that ran from April 22, 2014, to June 5, 2014.

Based on this review, the OWMRP hereby approves the Final RAP/CMIP, subject to the following requirements:

1. The Post Closure Plan must be modified to reflect the implementation needs and post closure care activities associated with the final selected remedial actions following this approval of the Final RAP/CMIP, including those required under the PCB Remediation Plan Coordinated Approval. Accordingly, a revised draft Post Closure Plan shall be submitted to the OWMRP for review and approval by September 30, 2014.

2. Any changes to the corrective action financial assurance cost estimate and instrument shall be made when the Post Closure Plan is modified.

Please be advised that this approval does not constitute a release from any corrective action responsibilities that Warner-Lambert or any future owners or operators may have for the facility under Part 111 or the federal Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984. At this time, the OWMRP is not aware of the existence of any other contamination beyond those identified and remediated as a part of the approved Final RAP/CMIP. This approval does not preclude the MDEQ from requiring further corrective action at the facility at a later date if new information or subsequent analysis indicates that a release or potential release of a hazardous waste from the facility may pose a threat to public health, safety, welfare, or the environment.

If you have any questions regarding this approval, please contact Ms. Cheryl Howe, Hazardous Waste Section, OWMRP, at 517-284-6561; howec@michigan.gov; or MDEQ, OWMRP, P.O. Box 30241, Lansing, Michigan 48909-7741.

Sincerely,

Bryce Feighner, P.E., Chief
Office of Waste Management and
Radiological Protection
517-284-6551

cc: Mr. Allen Reilly, Horizon Environmental
Ms. DeLores Montgomery/Ms. Virginia Himich, MDEQ
Dr. Deb MacKenzie-Taylor//Mr. Art Ostaszewski, Mr. David Slayton MDEQ
Corrective Action File

# Appendix B

## BPW Discharge Permit

**WASTEWATER DISCHARGE PERMIT**
**PERMIT NO. HT-2021-WLC-24**

**PART I: GENERAL INFORMATION**

Company Name: Warner-Lambert Company, LLC

Mailing Address: 100 Route 206 South
Peapack, NJ 07977

Facility Address: 188 Howard Avenue
Holland, MI 49424

The Holland Board of Public Works (BPW) hereby authorizes the permittee specified above to discharge industrial wastewater to the Holland Area Water Reclamation Facility (WRF) sewer system. This authorization is granted in accordance with the City's Ordinance as amended or equivalent local ordinance and any applicable provisions of Federal or State laws or regulations.

The requirements and conditions established in this permit do not relieve the company of its obligation to comply with any applicable pretreatment regulations, standards, requirements, or laws that may become effective during the term of this permit.

In addition, this permit is granted in accordance with the application filed with BPW, and in conformity with plans, specifications, and other substantive data submitted to the BPW in support of the above application.

To continue discharging industrial wastewater after the expiration date, it is the responsibility of the permittee to submit an application for permit reissuance at least ninety (90) day before the expiration of the existing permit.

Issued Date: activated upon request

Effective Date:

Expiration Date:

Issued By:

Environmental Compliance Supervisor
Holland Area Water Reclamation Facility

Authorized by:

Superintendent
Holland Area Water Reclamation Facility

**Part II - Discharge Limitations and Monitoring Requirements**

A. MONITORING POINT 001

1. Monitoring Point Location: See attached map
2. Wastewater Discharge Type: Continuous
3. Average Discharge Flow: 24,000 gpd
4. Approved Composite Sampling Method: Proportional
5. Discharge Limitations: During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the discharge shall be limited and monitored by the permittee as specified herein.

**LOCAL LIMIT POLLUTANTS**

Pretreatment Standard Used for Determining Discharge Limits: Local Limits

| Discharge Parameter | Daily Minimum Concentratio | Daily Maximum Concentration | Daily Maximum Loading | Sample Frequency | Sample Type |
|---|---|---|---|---|---|
| Chemical Oxygen Demand (COD)[1] | -- | 2000 mg/l | 80 lbs/day | n/a | Composite |
| Total Suspended Solids (TSS)[1] | -- | 1400 mg/l | 100 lbs/day | n/a | Composite |
| Total Phosphorus (P)[1] | -- | 40 mg/l | 1 lbs/day | n/a | Composite |
| Grease and Oil (G&O)[1] | -- | 150 mg/l | 5 lbs/day | n/a | Composite |
| pH | 6.0 S.U. | 11.0 S.U. | -- | n/a | Grab |
| | -- | | -- | | |
| | -- | | -- | | |

[1] Limitations listed for COD, TSS, P and G&O are the maximum concentration and loadings that can be discharged without a Special Discharge Allocation (SDA).

**SPECIAL DISCHARGE ALLOCATION(S)**

| Discharge Parameter | Daily Maximum | Effective Date | Expiration Date |
|---|---|---|---|
| Chemical Oxygen Demand (COD) | lbs | n/a | |
| Total Suspended Solids (TSS) | lbs | n/a | |
| Total Phosphorus (P) | lbs | n/a | |
| Grease and Oil (G&O) | lbs | n/a | |
| Chlorides | lbs | n/a | |

**CATEGORICAL POLLUTANT**

Category(s): n/a

Subcategory(s): n/a

Source: n/a

Pretreatment Standard Used for Determining Discharge Limits: Categorical (40 CFR

Toxic Organic Management Plan: Permittee is exempt from toxic organic monitoring per the TOMP approved on _____n/a_____. Permittee shall submit a TOMP certification statement at least once every 6 months.

| Discharge Parameter | Daily Maximum Concentration | Monthly Average Concentration | Sample Frequency | Sample Type |
|---|---|---|---|---|
| Benzene | 0.16 mg/L | | one sample/month | grab |
| Chlorobenzene | 1.7 mg/L | | one sample/month | grab |
| PFOA | 12,000 ppt | | one sample/month | grab |
| PFOS | 12 ppt | | one sample/month | grab |
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**PART III – DEFINITIONS**

A. DAILY CONCENTRATION is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. The daily concentration shall be used to determine compliance with all maximum and minimum daily concentration limitations except for pH. For pH, the maximum value of any individual sample taken during a calendar day shall be used for determining compliance with the maximum daily concentration limitation. Similarly, the minimum value of any individual sample taken during a calendar day shall be used for determining compliance with the minimum daily pH concentration limitation.

B. FLOW PROPORTIONAL COMPOSITE SAMPLE is a 24-hour composite sample with the sample volume proportional to the discharge flow.

C. GRAB SAMPLE is a single sample taken at neither a set time nor flow.

D. INTERFERENCE is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. (This definition does not apply to sample matrix interference).

E. MONTHLY CONCENTRATION is the sum of the daily concentrations determined during a calendar month by the number of daily concentrations determined for that calendar month. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations.

F. NATIONAL PRETREATMENT STANDARDS are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

G. PRETREATMENT is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

H. Publicly owned treatment works (POTW) means the treatment works as defined by Section 212 of the Federal Water Pollution Control Act including any devices and systems used in the monitoring, testing, storage, treatment, recycling, and reclamation of municipal sewage and industrial waste which are connected to or part of the Holland Area Water Reclamation Facility. The systems include sewers, pipes, and equipment used to convey wastewater to the treatment facility. The term also includes the municipality as defined in Section 502(4) of the Federal Water Pollution Control Act which has jurisdiction over the indirect discharges to and the discharges from such a treatment works.

I. QUARTERLY MONITORING FREQUENCY refers to a three month period, defined as January through March, April through June, July through September, and October through December.

J. TIME PROPORTIONAL COMPOSITE SAMPLE is a 24-hour composite sample comprised of samples collected at a constant time interval. Usage of time proportioned composite sampling is prohibited unless specifically approved by the BPW.

K. TOMP refers to an acceptable Toxic Organic Management Plan (TOMP).

**PART IV - STANDARD CONDITIONS**

A. PROHIBITED DISCHARGES

The permittee shall comply with all the general prohibited discharge standards in the City's Ordinance as amended or equivalent local ordinance. These prohibitions include that no person shall discharge or cause to be discharged into the sewage system any wastes containing any of the following substances or which exhibit the following characteristics:

1. It shall be unlawful to discharge any wastewater to the POTW except in accordance with the provisions of this Ordinance.

2. No user shall contribute or cause to be contributed, directly or indirectly to the POTW, any pollutant or wastewater which will pass-through or cause interference with the operation or performance of the POTW.

3. No person shall discharge or cause to be discharged to any public sewer any storm water, surface water, ground water, roof runoff, subsurface drainage, cooling water, unpolluted air conditioning water or unpolluted industrial process water. No footing drain, roof downspout, areaway drain or other source of surface water or ground water shall be connected to a public sewer. All footing drain water shall be discharged to storm sewers or dry wells. Storm water and all other unpolluted drainage shall be discharged to sewers specifically designated as storm sewers, or to a natural outlet approved by the Michigan Department of Environment, Great Lakes and Energy (EGLE). The discharge of cooling water or unpolluted industrial process water shall only be permitted when authorized and approved by the EGLE.

4. Any substances which by reason of their nature or quantity may create a fire or explosion hazard or be injurious to the POTW or to the operation of the POTW, including but not limited to, wastestreams with a closed cup flashpoint of less than one hundred forty (140) degrees Fahrenheit or sixty (60) degrees Centigrade using the test methods specified in 40 CFR 261.21.

5. Any solid or viscous substances which may cause obstruction to the flow in a sewer or other interference with the operation of the POTW such as, but not limited to: grease, garbage with particles greater than one-half inch (1/2") in any dimension, or any material which can be disposed of as trash.

6. Any wastewater having a pH less than six (6.0) or greater than eleven (11.0) or having any other corrosive property capable of causing damage or hazard to structures, equipment, or personnel of the POTW.

7. Any substance which may cause a public nuisance, cause hazard to life or prevent entry into the sewers for maintenance and repair.

8. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW exceeds forty (40) degrees Centigrade (one hundred and four (104) degrees Fahrenheit).

9. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass-through.

10. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.

11. Any trucked or hauled pollutants, except at discharge points and as otherwise designated by the BPW.

12. Any pollutant, including oxygen demanding pollutants released in a discharge at a flow rate and or concentration (including any slug discharge), which may cause interference to the POTW.

13. Any of the following toxic pollutants (a) those pollutants listed on the current critical materials register prepared pursuant to Section 66 of the Water Resources Commission Act (MCLA Sec. 323.1 et seq) by the Michigan Water Resources Commission, and (b) those pollutants identified by the BPW as a "toxic pollutant" by amendment to the Sewer Use Ordinance

    If a pollutant is specifically allowed by the BPW, local ordinance, or categorical pretreatment standards, then the above paragraph does not apply.

14. Any toxic substances in amounts exceeding standards promulgated by the administrator of the United States Environmental Protection Agency pursuant to Section 307 (a) of the Federal Water Pollution Act of 1972, as amended.

15. Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the BPW in compliance with applicable State or Federal regulations.

16. Any discoloration other than the color of normal strength domestic waste including, but not limited to dyes, inks and vegetable tanning solutions which singularly or in conjunction with other waste constituents is deleterious to treatment and/or sludge disposal practices or a hazard to the POTW and its employees.

17. Any wastewater discharge with a monthly average hydrogen sulfide gas concentration above the NIOSH Recommended Exposure Limit (10 ppm) and/or with a peak hydrogen sulfide gas concentration above the NIOSH Immediately Dangerous to Life and Health limit (100 ppm) without approval of the control authority. Approval of Control Authority for alternate limits will be subject to the following: 1) Submittal of an acceptable health and safety plan that sufficiently outlines procedures for the safe access of the impacted site and sanitary sewer; 2) Demonstration that the discharge will not create nuisance odors; and 3) Completion of any improvements to the sanitary sewer system (at user's expense) determined necessary by the control authority in order to prevent increased corrosion due to the elevated hydrogen sulfide concentrations.

18. Any unused pharmaceuticals (both over the counter and prescription only medications).

19. Any wastewater having effluent characteristics in excess of the values outlined in Table 1:

**TABLE 1 – PROHIBITED POLLUTANTS**

| Pollutant | Daily Maximum Allowable Concentration (mg/l) |
|---|---|
| **Organics** | |
| Acetone | 170 |
| Benzene | 0.16 |
| Methyl Ethyl Ketone | 120 |

| | |
|---|---|
| Chloroethane | 1.8 |
| Chloromethane | 1.2 |
| Chloroform | 0.64 |
| Dibromochloromethane | 0.086 |
| 1,4-Dichlorobenzene | 0.40 |
| 1,1-Dichloroethane | 8.3 |
| 1,1-Dichloroethylene | 1.4 |
| cis-1,2-Dichloroethylene | 2.9 |
| trans-1,2-Dichloroethylene | 2.8 |
| Diethyl Ether | 21 |
| Ethyl Benzene | 0.44 |
| Lindane | 0.00038 |
| 4-Methyl-2-Pentanone | 20 |
| Methylene Chloride | 0.66 |
| Styrene | 0.29 |
| Tetrachloroethylene | 0.050 |
| Toluene | 3.5 |
| 1,1,1-Trichloroethane | 1 |
| Trichloroethylene | 0.34 |
| 1,2,4-Trimethylbenzene | 0.50 |
| Xylenes, Total | 0.91 |
| Phenols, Total | 0.90 |
| **Metals** | |
| Arsenic | 0.12 |
| Cadmium | 0.059 |
| Chromium | 1.3 |
| Copper | 1.3 |
| Cyanide, Amenable | 0.083 |
| Lead | 1.1 |
| Lithium | 2.9 |
| Mercury | See Part IV.A.20 |
| Molybdenum | 0.28 |
| Nickel | 0.865 |
| Selenium | 0.10 |
| Silver | 0.037 |

| | |
|---|---|
| Zinc | 4.2 |
| **Compatibles** | |
| Grease & Oil (Non-Polar Fraction) | 200* |

*Grease & Oil limitation is a firm limit for the non-polar fraction. Polar fraction in excess of the above stated limit is allowed under the conditions of Sections 21 and 22.

20. There shall be no detectable amounts of mercury discharged into the POTW. The local discharge limitation for mercury is established at the method detection limit (MDL) in accordance with the following:

    Mercury sampling procedures, preservation and handling, and analytical protocol for compliance monitoring shall be in accordance with EPA Method 245.1. The MDL, developed in accordance with the procedure specified in 40 CFR 136 shall not exceed 0.2 ug/L for mercury unless higher levels are appropriate due to matrix interference. The evaluation of potential matrix interference(s) shall include, at a minimum, the following:

    a. A demonstration that the laboratory conducting the analysis is capable of achieving the MDL of 0.2 ug/L in reagent water;

    b. A demonstration that the MDL of 0.2 ug/L cannot be achieved in the effluent; and

    c. A demonstration that an attempt has been made to resolve the matrix interference(s).

    In cases where true matrix interference(s) can be demonstrated, a discharge-specific MDL will be developed in accordance with the procedure in 40 CFR 136. Discharge-specific MDLs will be incorporated into the wastewater discharge permit.

21. Any wastewater containing more of the substances referenced in Table 2, unless permitted by Special Discharge Allocation.

    In addition to the limits in Table 2, any discharge that, in the judgment of the BPW, would contribute a significant amount of these substances due to exceptional flowage, regardless of mg/l concentration, shall be prohibited except by Special Discharge Allocation.

**TABLE 2 – COMPATIBLE POLLUTANTS**

| | Daily Maximum mg/l | | Daily Maximum pounds per day |
|---|---|---|---|
| Biochemical Oxygen Demand (BOD) | 1,000* | and | 40* |
| Chemical Oxygen Demand (COD) | 2,000* | and | 80* |
| Total Suspended Solids (TSS) | 1,400* | and | 100* |
| Total Phosphorus (P) | 25* | and | 1* |
| Chlorides | 3,200* | and | 100* |
| Grease & Oil (Polar Fraction) | 150* | and | 5* |

*or as approved by the EGLE in accordance with the BPW's approved procedures, with any change in such approved amounts being effective upon publication by the BPW in a daily newspaper of general circulation in the Holland area.

B. SURCHARGES

The industrial user will be surcharged pursuant to the local ordinance for non-domestic wastes containing compatible pollutants in excess of the following concentrations:

| TABLE 3 – SURCHARGE LIMITS | |
|---|---|
| Parameter | Surcharge Limits |
| Biochemical Oxygen Demand ($BOD_)$ | 250mg/l |
| Chemical Oxygen Demand (COD) | 500 mg/l |
| Total Suspended Solids (TSS) | 250 mg/l |
| Total Phosphorus (P) | 5.0 mg/l |
| Polar Grease and Oil (G&O) | 50 mg/l |

C. RIGHT OF ENTRY

The BPW's employees or authorized representative shall have ready access to the permittee's premises to engage in inspection, sampling, compliance monitoring and/or metering activities. Each such activity shall be commenced and completed at reasonable times, and in a reasonable manner. It is the permittee's responsibility to make prompt and necessary arrangements so that upon presentation of appropriate credentials, personnel from the BPW will be permitted to enter immediately for the purpose of performing their specific responsibilities.

D. RECORDS RETENTION

The permittee shall retain and preserve for no less than three (3) years, any records, books, documents, memoranda, reports, correspondence, and any and all summaries thereof, relating to monitoring, sampling and chemical analyses made by or on behalf of the permittee in connection with its discharge.

All records that pertain to matters that are the subject of special orders or any other enforcement or litigation activities brought by the BPW shall be retained and preserved by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

E. CONFIDENTIAL INFORMATION

Except for data determined to be confidential under the local ordinance, all reports required by this permit shall be available for public inspection at the office of the Holland Area Water Reclamation Facility.

F. RECORDING OF RESULTS

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

1. The exact place, date, time, and method of sampling;
2. The names of the persons taking the sample.
3. The dates the analyses were performed;
4. The person(s) who performed the analyses;
5. The analytical techniques or methods used; and
6. The results of all required analyses.

G. OPERATION AND MAINTENANCE OF PRETREATMENT FACILITIES

The permittee shall operate and maintain any and all pretreatment facilities in a prudent and professional manner. Records of operation and maintenance shall be provided to the BPW for review, upon request.

H. DILUTION

No permittee shall increase the use of potable or process water or, in any way, attempt to dilute a discharge as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit. The BPW may impose mass limitations on permittees who use dilution to meet applicable pretreatment standards or requirements or in other cases where the imposition of mass limitations is appropriate.

I. PROPER DISPOSAL OF PRETREATMENT SLUDGE AND SPENT CHEMICALS

The disposal of sludge and spent chemicals generated shall be done in accordance with Section 405 of the Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act.

J. SIGNATORY REQUIREMENTS

All reports required by this permit shall be signed by a principal executive officer of the permittee, or his designee.

K. REVOCATION OF PERMIT

The permit issued to the permittee by the BPW may be revoked when, after inspection, monitoring, or analysis, it is determined that the discharge of wastewater to the sanitary sewer is in violation of Federal, State, or Local laws, ordinances, or regulations. Additionally, falsification or intentional misrepresentation of data or statements pertaining to the permit application or any other required reporting form shall be cause for permit revocation.

L. FALSIFYING INFORMATION OR TAMPERING WITH MONITORING EQUIPMENT

Knowingly making any false statement on any report or other document required by this permit or knowingly rendering any monitoring device or method inaccurate, may result in punishment under the criminal laws of the local jurisdiction, as well as being subject to civil penalties and relief.

M. MODIFICATION OR REVISION OF THE PERMIT

1. The terms and conditions of this permit may be subject to modification by the BPW at any time as limitations or requirements as identified in the local ordinance are modified, or other just cause exists.

2. This permit may also be modified to incorporate special conditions resulting from the issuance of a special order.

3. The terms and conditions may be modified as a result of the U.S. EPA promulgating a new federal pretreatment standard.

4. Any permit modifications which result in new conditions in the permit shall include a reasonable time schedule for compliance if necessary.

N. REQUIREMENT TO REAPPLY

This permit shall expire on the expiration date identified. Existing permittees shall apply for permit reissuance a minimum of ninety (90) days prior to the expiration of existing permits on a form prescribed by the BPW. Failure to submit a timely reapplication for reissuance may result in a delayed issuance of a permit and a cessation of unpermitted discharges to the sewer system.

O. LIMTATIONS ON PERMIT TRANSFER

Wastewater discharge permits are issued to a specific process or operation. A wastewater discharge permit shall not be reassigned or transferred or sold to a new owner, new user, different premises or a new or changed operation without prior approval of the BPW.

P. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

Q. PROPERTY RIGHTS

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any invasion of personal rights, nor infringement of Federal, State, or Local regulations.

R. NEW SOURCE COMPLIANCE DEADLINE

New sources shall install and have in operating condition, and shall "start-up" all pollution control equipment required to meet applicable Pretreatment Standards before beginning to discharge. Within the shortest time feasible (not to exceed 90 days), New Sources must meet all applicable Pretreatment Standards.

S. APPLICABLE PENALTIES

The BPW has the authority to seek or assess civil or criminal penalties of up to $1,000 per day or the maximum allowable under State law for each violation by the permittee of the limitations and other requirements contained in this permit.

T. TERMINATION OF SERVICES

The BPW has the authority to terminate water and/or sewer service for violations of the local ordinance, or in emergency situations.

**PART V - REPORTING REQUIREMENTS**

A. SLUG CONTROL/SPILL PREVENTION PLAN

The permittee is required initially to submit and implement a Slug Control/Spill Prevention Plan (SC/SPP) in accordance with the local ordinance to provide protection against accidental discharges to the POTW, unless the permittee has received a written notification from the BPW exempting them from this requirement.

In addition, the permittee shall review and, if necessary, modify or update its SC/SPP and provide an updated copy to the BPW:

1. Every two (2) years and/or

2. Upon any substantial change in operation

B. DISCHARGE MONITORING REPORT

To confirm compliance with the permit limitations outlined in Part II of this permit and for calculation of any surcharges and/or Special Discharge Allocations applicable to the permittee's discharge, the permittee shall submit a Discharge Monitoring Report (DMR) at the frequency required by Part VI of this permit. The DMR shall consist of laboratory report(s) prepared by the laboratory(s) which performed analysis of the discharge. Laboratory reports shall contain at a minimum:

1. Collection date of sample

2. Analyses results listed with associated units, qualifiers (if any), dilution factors, test method, analyst, and test date.

3. Quality Control report showing quality control testing and associated results for the analyses performed.

4. Chain of Custody Form(s) for the sample(s) tested.

C. BASELINE MONITORING REPORT

Within 180 days after the effective date of a categorical Pretreatment Standard, or 180 days after the final administrative decision made upon a category determination submission under 40 CFR 403.6(a)(4), whichever is later, existing Industrial Users subject to such categorical Pretreatment Standards and currently discharging to or scheduled to discharge to the POTW shall be required to submit to the Control Authority a Baseline Monitoring Report in accordance with 40 CFR 403.12(b).

D. 90-DAY COMPLIANCE REPORT (90-DAY CR)

Categorical Industries must submit a 90-day Compliance Report to the BPW within 90 days following the date for final compliance with applicable Categorical Pretreatment Standards or, in the case of a New Source, within 90 days following the commencement of discharge. The report shall indicate the nature and concentration of all pollutants in the discharge from the regulated process which are limited by such standards and the average and maximum daily flow for these process units in the user facility which are limited by such pretreatment standards or requirements. Where equivalent mass or concentration limits are established by the BPW for a user, this report shall contain a reasonable measure of the user's long-term production rate. Where a user is subject to categorical pretreatment standards expressed in terms of allowable pollutant discharge per unit of production, the report shall include the user's actual production during the appropriate sampling period. The report shall state whether the applicable pretreatment standards are being met on a consistent basis and, if not, what additional O&M and/or pretreatment is necessary to bring the user into compliance with the applicable pretreatment standards. This statement shall be signed by an authorized representative of the user.

E. CONTINUING COMPLIANCE REPORTS (CCR)

In accordance with 40 CFR 403.12 (e) and the local ordinance, Categorical Industries shall, after the effective date of the permit, submit to the BPW, reports indicating the nature and concentration of pollutants in the effluent which are limited by the standards specified in Part II of the permit.

Data obtained through sampling and analysis reported in the CCR must be performed during the period covered by the CCR, and must be representative of conditions occurring during the reporting period. All analyses shall be performed in accordance with the methods indicated in 40 CFR Part 136 and amendments thereto.

If the permittee monitors any pollutant more frequently than required by this permit, in accordance with 40 CFR Part 136 or other EPA approved methods, the results of such monitoring shall be submitted with the applicable Continuing Compliance Report.

If sampling by the permittee indicates a violation of Part II of this permit, the permittee shall notify the BPW within 24 hours of becoming aware of the violation. The permittee shall also repeat the sampling and analysis and submit the results of the repeat analyses to the BPW within 30 days after becoming aware of the violation.

F. SEMIANNUAL COMPLIANCE REPORTS

In accordance with the local ordinance, Non-Categorical Significant Industrial Users shall, after the effective date of the permit, submit to the BPW, reports indicating the nature and concentration of pollutants in the effluent which are limited by the standards specified in Part II of the permit.

Data obtained through sampling and analysis reported in the Semiannual Report must be performed during the period covered by the Semiannual Report, and must be representative of conditions occurring during the reporting period. All analyses shall be performed in accordance with the methods indicated in 40 CFR Part 136 and amendments thereto.

If the permittee monitors any pollutant more frequently than required by this permit, in accordance with 40 CFR Part 136 or other EPA approved methods, the results of such monitoring shall be submitted with the applicable Semiannual Report.

If sampling by the permittee indicates a violation of Part II of this permit, the permittee shall notify the BPW within 24 hours of becoming aware of the violation. The permittee shall also repeat the sampling and analysis and submit the results of the repeat analyses to the BPW within 30 days after becoming aware of the violation.

G. MERCURY REDUCTION PLAN

To ensure that the maximum allowable mercury loading to the POTW is not exceeded, the BPW may require any nondomestic user with a reasonable potential to discharge mercury to develop, submit for approval and implement a Mercury Reduction Plan (MRP). The MRP may be required by permit if the nondomestic user has not violated the local limit for mercury, but the BPW has determined that a reasonable potential for such a violation may exist. MRPs may be required in notices of violations, orders or other enforcement actions when the nondomestic user has violated the mercury local limit. At a minimum, an approvable MRP shall contain the following:

1. A written commitment by the nondomestic user to reduce all nondomestic discharges of mercury to levels below the MDL within a time frame approved by the BPW;

2. Within 60 days of notification by the BPW that a MRP is required, The nondomestic user shall supply an initial identification of all potential sources of mercury which could be discharged to the POTW;

3. Specific strategies for mercury reduction with reasonable time frames for implementation, capable of ensuring that mercury discharges will be below the specified MDL within a time frame approved by the BPW;

4. A program for sampling and analysis of the nondomestic discharge for mercury in accordance with [EPA Method] 245.1 methods;

5. A demonstration of specific, measurable and/or otherwise quantifiable mercury reductions consistent with the goal of reducing mercury discharges below the specified MDL. Where such reductions cannot be demonstrated through normal effluent monitoring (e.g., mercury discharges are already near MDL), the demonstration should incorporate the following:

    a. Internal process monitoring, documenting the results of mercury reduction strategies at sampling locations within the facility (e.g., a program of regular monitoring of sink traps where mercury containing reagents had previously been disposed, but have since been substituted by non-mercury containing compounds).

    b. Internal and/or effluent sampling utilizing clean and/or ultra-clean sampling and analytical methods as referenced by USEPA federal register. Note that the results of such monitoring will not be used for compliance purposes unless performed in accordance with EPA Method 245.1 and collected at the appropriate compliance measurement location.

    c. Loading calculations wherein the nondomestic user calculates the total mass of mercury reduced from the sanitary sewer discharge through reagent substitutions, changes in disposal practices and/or other approved MRP strategies implemented.

6. A semiannual report on the status of the mercury reduction efforts. At a minimum, these reports shall:

    a. Identify compliance or noncompliance with specific reduction commitments in the MRP;

    b. Summarize the analytical, mass-based or other quantifiable demonstrations of mercury reductions performed to date;

    c. Provide all applicable analytical data;

    d. Provide an evaluation of the effectiveness of actions taken to date;

    e. Provide updates to the initial list of mercury containing compounds discharged to the sanitary sewer; and

    f. Propose for approval new strategies and/or modifications to the current MRP to continue and improve mercury reduction efforts.

7. Any other conditions that the BPW deems necessary to ensure that mercury reduction efforts are effective in achieving the goals of this section.

Failure to submit an approvable MRP within 30 days of the required due date shall constitute significant noncompliance in accordance with this section, and will result in publication as a significant violator, in addition to other possible enforcement action.

A MRP may be evaluated for adequacy at any time by the BPW. If such an evaluation determines that the mercury reduction plan is inadequate, or the nondomestic user has not complied with its approved MRP, the nondomestic user will be notified. Failure to comply with the MRP requirement constitutes noncompliance. The BPW will follow its enforcement response plan (ERP) to ensure that corrective actions are taken.

A nondomestic user may request a release from MRP requirements if (i) all samples of the discharge for a period of one year are less than the specified MDL; (ii) the nondomestic user has complied with the minimum monitoring frequency of quarterly sampling events; and (iii) the BPW deems that MRP commitments have been fulfilled sufficiently to ensure continued compliance with the mercury limitation. The BPW shall notify the nondomestic user of any release from MRP requirements in writing.

If the MRP requirement is waived by the BPW, the nondomestic user remains subject to the local limitation for mercury in accordance with the requirements of this section.

Rediscovery of mercury in the nondomestic user discharge subjects said user to the submission of a new MRP, or escalation of enforcement in accordance with the ERP.

H. NOTIFICATION OF DISCHARGE VIOLATION

The permittee shall notify the BPW at (616) 355-1250 immediately upon any discharge that is in violation of discharge permit conditions or that could cause problems to the POTW, including slug discharges as outlined in the local ordinance. The notification shall include:

1. The date, time, location and duration of the discharge;

2. The type of waste including concentration and volume; and

3. Any corrective actions taken by the permittee.

Within five days following such a discharge the permittee shall submit a written report describing the cause of the discharge and the measures that will be taken by the user to prevent similar future discharges. The permittee shall also repeat the sampling and analysis and submit the results of the repeat analyses to the BPW within 30 days after becoming aware of the violation.

I. UPSET OR UNANTICIPATED BYPASS

The permittee shall notify the BPW within 24 hours of the first awareness of an upset or unanticipated bypass experienced by the permittee of its treatment that places the discharge in a temporary state of noncompliance with wastewater discharge limitations contained in this permit or other limitations specified in the local ordinance. A written report shall be submitted to the BPW within five (5) days of the occurrence, containing the following information:

1. A description of the discharge and cause of noncompliance/bypass;

2. The period of noncompliance including exact dates and times or, if not corrected, the anticipated time the noncompliance/bypass is expected to continue; and

3. The steps being taken and/or planned to reduce, eliminate, and prevent recurrence of the noncompliance/bypass.

J. SIGNIFICANT CHANGE IN DISCHARGE OR SEWER USE

The permittee shall notify the BPW prior to the introduction of new wastewater or pollutants or any significant change in sewer use or characteristic of the wastewater being introduced into the Holland Area Water Reclamation Facility system from the permittee's processes. Formal written notification shall be submitted prior to such an introduction. Significant change in sewer use is defined as an increase in the concentrations of pollutants discharged of 20% over those reported on the Wastewater Discharge Disclosure Report, or the increase in discharge volume of 1000 gallons/day or more than 10% over that reported on the Baseline Monitoring report/Wastewater Discharge Disclosure Report, whichever is less.

Any change which would violate categorical pretreatment standards or local limits is prohibited.

K. HAZARDOUS WASTE DISCHARGE REPORTING REQUIREMENT

The permittee shall notify the BPW, The Michigan Department of Environmental Quality, and the U.S. EPA-Region V of any discharge into the POTW of a substance which is considered a hazardous waste under 40 CFR Part 261. Notification is required within six (6) months of the commencement of discharge of the hazardous substance, or within six (6) months of the listing date of the hazardous substance, whichever is later.

L. SUBMITTAL OF REPORTS

**All reports shall be submitted to the following address:**

Holland BPW
Pollution Control Division
625 Hastings Ave.
Holland, Michigan 49423

**PART VI - SPECIAL CONDITIONS/COMPLIANCE SCHEDULES**

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☑ C. Monthly Discharge Monitoring Report
On or before the 6th of each month, a surcharge monitoring report for the prior month is required for your facility as outlined in Part V.B of this permit.

☐

☑ E. Continuing Compliance Report
On January 15 and July 15 of each year, a Continuing Compliance Monitoring report as outlined in Part V.E of this permit is required for your facility.

☐

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☐

# Appendix C

## EGLE Conditional Approval Letter

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

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

August 25, 2021

VIA E-MAIL

Mr. Thomas Donohue, Senior Manager
Pfizer, Inc.
100 Route 206 North
Peapack, New Jersey 07977

Dear Mr. Donohue:

SUBJECT: Conditional Approval for Construction of Proposed Treatment System for Plant Site Extracted Groundwater - Treatment System and Discharge; Warner-Lambert Company LLC Former Manufacturing Facility; Holland, Michigan; MID 006 013 643; Waste Data System Number 393958

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Materials Management Division (MMD), has received the documents listed below (Documents) from Barr Engineering Co. (Barr) on behalf of Pfizer, Inc. (Pfizer), pertaining to their former manufacturing site (facility) located at 188 Howard Avenue, Holland, Michigan. These Documents were reviewed by the MMD to assess compliance with Part 111, Hazardous Waste Management, of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, and the administrative rules.

- Extracted Groundwater Treatment System (GWTS) Final (95%) Design Plans, dated March 7, 2021, and submitted to the MMD by Barr on April 8, 2021.

- Wastewater Discharge Permit Number HT-2021-WLC-24, initially authorized by the City of Holland's Board of Public Works (BPW) on May 27, 2021, with an effective date of June 1, 2021, and submitted to the MMD by Barr on June 8, 2021.

- Revised Wastewater Discharge Permit Number HT-2021-WLC-24, authorized by the City of Holland's BPW to be "activated upon request", and provided to the MMD by Barr on June 15, 2021.

The Documents pertain to Pfizer's letter of August 31, 2020, (Proposal) requesting modifications to the facility's approved Remedial Action Plan/Corrective Measures Implementation Plan (RAP/CMIP), and Post-Closure Plan (PCP). The RAP/CMIP and the PCP describe Pfizer's current post-closure and corrective action obligations.

In the Proposal and the Documents, Pfizer suggests changes to how contaminated groundwater extracted from within the Plant Site's hydraulic containment system would be managed. Specifically, Pfizer is proposing to shift from on-site deep well disposal to on-site pretreatment with subsequent discharge to the BPW's Holland Area Water

Reclamation Facility (WRF) sewer system. The on-site pretreatment of the extracted groundwater would consist primarily of a biologically active granular activated carbon treatment system.

Based on the MMD's review of the Documents, Pfizer may proceed with construction of the proposed on-site GWTS. However, prior to discharging to the BPW WRF's sewer system, Pfizer must:

1) Submit a request for formal modifications of the RAP/CMIP and the PCP. This request must include the revised sections of the RAP/CMIP and the PCP, for review by the MMD.

2) Provide an updated copy of the Wastewater Discharge Permit from the City of Holland's BPW, once activated. This updated copy must include the issued date, effective date, and the expiration date.

Should you have any questions regarding this matter, please contact me at 517-290-3813; BertapelleA1@Michigan.gov; or EGLE, MMD, P.O. Box 30241, Lansing, Michigan 48909-7741.

Sincerely,

Andrew Bertapelle, Environmental Engineer
Permit and Corrective Action Unit
Hazardous Waste Section
Materials Management Division
517-290-3813

cc: Mr. Allen Reilly, Senior Environmental Scientist, Barr
Ms. Kimberly Tyson, EGLE
Mr. Fred Sellers, EGLE
Mr. Dale Bridgford, EGLE
Mr. Art Ostaszewski, EGLE
Ms. Nicole Sanabria, EGLE
Corrective Action File

# Appendix D

## Operation, Maintenance, and Monitoring (OM&M) Plan

# Groundwater Water Treatment System

## *Operation and Maintenance Manual*

Prepared for

Pfizer

**Revision History**

| Revision | By | Date | Description |
|---|---|---|---|
| A | LEH | 4/21/2022 | Original issue |

**Certifications**

| Document Owner: |
|---|
| _____ |

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# Groundwater Water Treatment System O&M Manual

## Contents

## List of Tables

# List of Attachments

# Abbreviations

| | |
|---|---|
| BPW | Board of Public Works |
| GAC | granular activated carbon |
| GWTS | Groundwater treatment system (GWTS) |
| HCS | hydraulic containment system |
| HDPE | high-density polyethylene |
| EGLE | Michigan Department of Great Lakes and the Environment |
| MSU | Michigan State University |
| POTW | publicly owned treatment works |
| PPE | personal protective equipment |
| UIC | Underground Injection Control |
| VOC | volatile organic constituent |

# 1 Introduction

This document describes the operation, maintenance, and monitoring of a groundwater treatment system (GWTS) at the Warner-Lambert Company's former manufacturing site in Holland, Michigan (the site).

## 1.1 Site History

The site is located at 188 Howard Avenue in Holland Charter Township, Ottawa County, Michigan. It was used to manufacture a wide array of final and intermediate pharmaceuticals between 1950 and 2007. Buildings and structures associated with pharmaceutical manufacturing operations were removed between 2007 and 2009, except for a research and development (R&D) facility. This facility, located in the northwestern corner, was separated from the plant site and donated to Michigan State University (MSU). It remains in use today.

Groundwater at the site is extracted as part of a hydraulic containment remedy installed in 2010. The hydraulic containment system (HCS) was implemented to prevent venting of site groundwater to the adjacent Macatawa River. The extracted groundwater is disposed of through two deep injection wells (permitted through federal Underground Injection Control [UIC] regulations) or the publicly owned treatment works (POTW) of the Holland Board of Public Works (BPW).

## 1.2 Regulatory Framework

The GWTS was implemented according to the facility's corrective action obligations under Part 111 ("Hazardous Waste Management") of 1994 Michigan PA 451, as amended (Part 111 of Act 451) and in conjunction with appropriate discharge permitting and associated regulations established under Part 31 of Act 451.

Discharge of pre-treated water to the Holland POTW is conducted following Permit No. HT-2021-WLC-24 issued by the Holland BPW.

## 1.3 Groundwater Constituents of Concern

The distribution of chemical constituents in soil and groundwater at the site has been determined through numerous investigative phases. These investigations indicate that chemical constituents in soil and groundwater are distributed in a complex and heterogeneous manner due to greater than 100 years of historical industrial activity at the site (Horizon Environmental, Final Remedial Action Plan/Corrective Measures Implementation Plan, 2014). Volatile organic constituents (VOCs), including chlorobenzene and benzene, are the primary constituents of concern in site groundwater.

## 1.4 Description of Site Remedy

The HCS remedy consists of a subsurface groundwater flow barrier and surface cap and a groundwater extraction, treatment, and injection system. Groundwater is (1) extracted from wells within the groundwater flow barrier, (2) treated via filtration in Building 91 to remove suspended solids, (3) injected

into one of two on-site deep wells or treated via the GWTS described in this document, and (4) discharged to the Holland BPW.

The GWTS described in this manual provides a groundwater disposal alternative to deep injection wells. With this system, water is managed through on-site pretreatment and discharged to the Holland BPW POTW. The GWTS supplements the existing deep wells, with the option to dispose of extracted groundwater through either method.

## 1.5 Purpose and Scope of Pretreatment Operations

Groundwater continues to be extracted from the site using the existing shallow extraction wells. Table 1-1 summarizes components of the GWTS.

**Table 1-1 Treatment System Element Purpose**

| Element | Purpose |
|---|---|
| Raw water storage tanks | Equalize flow from the shallow extraction wells |
| Rapid mix tank | Increase dissolved oxygen and mix caustic to increase pH |
| Flocculation/Clarifier tank | Form large particles and separate solids from water |
| Sludge holding tank | Store sludge from the clarifier |
| Filter press | Dewater sludge for solids landfill disposal |
| Clarifier overflow tank | Equalize flow to be pumped into the GAC vessels |
| Multi-media pressure vessel | Remove particulates |
| Granulated activated carbon (GAC) vessels | Removal of organic constituents |

## 1.6 Health and Safety Requirements

A "No-Dig Area" on the former site is in effect. Excavation and construction activities below the high-density polyethylene (HDPE) liner are prohibited in the No-Dig Area without prior approval from the Michigan Department of Great Lakes and the Environment (EGLE), formerly the Michigan Department of Environmental Quality. GWTS construction and start-up activities will be conducted following EGLE regulations. Contact your health and safety staff for rules, regulations, training requirements, documentation requirements, and other details before any planned digging.

GWTS operation will include the following health and safety precautions:

- Per the 29 CFR 1910.120, operators will have 40 hours of training with up-to-date annual refreshers.
- Follow 29 CFR 1910.120 for information regarding federal health and safety requirements applicable to hazardous waste sites
- Appropriate personal protective equipment (PPE) will be worn for the specific job and may include steel-toed boots, nitrile gloves, safety glasses, and splash shields.
- Do not conduct any work that would excavate or otherwise impair the HPDE geomembrane liner.

# 2 Publicly Owned Treatment Works (BPW) Discharge Permit Requirements

## 2.1 General Permit Requirements

The BPW discharge permit regulates the discharge of water extracted from the HCS and treated through the GWTS. This section summarizes specified discharge requirements. For additional details, see the full permit included in Attachment G.

## 2.2 Numerical Permit Limits

Table 2-1 summarizes pretreatment permit limits for the Holland BPW discharge permit.

**Table 2-1 Pretreatment Permit Limits**

| Discharge Parameter | Daily Minimum Concentration | Daily Maximum Concentration | Daily Maximum Loading | Sample Frequency | Sample Type |
|---|---|---|---|---|---|
| Chemical Oxygen Demand (COD) | -- | 2,000 mg/L | 80 lbs/day | n/a | Composite |
| Total Suspended Solids (TSS) | -- | 1,400 mg/L | 100 lbs/day | n/a | Composite |
| Total Phosphorus (P) | -- | 40 mg/L | 1 lb/day | n/a | Composite |
| Grease and Oil (G&O) | -- | 150 mg/L | 5 lbs/day | n/a | Composite |
| pH | 6.0 S.U. | 11.0 S.U. | -- | n/a | Grab |
| Benzene | -- | 0.16 mg/L | -- | One sample/ month | Grab |
| Chlorobenzene | -- | 1.7 mg/L | -- | One sample/ month | Grab |
| Perfluorooctanoic acid (PFOA) | -- | 12,000 ppt | -- | One sample/ month | Grab |
| Perfluorooctane sulfonic acid (PFOS) | -- | 12 ppt | -- | One sample/ month | Grab |

## 2.3 Monitoring Requirements

Specific monitoring requirements from the permit are summarized below:

- All samples shall be collected from the designated monitoring point location
- Grab samples: single sample taken at neither a set time nor flow
- Composite samples: a 24-hour composite sample with the sample volume proportional to the discharge flow

- For each sample or measurement taken at the monitoring point, the following information must be recorded:
    - Place, date, time, and method of sampling
    - Name of person taking the sample
    - Date analyses were performed
    - Person(s) who performed the analysis
    - Analytical techniques or methods used
    - Results

In addition to sampling to be completed by Pfizer, composite discharge monitoring samples will periodically be collected by the Holland BPW and Holland Charter Township, which operates the sanitary sewer system at the point of discharge. The sampling manhole near the property boundary was designed to facilitate easy flow readouts and the ability to store a composite sampler and connect it to the flow meter for flow-weighted composite sampling. Both entities will be provided with access to this manhole as well as the flow readout located inside. Operators can also collect confirmatory samples as needed from the same location or inside the GWTS building.

## 2.4 Reporting Requirements

Table 2-2 summarizes routing reporting requirements.

**Table 2-2 Routine Reporting Requirements to BPW**

| Requirement | Frequency/Duration | Due Dates |
|---|---|---|
| Slug Control/Spill Prevention Plan | Initially and review every two years and/or upon any substantial change in operation | Initially and every two years after |
| Toxic Organic Management Plan (TOMP) Certification Statement | once / six months | January 15 and July 15 |
| Continuing Compliance Report | once / six months | January 15 and July 15 |
| Discharge Monitoring Report (DMR) | once / month | On of before 6th of the month for the prior month |
| Operation and maintenance records | Retain for at least 3 years | N/A |
| Retain monitoring, sampling, and chemical analysis records | Retain for at least 3 years | N/A |

Additional reporting requirements include:

- All reports shall be signed by a principal executive officer or designee

- Notify BPW in the event of:
    - Notification of Discharge Violation (NOV)
    - Upset or unanticipated bypass
        - Notify the BPW within 24 hours of the first awareness. See Attachment G for the full requirement.
    - A significant change in discharge
    - Hazardous waste discharge

# 3 Description of Groundwater Extraction and Pretreatment Operations & Maintenance

## 3.1 Extraction Wells

A series of five groundwater extraction wells are spaced around the southern perimeter of the facility. Each well is equipped with a submersible pump and a calibrated level transmitter to provide groundwater elevation information to the PLC. The level signal is used to ensure that the wells do not have excessive drawdown that could damage the pump. To prevent freezing, the extraction well pumps are connected to the forcemain below ground by means of a pitless adaptor assembly. The extraction well logs are provided as Attachment E. Groundwater from each of the extraction wells is conveyed to Building 91 by a dedicated buried forcemain. Inside Building 91, each forcemain is equipped with a flow indicating transmitter and an automatic flow control valve to indicate and regulate flow.

## 3.2 Pretreatment Process Equipment

Operators should conduct maintenance activities with appropriate PPE. At start-up, operators should check that manual values on the input and output lines to the tank, vessel, or pump are in their normal operating position. At shutdown, operators should check that manual values on the input and output lines to the tank, vessel, or pump are in their closed position to isolate the piece of equipment.

**Table 3-1 Summary of maintenance requirements by process equipment type**

| Equipment | Maintenance Item | Frequency | Description |
|---|---|---|---|
| Tanks and vessels | Visual inspection | Annual | Visually interior, outside tank walls and foundation |
| | Solids removal and cleaning | Based on visual inspection | Drain, clean, and remove solids that are present in sufficient quantities to impact tank functionality. |
| | Integrity inspection | Based on visual inspection | Further assess condition for corrosion, leaks, cracks, damage, pitting, etc. |
| | Ventilation inspection | Annually or less | Visually inspect the ventilation on the tank for obstructions or structural damage. |
| Agitators | Agitator gearbox and motor preventative maintenance | As noted in Attachment A | The gearbox and motor should be maintained and have parts replaced according to the schedules in Attachment A |
| GAC vessels | Carbon changeout | Based on monitoring results | Replace the carbon in the GAC vessel. |
| Pumps | Bearing and motor preventative maintenance | As noted in Attachment A | The bearings and motor should be maintained and have parts replaced according to the schedules in Attachment A |
| Process Piping | Line inspection | As dictated by pressure drop | Isolate, drain, and inspect lines |
| Process Piping | Line cleaning | Based on line inspection | Flush, jet or mechanically clean process lines to restore service |

For a list of operator adjustable set points by equipment type, see Attachment A.

### 3.2.1 Raw Water Tank

The raw water tank stores incoming water from the existing groundwater extraction system and supplies water to downstream pretreatment processes. The raw water tank receives water from the extraction wells through the well water supply header during normal operation. Water is pumped out of the raw water tank by a pump that directs water to the rapid mix tank. The water level in the tank is measured and controlled by a level transmitter, an operator adjustable setpoint, and a downstream flow control valve. The headspace of the raw water tank is passively vented outside the treatment building.

The raw water tank has the following inputs:

- The well water supply header
- The treated water recycle

The raw water tank has the following outputs:

- Rapid mix tank
- Overflow to floor trench
- Drain to floor trench

For equipment-specific operation and maintenance manuals, see Attachment C. The raw water tank has the following equipment and instrumentation associated with it:

- Rapid mix feed pump
- Flow control valve
- Raw water tank level transmitter

### 3.2.2 Rapid Mix Tank

Water is pumped from the raw water tank to the rapid mix tank. Water is pumped out of rapid-mix tank by a pump that directs water to the process clarifier. The water level in the tank is measured and controlled by a level transmitter, operator adjustable setpoints, and downstream flow control valve and pump. A caustic is used to raise the pH to facilitate iron oxidation. Caustic is fed into the process line between the raw water tank and the rapid mix tank by a positive-displacement chemical feed pump.

The caustic pumping rate is controlled by the pH probe and flow meter between the raw water tank and the rapid mix tank to achieve an operator-designated pH. If the pH is above a certain pH, the pumping rate will be controlled by the pH probe downstream of the rapid mix tank until the pH falls below the setpoint. See Attachment A for full details.

The rapid mix tank is equipped with a mechanical agitator to increase dissolved oxygen in the water. This facilitates the oxidation of iron and volatilization of VOC compounds. The rapid mix tank has an active ventilation system to remove liberated odors and compounds from the headspace above the tank.

The rapid mix tank has the following inputs:

- Raw water tank
- Building sump

The rapid mix tank has the following outputs:

- Process clarifier
- Overflow to floor trench
- Drain to floor trench
- Grab sample line for process sampling at the tank ahead of the upstream pH probe and after the downstream pH probe

For equipment-specific operation and maintenance manuals, see Attachment C. The rapid mix tank has the following equipment and instrumentation associated with it:

- Rapid mix agitator
- Rapid mix feed pump
- Process clarifier feed pump
- Flow control valve
- Exhaust fan
- Rapid mix level transmitter
- pH probes (upstream and downstream)
- Caustic metering pump (downstream)
- Coagulant metering pump (downstream)

### 3.2.3 Process Clarifier

The process clarifier settles particles in process water from the rapid mix tank, provides clarified effluent to the clarifier overflow tank and provides underflow to the sludge holding tank. The process clarifier also has a sludge recycle pump to return sludge to the unit. The process clarifier is equipped with a mechanical agitator to facilitate flocculation.

Coagulant is fed into the process line between the rapid mix tank and the process clarifier by a positive-displacement chemical feed pump. Flocculant fed to the clarifier by a positive-displacement chemical feed pump.

The process clarifier has the following inputs:

- Coagulant (upstream)
- Polymer flocculant
- Flow from the rapid mix tank
- Sludge recycle line
- Pressure relief on sludge line

The process clarifier has the following outputs:

- Gravity overflow to the clarifier overflow tank
- Underflow to the sludge holding tank
- Grab sample line for process sampling

For equipment-specific operation and maintenance manuals, see Attachment C. The process clarifier has the following equipment and instrumentation associated with it:

- Agitator
- Process clarifier feed pump
- Process clarifier flow control valve
- Process clarifier sludge pump
    - Grab sample line for sludge sampling is located on the pipe between the sludge pump and sludge holding tank
- Process clarifier sludge control valve
- Service water flush control valve

### 3.2.4 Clarifier Overflow Tank

The clarifier overflow tank holds treated clarifier effluent, which is fed into the tank by gravity during normal operation. A pump pumps water out of the clarifier overflow tank to the multi-media pressure filter.

The clarifier overflow tank has the following inputs:

- Process clarifier effluent
- Upstream pump return

The clarifier overflow tank has the following outputs:

- Multi-media pressure filter
- Overflow to floor trench
- Drain to floor trench
- Grab sample line for process sampling

For equipment-specific operation and maintenance manuals, see Attachment C. The rapid mix tank has the following equipment and instrumentation associated with it:

- Multi-media pressure filter feed pump
- Clarifier overflow tank level transmitter

### 3.2.5 Multi-media Pressure Filter Skid

The multi-media pressure filter feed pump directs water through the multi-media pressure filter and then to the GAC vessels. The multi-media pressure filter (MMPF) skid has a single vessel that contains filtration

media. The multi-media pressure filter receives process water from the clarifier overflow tank and removes constituents from the process water before it is directed to the GAC vessels.

Backwash operation of the multi-media pressure filter is initiated by the following:

- An operator-adjustable high differential pressure setpoints across the multi-media pressure filter
- An operator adjustable setpoint for maximum time between backwashes and an adjustable setpoint for the length of backwash for the multi-media pressure filter

During backwash operation, the multi-media pressure filter feed pump is shut off, and water is routed from the backwash supply tank to the multi-media pressure filter and into the backwash holding tank.

The multi-media pressure filter skid has the following inputs:

- Water from the clarifier overflow tank
- Backwash water from the backwash supply tank

The multi-media pressure filter skid has the following outputs:

- Water to the GAC vessels
- Backwash line to the backwash holding tank
- Grab sample line for process sampling after the vessel

### 3.2.6 Granular Activated Carbon (GAC) Pressure Vessel Skid

The GAC pressure vessel skid has two vessels that contain GAC. The GAC vessels receive process water from the multi-media pressure filter and remove constituents from the process water before it is directed to the treated water tank.

The GAC pressure vessel skid can direct flow in series, parallel, duty-standby, forward, or reverse with either vessel in the lead position. Process flow from the GAC vessels can also be routed around the treated water tank and sent straight to the composite sampler and the POTW by a manual valve.

Backwash operation on the GAC vessels is initiated by the following:

- An operator-adjustable high differential pressure setpoints across the GAC vessels.
- An operator adjustable setpoint for maximum time between backwashes and an adjustable setpoint for the length of backwash for each GAC vessel

During backwash operation, the multi-media pressure filter feed pump is shut off, and water is routed from the backwash supply tank to the GAC vessels and into the backwash holding tank.

The GAC pressure vessel skid has the following inputs:

- Multi-media pressure filter
- Backwash water from the backwash supply tank

The GAC pressure vessel skid has the following outputs:

- Process flow line to the treated water tank
- Backwash line to the backwash holding tank
- Grab sample line for process sampling after each GAC vessel

### 3.2.7 Treated Water Tank

The treated water tank holds water from the GAC vessels and backwash clarifier effluent. The treated water tank receives water from the GAC vessels during normal operation. When the system is backwashing, the GAC effluent temporarily stops, and the backwash clarifier effluent gravity flows into the treated water tank.

A pump pumps water out of the treated water tank to the discharge point. A composite sampler is located along this pipe to pull samples from the effluent.

The treated water tank has the following inputs:

- GAC vessel effluent
- Backwash clarifier effluent
- Upstream pump return

The treated water tank has the following outputs:

- Treated water discharge point via discharge pump
- Overflow to floor trench
- Drain to floor trench
- Grab sample line for process sampling

For equipment-specific operation and maintenance manuals, see Attachment C. The treated water tank has the following equipment and instrumentation associated with it:

- Treated water discharge pump
- Treated water tank level transmitter

### 3.2.8 Backwash Supply Tank

The backwash supply tank provides potable water storage for the backwash process. Water is pumped out of the backwash supply tank by a pump that directs water to either the multi-media pressure filter or GAC vessels during a backwash sequence.

A reducing agent is used to dechlorinate potable water for the backwash process. The reducing agent is proportionally fed into the backwash line downstream of the backwash supply tank by a positive-displacement chemical feed pump.

The backwash supply tank has the following inputs:

- Potable water line header
- Reducing agent chemical feed (downstream)

The backwash supply tank has the following outputs:

- Backwash flow line to the multi-media pressure filter and the GAC vessels
- Overflow to floor trench
- Drain to floor trench

For equipment-specific operation and maintenance manuals, see Attachment C. The backwash water tank has the following equipment and instrumentation associated with it:

- Backwash supply pump
- Backwash supply tank level transmitter

### 3.2.9 Backwash Holding Tank

The backwash holding tank stores backwash water from the GAC vessels and the multi-media pressure vessel from a backwash sequence and supplies water to the backwash clarifier. A pump pumps water out of the backwash holding tank to the backwash clarifier. The backwash tank is equipped with a mechanical agitator to keep solids from settling.

The backwash holding tank has the following inputs:

- Backwash from the GAC vessels
- Backwash from the multi-media pressure filter
- Building Sump 1

The backwash holding tank has the following outputs:

- Backwash flow line to the backwash clarifier
- Overflow to floor trench
- Drain to floor trench
- Grab sample line for process sampling

For equipment-specific operation and maintenance manuals, see Attachment C. The backwash water tank has the following equipment and instrumentation associated with it:

- Backwash clarifier feed pump
- Backwash holding tank agitator
- Backwash holding tank level transmitter

### 3.2.10 Backwash Clarifier

The backwash clarifier settles particles in the backwash water from the GAC vessels, and the multi-media pressure filter provides clarified effluent to the treated water tank by gravity and underflow is pumped to the sludge holding tank.

The backwash clarifier has the following inputs:

- Backwash flow line from the backwash holding tank
- Pressure relief on sludge line

The process clarifier has the following outputs:

- Gravity overflow to the treated water tank
- Underflow to the sludge holding tank
    - Grab sample line for sludge sampling is located on the pipe between the sludge pump and sludge holding tank
- Grab sample line for process sampling

For equipment-specific operation and maintenance manuals, see Attachment C. The process clarifier has the following equipment and instrumentation associated with it:

- Agitator
- Backwash clarifier feed pump
- Backwash clarifier sludge pump
    - Grab sample line for sludge sampling is located on the pipe between the sludge pump and sludge holding tank
- Backwash clarifier sludge control valve
- Service water flush control valve

### 3.2.11 Sludge Holding Tank

The sludge holding tank receives underflow from the process and backwash clarifiers. Solids are pumped to the filter press. The sludge holding tank is equipped with a mechanical agitator.

The sludge holding tank has the following inputs:

- Underflow from the process clarifier
- Underflow from the backwash clarifier
- Upstream pressure relief return

The sludge holding tank has the following outputs:

- Thickened solids flow to the filter press
- Overflow to floor trench
- Drain to floor trench

- Grab sample line for process sampling

For equipment-specific operation and maintenance manuals, see Attachment C. The backwash water tank has the following equipment and instrumentation associated with it:

- Backwash clarifier sludge pump
- Process clarifier sludge pump
- Agitator
- Sludge holding tank level transmitter

### 3.2.12 Filter press

The filter press dewaters thickened solids from the sludge holding tank. The filter press feed pump is hand-operated and used to remove the sludge volume from the sludge tank on a regular as-needed basis to fill the filter press. After the filter press finishes a run, the plates are opened, and the solids are emptied into a dumpster. This dumpster should be emptied on a regular basis as needed. The polymer dose should be adjusted to ensure the solids do not contain liquid and can pass a paint filter test as required by the waste hauler.

The filter press has the following inputs:

- Thickened solids from the sludge holding tank

The filter press has the following outputs:

- Filtrate to building sump to the rapid-mix tank
- Dewatered solids to the dumpster cart

### 3.2.13 Process Pumps

#### Operation and Maintenance Requirements

Table 3-2 describes the process pumps and associated interlocks in the system.

**Table 3-2 – Process Pumps and Interlocks**

| Pump Name | Type | Description | Interlocks |
|---|---|---|---|
| Rapid mix tank feed pump | Centrifugal | Pumps from the raw water tank to the rapid-mix tank | Raw water tank level<br>Downstream high-pressure switch<br>Flow control valve |
| Process clarifier feed pump | Centrifugal | Pumps from the rapid mix tank to the process clarifier | Rapid mix tank level<br>Downstream high-pressure switch<br>Flow control valve<br>Control valve on service water flush line |
| Multi-media pressure filter feed pump | Centrifugal | Pumps from the clarifier overflow tank to the multi-media pressure vessel and GAC vessels | Clarifier overflow tank level<br>Downstream high-pressure switch |
| Backwash clarifier feed pump | Centrifugal | Between the backwash holding tank and the backwash clarifier | Backwash holding tank level<br>Downstream high-pressure switch |
| Treated water discharge pump | Centrifugal | Between the treated water tank and the system discharge to the POTW | Treated water tank level<br>Downstream high-pressure switch |
| Backwash supply pump | Centrifugal | Between the backwash supply tank and the MMPF and GAC vessels | Backwash supply tank level<br>Backwash holding tank level<br>Downstream high-pressure switch<br>Differential pressure switches on multi-media pressure filter and GAC skids |
| Process clarifier sludge bleed pump | Positive Displacement | Between the underflow of the process clarifier and the sludge holding tank | Sludge holding tank level<br>Control valve on sludge line<br>Control valve on sludge service water flush line |
| Backwash clarifier sludge bleed pump | Positive Displacement | Between the underflow of the backwash clarifier and the sludge holding tank | Sludge holding tank level<br>Control valve on sludge line<br>Control valve on sludge service water flush line |
| Filter press feed pump | Positive Displacement | Between the sludge holding tank and the filter press | Control valve on sludge line<br>Control valve on sludge service water flush line<br>Sludge holding tank level |
| Process clarifier sludge recycle pump | Positive Displacement | On the process clarifier | None |
| Building sump 1 | Submersible | Building washdown to the backwash holding tank | Sump pump float switch |
| Building sump 2 | Submersible | Filter press to the rapid-mix tank | Sump pump float switch |
| Caustic feed pump | Positive Displacement | From the caustic container to the pipe upstream of the rapid mix tank | Rapid Mix Tank Feed pH Probe<br>Process Clarifier Feed pH Probe<br>Process flow meter |
| Coagulant feed pump | Positive Displacement | From the chemical container to the pipe upstream of the process clarifier | Process flow meter |
| Reducing agent feed pump | Positive Displacement | From the chemical container to the pipe downstream of the backwash supply tank | Backwash flow meter |

**Table 3-2 – Process Pumps and Interlocks (cont'd)**

| Pump Name | Type | Description | Interlocks |
|---|---|---|---|
| Process clarifier polymer feed pump | Positive Displacement | From the chemical container to the process clarifier | Process flow meter |
| Backwash clarifier polymer feed pump | Positive Displacement | From the chemical container to the pipe upstream of the backwash clarifier | Clarified backwash flow meter |
| Filter press polymer feed pump | Positive Displacement | From the chemical container to the filter press | Filter press feed pump |

### 3.2.14 Chemical injection Systems

The chemical injection systems consist of a pump and calibration column for the following systems:

- Caustic
- Coagulant
- Reducing agent

A chemical injection system consisting of a pump, calibration column, and inline mixer for the following systems:

- Process clarifier polymer
- Backwash clarifier polymer
- Filter press polymer

Operators should conduct maintenance activities with appropriate PPE.

At start-up, operators should check that manual values on the input and output lines to the chemical pump and calibration column are in their normal operating position. Operators should also check that the chemical containment for the caustic system is functional and empty. Operators should check that there is a sufficient volume of caustic in the chemical container.

During normal operation, operators should check to see that the pump runs as directed. A calibration column is located ahead of the pump so the flow rate can be checked. At shutdown, operators should follow lockout tagout procedures to de-energize mechanical equipment and seal chemical containers as necessary.

Troubleshooting should follow the steps outlined in Attachment C for the relevant chemical feed system.

Maintenance activities on the pump should follow the schedules outlined in Attachment A for the relevant chemical feed system.

## 3.3 Instrumentation and Controls

The operation of instrumentation and control equipment should follow the specific start-up and shut down procedures as outlined in Attachment C. Troubleshooting for system controls should follow steps outlined in Attachment C.

Table 3-3 summarizes major maintenance activities for the instrumentation and controls equipment.

**Table 3-2 Instrumentation and Controls Systems Maintenance Activities**

| Instrument or Control Equipment | Maintenance Item | Frequency | Description |
|---|---|---|---|
| • Flow meters<br>• pH probes<br>• Level indicators | Element cleaning | Annually or in accordance with manufacturer's recommendations | Clean element in accordance with Attachment A and C |
| pH probes | Calibration | Monthly or as-needed | Calibrate pH element in accordance with Attachment C |
| • Flow meters<br>• Level indicators | Calibration | As-needed | Calibrate pH elements in accordance with Attachment C |
| • Control valves<br>• Flow control valves<br>• Flow meters<br>• pH probes<br>• Level indicators<br>• Pressure indicators<br>• Pressure Switches | Visual inspection | Annually or in accordance with manufacturer's recommendations | Visually inspect the instrument or control element for corrosion or visible damage. |

Maintenance activities for the flow meters, pH probes, and level indicators should coincide with system shutdowns for tank or other equipment maintenance. Flow meters and level indicators should be calibrated as required based on operator feedback. Additional maintenance activities on the instrumentation and control equipment should follow the schedules outlined in Attachment A.

### 3.3.1 Control Valves

Control valves should be exercised regularly to avoid seizing. See Attachment C for troubleshooting and manufacturer-recommended maintenance. Table 3-4 summarizes control valve operations.

**Table 3-3 Control Valves Operations Summary**

| Name | Location | Interlocks |
|---|---|---|
| Service water flush control valve 1 | Service water flush line between the rapid mix tank and process clarifier | Process clarifier feed pump |
| Service water flush control valve 2 | Service water flush line on the process clarifier sludge line | Process clarifier sludge bleed pump |
| Process clarifier sludge control valve | Process clarifier sludge line | Process clarifier sludge bleed pump |
| Multi-media pressure filter vessel skid control valves | Multi-media pressure filter vessel skid influent, bypass and backwash | Backwash supply pump |
| GAC vessel skid control valves | GAC vessel skid influent, bypass, backwash, alternative flow routing | Backwash supply pump |
| Service water flush control valve 3 | Service water flush line on the backwash clarifier sludge line | Backwash clarifier sludge bleed pump |
| Backwash clarifier sludge control valve | Backwash clarifier sludge line | Backwash clarifier sludge bleed pump |
| Service water flush control valve 4 | Service water flush line on the filter press feed line | Filter press feed pump |
| Backwash supply tank control valve | Potable water line header to the backwash supply tank | None |

### Normal Operation

All control valves in the system are closed in normal operation with the exception of valves on the multi-media pressure filter and GAC vessel skids which may be set to various positions by an operator.

## 3.3.2 Flow Control Valves

Control valves should be exercised regularly to avoid seizing. See Attachment C for troubleshooting and manufacturer-recommended maintenance. Table 3-5 summarizes flow control valve operation.

**Table 3-4 Flow Control Valves Operations Summary**

| Name | Location | Interlocks |
|---|---|---|
| Rapid Mix Tank Feed Pump FCV | Downstream of the raw water tank | Rapid mix tank feed pump |
| Process Clarifier Feed Pump FCV | Downstream of the rapid mix tank | Process clarifier feed pump |

### Normal Operation

All flow control valves in the system are throttled by control action to maintain the water level in the upstream tank.

## 3.3.3 Flow meters

Flow meters should be cleaned at the same time as the pipe they are associated with is cleaned or if otherwise warranted by potentially anomalous flow rate measuresments. See Attachment C for troubleshooting and manufacturer-recommended maintenance. Table 3-6 summarizes flow meter operation.

**Table 3-5 Flow Meters Operations Summary**

| Name | Location | Controls | Alarms |
|---|---|---|---|
| Rapid Mix Tank Feed Line Flowmeter | Downstream of the raw water tank | Caustic chemical feed pump | Rapid Mix Tank Feed Line Flowmeter Low Flow Condition |
| | | | Instrument out of Range |
| Process Clarifier Feed Line Flowmeter | Downstream of the rapid mix tank | • Coagulant chemical feed pump<br>• Process polymer feed pump | Process Clarifier Feed Line Flowmeter Low Flow Condition |
| | | | Instrument out of Range |
| Treated Water Tank Feed Line Flowmeter | Downstream of the GAC vessels | Multi-Media Pressure Filter Feed pump | Treated Water Tank Feed Line Flowmeter Low Flow Condition |
| | | | Instrument out of Range |
| Backwash Clarifier Feed Line Flowmeter | Downstream of the backwash holding tank | Backwash polymer feed pump | None |
| Discharge Line Flowmeter | Downstream of the treated water tank | Treated water discharge pump | Discharge Line Flowmeter Low Flow Condition |
| | | | Instrument out of Range |
| Backwash Line Flowmeter | Downstream of the backwash supply tank | Backwash supply pump | Backwash Line Flowmeter Low Flow Condition |
| | | | Instrument out of Range |

### 3.3.4 pH probes

pH probes should be calibrated according to schedules in Attachment A and according to the manufacturer's recommendations in Attachment C. The calibration levels should be chosen to span the pH range that the pH probe experiences during normal operation. The system actions are described in the process equipment section. Table 3-7 summarizes pH operation.

**Table 3-6 pH Indicators Operations Summary**

| Name | Location | Controls | Alarms |
|---|---|---|---|
| Rapid Mix Tank Feed pH Probe | Downstream of the raw water tank | Caustic feed pump | Instrument out of Range |
| Process Clarifier Feed pH Probe | Downstream of the rapid mix tank | Caustic feed pump | Instrument out of Range |

### 3.3.5 Level Indicators

Level indicators should be calibrated upon start-up and as-needed during normal operations according to the manufacturer's recommendations in Attachment C. The system actions are described in the process equipment section. Table 3-8 summarizes level indicator operations.

**Table 3-7 Level Indicators Operations Summary**

| Name | Location | Controls | Alarms |
|---|---|---|---|
| Raw Water Tank Level Sensor | Raw water tank | Rapid Mix Tank Feed Pump FCV | Raw Water Tank High Level |
| | | | Raw Water Tank Low Level |
| | | | Instrument out of Range |
| Rapid Mix Tank Level Sensor | Rapid mix tank | Process Clarifier Feed Pump FCV | Rapid Mix Tank High Level |
| | | | Rapid Mix Tank Low Level |
| | | | Instrument out of Range |
| Clarifier Overflow Tank Level Sensor | Clarifier overflow tank | Multi-Media Pressure Filter feed pump | Clarifier Overflow Tank High Level |
| | | | Clarifier Overflow Tank Low Level |
| | | | Instrument out of Range |
| Treated Water Tank Level Sensor | Treated water tank | Treated water discharge pump | Treated Water Tank High Level |
| | | | Treated Water Tank Low Level |
| | | | Instrument out of Range |
| Backwash Supply Tank Level Switches | Backwash supply tank | Backwash supply tank CV | Backwash Supply Tank Low Level |
| Backwash Holding Tank Level Sensor | Backwash holding tank | • Backwash clarifier feed pump<br>• Backwash supply pump | Backwash Holding Tank High Level |
| | | | Backwash Holding Tank Low Level |
| | | | Instrument out of Range |
| Sludge Holding Tank Level Sensor | Sludge holding tank | • Filter press feed pump<br>• Backwash clarifier sludge bleed pump<br>• Process clarifier sludge bleed pump | Sludge Holding Tank High Level |
| | | | Instrument out of Range |
| Chemical Container Level Switches | Chemical containers | Caustic, coagulant, reducing agent, polymer make down chemical feed pumps | Associated chemical container low level |
| Sump Level Switches | Building sumps | Building Sumps 1 and 2 | None |

### 3.3.6 Pressure Indicators

Pressure indicators should be calibrated upon start-up and as-needed during normal operations according to the manufacturer's recommendations in Attachment C. Table 3-9 summarizes pressure indicator operation.

**Table 3-8 Pressure Indicators Operations Summary**

| Name | Location | Alarms | System Action |
|---|---|---|---|
| Caustic PIT | Discharge line of the caustic chemical feed line | High-Pressure Chemical Feed Line Condition | Remote indication of system malfunction |
| Coagulant PIT | Discharge line of the coagulant chemical feed line | High-Pressure Chemical Feed Line Condition | Remote indication of system malfunction |
| Reducing agent PIT | Discharge line of the reducing agent chemical feed line | High-Pressure Chemical Feed Line Condition | Remote indication of system malfunction |
| Compressed air PIT | Compressed air line | • High Pressure Compressed Air Line Condition<br>• Low Pressure Compressed Air Line Condition | Remote indication of system malfunction |
| Instrument air PIT | Instrument air line | • High Pressure Compressed Air Line Condition<br>• Low Pressure Compressed Air Line Condition | Remote indication of system malfunction |

### 3.3.7 Differential Pressure Indicators

Differential pressure indicators should be calibrated upon start-up and as-needed during normal operations according to the manufacturer's recommendations in Attachment C. Table 3-10 summarizes differential pressure indicator operation.

**Table 3-9 Differential Pressure Indicators Operations Summary**

| Name | Location | Alarms | System Action |
|---|---|---|---|
| Multi-Media Pressure Filter DPIT | Multi-Media Pressure Filter | High Differential Pressure Condition | Initiation of backwash sequence |
| | | Unexpected Differential Pressure Vessel Condition | Remote indication of system malfunction |
| GAC Vessel 1 DPIT | GAC Vessel 1 | High Differential Pressure Condition | Initiation of backwash sequence |
| | | Unexpected Differential Pressure Vessel Condition | Remote indication of system malfunction |
| GAC Vessel 2 DPIT | GAC Vessel 2 | High Differential Pressure Condition | Initiation of backwash sequence |
| | | Unexpected Differential Pressure Vessel Condition | Remote indication of system malfunction |
| Process Polymer Makedown DPS | Polymer Makedown Skid | Unexpected Differential Pressure Condition | Remote indication of system malfunction |
| Backwash Polymer Makedown DPS | Polymer Makedown Skid | Unexpected Differential Pressure Condition | Remote indication of system malfunction |
| Filter Press Polymer Makedown DPS | Filter Press Polymer Makedown Skid | Unexpected Differential Pressure Condition | Remote indication of system malfunction |

### 3.3.8 Pressure switches

Pressure switches are located downstream of each pump and should be calibrated upon start-up and as-needed during normal operations according to the manufacturer's recommendations in Attachment C. The system actions are described in the process equipment section.

## 3.4 Ancillary Equipment

The treatment system is equipped with the following ancillary support systems:

- Emergency shower and eyewash station with water heater
- Building washdown hoses
- Air compressor system
    - Wet air receiver
    - Air dryer
    - Dry air receiver
- Building unit heaters and heated make-up air unit

The emergency shower and eyewash station have a flow switch which will cause the system to display an "Emergency Shower Eyewash in Operation" alarm. The system will remain in operation.

Specific start-up and shut down procedures for the ancillary equipment should be followed as outlined in Attachment C.

Troubleshooting should follow steps as outlined in Attachment C.

Maintenance activities on the ancillary equipment should follow the schedules outlined in Attachment A.

## 3.5 Interface with Existing Deep Well Injection

The extraction well system communicates to the deep well injection system and the groundwater treatment system. There is no interconnection between the groundwater treatment system and the existing deep well injection system. A manual valve is provided to control the flow of water through the systems, and separate PLCs and HMIs are provided for each system.

## 3.6 Shutdown Sequence

During a shutdown sequence initiated from the PLC, the following will occur:

- All motors in the system will be de-energized
- Flow control valves will be de-energized
- Control valves will be de-energized

# 4 Management of Change

The groundwater water treatment system will use a management-of-change (MOC) process for any changes to the system. The MOC will be used to ensure that the environmental, health, and safety risks are carefully evaluated before implementing significant changes.

## 4.1 Procedures

If the following elements are being evaluated for change, the MOC process should be followed:

- Changes in treatment chemicals
- Changes in equipment
- Changes to procedures
- Changes to the facilities

The MOC process includes:

1. Identifying the proposed change(s)
2. Evaluate the hazards and risks
3. Determine if the hazards and risks can be reduced, controlled, or eliminated
4. Determine if the change(s) can and should be made
    a. Determine if the change(s) require a notification to the BPW or any other regulatory authority
    b. Notify BPW or any other regulatory authority
5. Implement change(s) if determined safe to do so
6. Conduct Pre-Startup Safety Review (PSSR)
    a. Modify O&M manual and SOPs as relevant
7. Train operators on the implemented changes
8. Execute and monitor changes

## 4.2 Documentation Requirements

The MOC documentation template is included in Attachment F.

# Attachment A

## Specific Equipment and Instrumentation Identification, Operation and Maintenance Requirements

**Not available until after construction**

# Attachment B

## Engineering Plans and Specifications

**Previously Submitted to EGLE in April 2021**

# Attachment C

## Manufacturers' Equipment and Instrument Manuals

**Not available until after construction**

# Attachment D

## Process Control Documentation

**Not available until after construction**

# Attachment E

## Groundwater Extraction Well Boring Logs

BROWN AND CALDWELL

4700 Lakehurst Court Suite 100
Dublin, OH 43016

**Boring/Hole #:** EW-1 **Page No.:** 1 of 2

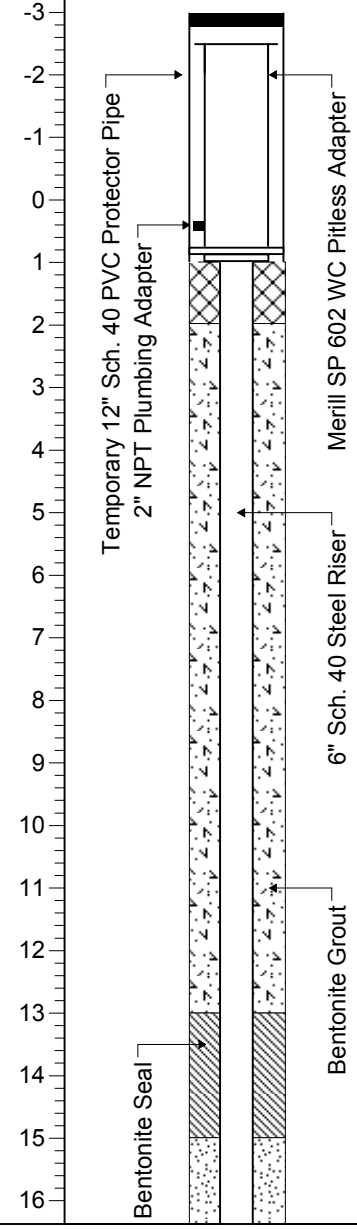
**Project:** Pfizer Holland
**Client:** Pfizer Inc.
**Start Date:** 5/18/10
**Finish Date:** 5/19/10
**Project No.:** 139194

**BC Personnel:** J. Warburton
**Location:** 188 Howard Avenue
**Contractor:** Mateco
**Equipment:** CME 750 ATV Rig
**Method:** 10.25" ID HSA

**WELL CONSTRUCTION**
**Diameter (ID):** 6"
**Material:** Steel
**Coupling:**
**Hole Diameter:** 14.25"

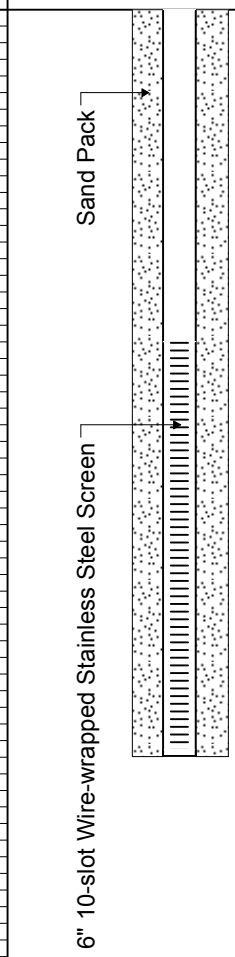
**WELL DEVELOPMENT**
**Methods:** Surged and Pumped
**Duration:** 0.5 hours
**Vol. Purged:** 580 gallons
**Slug Test:**

**SURVEY DATA (NGVD29 and Michigan S.P. South)**
**Ground:** 582.4
**TOC:** 584.63
**North:** 477292.45
**East:** 12653762.76




| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample: Run | Sample: Type | Sample: Headspace, ppm | Sample: Blow Count | Sample: Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ground Surface | | | | | | |
| | | | (0-16') Auger to 16' | | | | | | |

**Boring/Hole #:** EW-1 **Page No.:** 2 of 2




| Depth (ft) | Symbol | Lithologic Description | Sample Run | Type | Headspace | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 17 | | (16.0-18.4') Sand, c-m-f, some (-) silt, gray, wet | 1 | SS | 0.0 | 1-1-1-2 | 0.8 | |
| 18 | | | | | | | | |
| 19 | | (18.4-18.9') Sand, c-m-f, some (+) silt, gray, wet | 2 | SS | 0.0 | 1-1-1-2 | 0.9 | |
| 20 | | (20.0-21.0') Sand, c-m-f, some (-) silt, gray, wet | | | | | | |
| 21 | | | 3 | SS | 0.0 | 2-2-2-2 | 1.0 | |
| 22 | | | | | | | | |
| 23 | | (23.0-23.6') Clay, some (+) sand and silt, gray | | | | | | |
| 24 | | (23.6-24.2') Sand, c-m-f, little silt | 4 | SS | 0.0 | 2-1-1-2 | 1.5 | |
| | | (24.2-24.5') Silty clay, gray, soft | | | | | | |
| 25 | | (24.5-25.0') Sand, m-f, little silt | | | | | | |
| 26 | | (25.0-26.0') Silty clay, little (+) f. sand, soft, medium plasticity | 5 | SS | 0.0 | | 1.5 | |
| | | End of Log | | | | | | |
| 27 | | | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |

BROWN AND CALDWELL

4700 Lakehurst Court Suite 100
Dublin, OH 43016

**Boring/Hole #:** EW-2 **Page No.:** 1 of 2

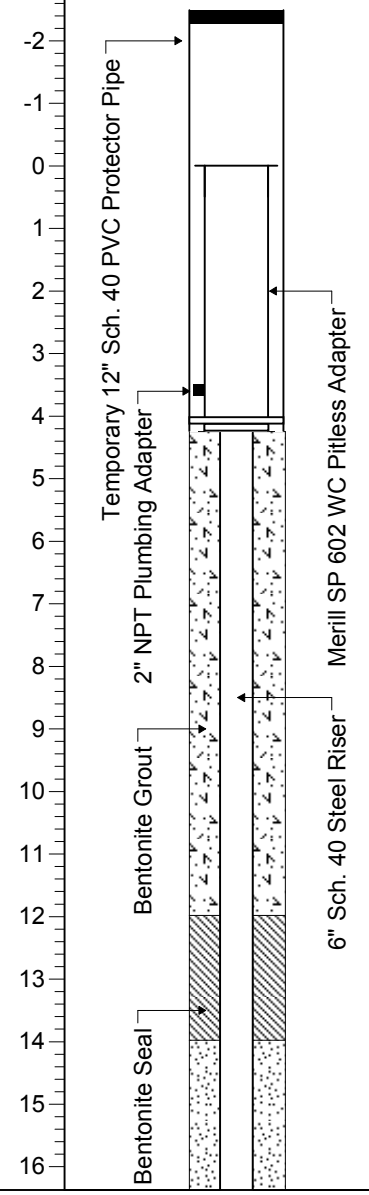
**Project:** Pfizer Holland
**Client:** Pfizer Inc.
**Start Date:** 5/12/10
**Finish Date:** 5/14/10
**Project No.:** 139194

**BC Personnel:** J. Warburton
**Location:** 188 Howard Avenue
**Contractor:** Mateco
**Equipment:** CME 750 ATV Rig
**Method:** 10.25" ID HSA

**WELL CONSTRUCTION**
**Diameter (ID):** 6"
**Material:** Steel
**Coupling:**
**Hole Diameter:** 14.25"

**WELL DEVELOPMENT**
**Methods:** Surged and Pumped
**Duration:** 1 hour
**Vol. Purged:** 600 gallons
**Slug Test:**

**SURVEY DATA (NGVD29 and Michigan S.P. South)**
**Ground:** 584.5
**TOC:** 584.54
**North:** 477438.41
**East:** 12654115.83




| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample Run | Sample Type | Sample Headspace, ppm | Sample Blow Count | Sample Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | Ground Surface | | | | | | |
| | | | (0-12') Auger to 12' | | | | | | |
| 12 | | | (12.0-12.6') Peat, brown, wet | | | | | | |
| 13 | | | (12.6-14.0') Sand, m-f, little silt, gray, wet | 1 | SS | | 2-2-2-2 | 2.0 | |
| 14 | | | (14.0-16.9') Sand, c-m-f, little silt, gray, wet | 2 | SS | | 1-1-1-1 | 2.0 | |

**Boring/Hole #:** EW-2 **Page No.:** 2 of 2

| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample Run | Type | Headspace | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 17 | Sand Pack | | | 3 | SS | 0.0 | Wt/18"-1 | 0.9 | |
| 18 | | | (18.0-18.6') Silty clay, gray, medium plasticity, moist | 4 | SS | 0.0 | Wt/12"-1/12" | 1.8 | |
| 19 | | | | | | | | | |
| 20 | | | (20.0-20.4') C. sand, gray | | | | | | |
| 21 | | | (20.4-20.6') Peat, brown | 5 | SS | 0.0 | 2-2-2-3 | 0.6 | |
| 22 | | | (22.0-22.4') C. sand | | | | | | |
| 23 | 6" 10-slot Wire-wrapped Stainless Steel Screen | | (22.4-22.7') Silty clay<br>(22.7-23.4') Sand, m-f, trace silt | 6 | SS | 0.0 | Wt/12"-1-3 | 1.4 | |
| 24 | | | | | | | | | |
| 25 | | | (24.0-25.5') Sand, little (+) silt, gray | 7 | SS | 0.0 | 2-2-2-2 | 2.0 | |
| 26 | | | (25.5-26.0') Silty clay, gray | | | | | | |
| 27 | | | End of Log | | | | | | |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | | | | | | | | | |
| 31 | | | | | | | | | |
| 32 | | | | | | | | | |
| 33 | | | | | | | | | |
| 34 | | | | | | | | | |
| 35 | | | | | | | | | |

BROWN AND CALDWELL

4700 Lakehurst Court Suite 100
Dublin, OH 43016

**Boring/Hole #:** EW-3 **Page No.:** 1 of 2

**Project:** Pfizer Holland
**Client:** Pfizer Inc.
**Start Date:** 5/14/10
**Finish Date:** 5/14/10
**Project No.:** 139194

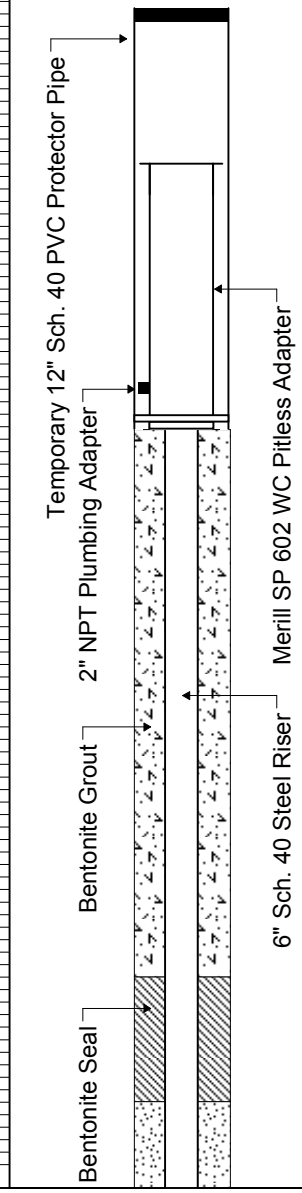
**BC Personnel:** J. Warburton
**Location:** 188 Howard Avenue
**Contractor:** Mateco
**Equipment:** CME 750 ATV Rig
**Method:** 10.25" ID HSA

**WELL CONSTRUCTION**
**Diameter (ID):** 6"
**Material:** Steel
**Coupling:**
**Hole Diameter:** 14.25"

**WELL DEVELOPMENT**
**Methods:** Surged and Pumped
**Duration:** 0.3 hours
**Vol. Purged:** 240 gallons
**Slug Test:**

**SURVEY DATA (NGVD29 and Michigan S.P. South)**
**Ground:** 585.2
**TOC:** 585.12
**North:** 477783.70
**East:** 12654299.64

| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample: Run | Type | Headspace, ppm | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| -3 to 16 | Temporary 12" Sch. 40 PVC Protector Pipe; 2" NPT Plumbing Adapter; Merill SP 602 WC Pitless Adapter; Bentonite Grout; 6" Sch. 40 Steel Riser; Bentonite Seal | | Ground Surface<br>(0-16') Auger to 16' | | | | | | |



**Boring/Hole #:** EW-3 **Page No.:** 2 of 2

| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample Run | Type | Headspace | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 17 | Sand Pack | | (16.0-18.8') Sand, c-m-f, trace silt, gray, wet | 1 | SS | 0.0 | 2-2-2-2 | 1.4 | |
| 18 | | | | | | | | | |
| 19 | | | (18.8-19.5') Sand, m-f, little silt, gray, wet | 2 | SS | 0.0 | 2-2-3-3 | 1.5 | |
| 20 | | | (20.0-21.0') Sand, c-m-f, trace silt, gray, wet | | | | | | |
| 21 | 6" 10-slot Wire-wrapped Stainless Steel Screen | | | 3 | SS | 0.0 | 2-2-2-2 | 1.0 | |
| 22 | | | | | | | | | |
| 23 | | | (22.5-23.4') F. sand, some (-) silt, gray | 4 | SS | 0.0 | 2-2-2-2 | 1.5 | |
| 24 | | | (24.0-25.0') F. sand, some (+) silt and clay, gray, wet | | | | | | |
| 25 | | | | 5 | SS | 0.0 | NR | 1.0 | |
| 26 | | | (26.0-26.4') Silty f. sand | | | | | | |
| 27 | | | (26.4-27.4') Silty clay, gray-brown, medium plasticity, moist | 6 | SS | 0.0 | 1-2-2-3 | 1.4 | |
| 28 | | | End of Log | | | | | | |
| 29 | | | | | | | | | |
| 30 | | | | | | | | | |
| 31 | | | | | | | | | |
| 32 | | | | | | | | | |
| 33 | | | | | | | | | |
| 34 | | | | | | | | | |
| 35 | | | | | | | | | |

BROWN AND CALDWELL

4700 Lakehurst Court Suite 100
Dublin, OH 43016

**Boring/Hole #:** EW-4 **Page No.:** 1 of 2

**Project:** Pfizer Holland
**Client:** Pfizer Inc.
**Start Date:** 5/17/10
**Finish Date:** 5/18/10
**Project No.:** 139194

**BC Personnel:** J. Warburton
**Location:** 188 Howard Avenue
**Contractor:** Mateco
**Equipment:** CME 750 ATV Rig
**Method:** 10.25" ID HSA

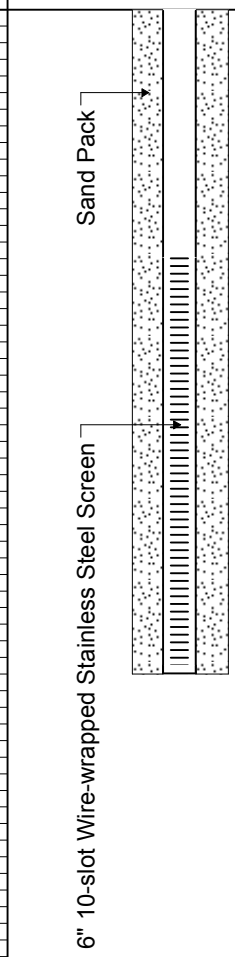
**WELL CONSTRUCTION**
**Diameter (ID):** 6"
**Material:** Steel
**Coupling:**
**Hole Diameter:** 14.25"

**WELL DEVELOPMENT**
**Methods:** Surged and Pumped
**Duration:** 0.5 hours
**Vol. Purged:** 800 gallons
**Slug Test:**

**SURVEY DATA (NGVD29 and Michigan S.P. South)**
**Ground:** 584.9
**TOC:** 584.52
**North:** 477966.71
**East:** 12654424.20

| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample: Run | Type | Headspace, ppm | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| -3 to 16 | Temporary 12" Sch. 40 PVC Protector Pipe; 2" NPT Plumbing Adapter; Merill SP 602 WC Pitless Adapter; Bentonite Grout; 6" Sch. 40 Steel Riser; Bentonite Seal | | Ground Surface<br>(0-16') Auger to 16'. Pea gravel at 4', offset 5' North, re-auger to 16' | | | | | | |

**Boring/Hole #:** EW-4 **Page No.:** 2 of 2




| Depth (ft) | Symbol | Lithologic Description | Sample Run | Type | Headspace | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 17 | | (16.0-20.6') F. sand, some (-) silt, gray, wet | 1 | SS | 0.0 | 6-4-2-2 | 1.0 | |
| 18 | | | | | | | | |
| 19 | | | 2 | SS | 0.0 | 5-4-3-4 | 1.7 | |
| 20 | | | | | | | | |
| 21 | | (20.6-20.8') Wood fragments and peat, brown | 3 | SS | 0.0 | 2-2-2-1 | 1.4 | |
| 22 | | (20.8-21.4') Sand, m-f, trace c. sand, little silt<br>(22.0-22.4') Sand, c-m-f, gray | | | | | | |
| 23 | | (22.4-22.9') Silty clay, trace f. sand, soft, medium plasticity | 4 | SS | 0.0 | 2-2-1-1 | 0.9 | |
| 24 | | (24.0-24.3') Sand and gravel, some (-) silt and clay, dark brown, wet | 5 | SS | 0.0 | 1-1-1-1 | 1.4 | |
| 25 | | (24.3-24.8') Silty clay | | | | | | |
| 26 | | (24.8-25.9') Silty clay, some f. sand | | | | | | |
| 27 | | End of Log | | | | | | |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| 31 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |

BROWN AND CALDWELL

4700 Lakehurst Court Suite 100
Dublin, OH 43016

**Boring/Hole #:** EW-5 **Page No.:** 1 of 2

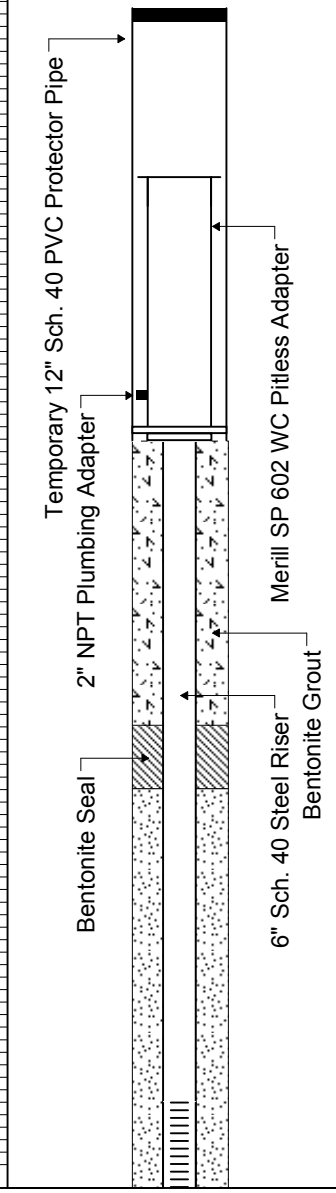
**Project:** Pfizer Holland
**Client:** Pfizer Inc.
**Start Date:** 5/19/10
**Finish Date:** 5/19/10
**Project No.:** 139194

**BC Personnel:** J. Warburton
**Location:** 188 Howard Avenue
**Contractor:** Mateco
**Equipment:** CME 750 ATV Rig
**Method:** 10.25" ID HSA

**WELL CONSTRUCTION**
**Diameter (ID):** 6"
**Material:** Steel
**Coupling:**
**Hole Diameter:** 14.25"

**WELL DEVELOPMENT**
**Methods:** Surged and Pumped
**Duration:** 2 hours
**Vol. Purged:** 300 gallons
**Slug Test:**

**SURVEY DATA (NGVD29 and Michigan S.P. South)**
**Ground:** 584.7
**TOC:** 584.56
**North:** 478221.32
**East:** 12654295.02

| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample: Run | Type | Headspace, ppm | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| -3 to 16 |  | | Ground Surface<br>(0-16') Auger to 16'. | | | | | | |

**Boring/Hole #:** EW-5 **Page No.:** 2 of 2

| Depth (ft) | Well Construction | Symbol | Lithologic Description | Sample Run | Type | Headspace | Blow Count | Recovery (ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 17 | Sand Pack | | (16.0-16.3') Sand, c-m-f, some (-) silt, gray, wet | | | | | | |
| 18 | | | (16.3-16.7') Silty clay, little f. sand | 1 | SS | 0.0 | 1-1-3-6 | 1.3 | |
| 19 | | | (16.7-19.0') Sand, m-f, little silt | 2 | SS | 0.0 | 2-2-2-1 | 1.2 | |
| 20 | | | (19.0-19.2') Silty clay, little (+) f. sand | | | | | | |
| 21 | 6" 10-slot Wire-wrapped Stainless Steel Screen | | (20.0-23.5') Silty clay, little (-) f. sand, gray, medium plasticity, moist | 3 | SS | 0.0 | 2-2-2-2 | 1.4 | |
| 22 | | | | | | | | | |
| 23 | | | | 4 | SS | 0.0 | 1-1-1-1 | 1.5 | |
| 24 | | | End of Log | | | | | | |
| 25 | | | | | | | | | |
| 26 | | | | | | | | | |
| 27 | | | | | | | | | |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | | | | | | | | | |
| 31 | | | | | | | | | |
| 32 | | | | | | | | | |
| 33 | | | | | | | | | |
| 34 | | | | | | | | | |
| 35 | | | | | | | | | |

# Attachment F

## Management of Change Documentation

# Management of Change Procedure

| | |
|---|---|
| Project Name | |
| Project Manager | |
| Date | |

Type of Change:

☐ Chemical ☐ Equipment ☐ Procedure ☐ Facility ☐ Other (list)_____

| Case for Change | |
|---|---|
| Proposed change | |
| Why change is being proposed/required | |
| Intended outcome | |
| Potential Risks and Hazards | |
| Estimated timeframes | |
| Additional factors | |
| Estimated costs | |

| Step | Role/Title, Name |
|---|---|
| Identifying the proposed change(s) | |
| Evaluate the hazards and risks | |
| Determine if the hazards and risks can be reduced, controlled, or eliminated | |
| Determine if change should be made | |
| Determine if notification is required and notify regulatory agency | |
| Conduct pre-startup safety review | |
| Train operators on proposed changes | |
| Implement and monitor changes | |

# Attachment G

## Holland BPW Wastewater Discharge Permit

**Included as RAP/CMIP Appendix B**

# Appendix E

## GWTS O&M Cost Estimate

**Appendix E**
**Addendum to Final RAP/CMIP**
**Operation & Maintenance Cost Estimate-Alternate GWTS**
**Warner-Lambert Company, LLC, Holland, Michigan**
**MID 006 013 643**

| Item No. | Task Description | Quantity | Unit | Unit Rate | Estimated Annual Cost |
|---|---|---|---|---|---|
| **1.** | **Labor (routine plus alarm response)** | | | | |
| | Operating Labor | 624 | HR | $80 | $49,900 |
| | Supervision | 208 | HR | $120 | $25,000 |
| | Operational Reporting | 64 | HR | $120 | $7,700 |
| | | | | **Task Total** | **$82,600** |
| **2.** | **Maintenance and Repair** | | | | |
| | Maintenance and Repair Labor Parts & Supplies | 600 | HR | $80 | $48,000 |
| | Maintenance and Repair-Parts & Supplies | 1 | LS | $21,000 | $21,000 |
| | | | | **Task Total** | **$69,000** |
| **3.** | **Analytical** | | | | |
| | Testing per BPW Permit | 4 | EA | $600 | $2,400 |
| | Misc. analytical | 1 | LS | $2,400 | $2,400 |
| | | | | **Task Total** | **$4,800** |
| **4.** | **Utilities** *(at average flow rate=15 gpm)* | | | | |
| | Electric | 1,088,640 | KWH/yr | $0.085 | $92,600 |
| | Phone Service | 1 | LS | $1,500 | $1,500 |
| | Water | 1 | LS | $500 | $500 |
| | Holland BPW Discharge Fees | 12 | Months | $251 | $3,000 |
| | Holland Charter Township Monthly Fees | 12 | Months | $29 | $400 |
| | Holland Charter Township Commodity Charge | 7,776 | 1,000 gal | $2.51 | $19,600 |
| | | | | **Task Total** | **$117,600** |
| **5.** | **Other Costs** | | | | |
| | Chemical - 48.8% Aluminum Sulfate | 660 | gallons | $3 | $1,980 |
| | Chemical - 50% Caustic | 2,700 | gallons | $4 | $10,800 |
| | Chemical - Polymer Flocculant | 200 | gallons | $5 | $1,000 |
| | Chemical - 40% Sodium Bisulfite | 30 | gallons | $6 | $180 |
| | GAC Replacement | 1,400 | lbs | $3 | $4,200 |
| | Waste Disposal (Solids) | 24 | tons | $50 | $1,200 |
| | | | | **Task Total** | **$19,360** |
| | | | | **Total Estimated Annual Cost:** | **$293,000** |

Printed: 5/11/2022