National Pollutant Discharge Elimination System (NPDES) Permit Program

F A C T S H E E T

Regarding an NPDES Permit to Discharge to Waters of the State of Ohio
for the **Geauga County McFarland Creek Wastewater Treatment Plant**

Public Notice No.: 16-10-002
Public Notice Date: October 5, 2016
Comment Period Ends: November 5, 2016

OEPA Permit No.: **3PK00010*LD**
Application No.: **OH0043494**

Name and Address of Applicant:

Geauga County Board of Commissioners
Water Resources Department
470 Center Street, Building #3
Chardon, Ohio 44024

Name and Address of Facility Where Discharge Occurs:

Geauga County McFarland Creek WWTP
17630 Chagrin River Road
Chagrin Falls, Ohio 44022
Geauga County

Receiving Water:

Aurora Branch Chagrin River

Subsequent Stream Network:

Chagrin River to Lake Erie

INTRODUCTION

Development of a Fact Sheet for NPDES permits is mandated by Title 40 of the Code of Federal Regulations, Section 124.8 and 124.56. This document fulfills the requirements established in those regulations by providing the information necessary to inform the public of actions proposed by the Ohio Environmental Protection Agency, as well as the methods by which the public can participate in the process of finalizing those actions.

This Fact Sheet is prepared in order to document the technical basis and risk management decisions that are considered in the determination of water quality based NPDES Permit effluent limitations. The technical basis for the Fact Sheet may consist of evaluations of promulgated effluent guidelines, existing effluent quality, instream biological, chemical and physical conditions, and the relative risk of alternative effluent limitations. This Fact Sheet details the discretionary decision-making process empowered to the Director by the Clean Water Act and Ohio Water Pollution Control Law (ORC 6111). Decisions to award variances to Water Quality Standards or promulgated effluent guidelines for economic or technological reasons will also be justified in the Fact Sheet where necessary.

No antidegradation review was necessary.

Effluent limits based on available treatment technologies are required by Section 301(b) of the Clean Water Act. Many of these have already been established by U.S. EPA in the effluent guideline regulations (a.k.a. categorical regulations) for industry categories in 40 CFR Parts 405-499. Technology-based regulations for publicly-owned treatment works are listed in the Secondary Treatment Regulations (40 CFR Part 133). If regulations have not been established for a category of dischargers, the director may establish technology-based limits based on best professional judgment (BPJ).

Ohio EPA reviews the need for water-quality-based limits on a pollutant-by-pollutant basis. Wasteload allocations are used to develop these limits based on the pollutants that have been detected in the

discharge, and the receiving water's assimilative capacity. The assimilative capacity depends on the flow in the water receiving the discharge, and the concentration of the pollutant upstream. The greater the upstream flow, and the lower the upstream concentration, the greater the assimilative capacity is. Assimilative capacity may represent dilution (as in allocations for metals), or it may also incorporate the break-down of pollutants in the receiving water (as in allocations for oxygen-demanding materials).

The need for water-quality-based limits is determined by comparing the wasteload allocation for a pollutant to a measure of the effluent quality. The measure of effluent quality is called PEQ - Projected Effluent Quality. This is a statistical measure of the average and maximum effluent values for a pollutant. As with any statistical method, the more data that exists for a given pollutant, the more likely that PEQ will match the actual observed data. If there is a small data set for a given pollutant, the highest measured value is multiplied by a statistical factor to obtain a PEQ; for example if only one sample exists, the factor is 6.2, for two samples - 3.8, for three samples - 3.0. The factors continue to decline as samples sizes increase. These factors are intended to account for effluent variability, but if the pollutant concentrations are fairly constant, these factors may make PEQ appear larger than it would be shown to be if more sample results existed.

SUMMARY OF PERMIT CONDITIONS

Limits for dissolved oxygen, carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), oil and grease, ammonia, phosphorus, and pH are proposed to continue from the current permit.

Based on revisions to Ohio's recreational use water quality standards, the *E. coli* limits have been reduced. No schedule of compliance is proposed for meeting these new limits.

The existing variance-based limits for mercury are proposed to continue in accordance with the data presented as part of the facility's mercury variance renewal request.

Based on the Wasteload Allocation (WLA) analysis, new effluent limits are proposed for copper. A compliance schedule for copper is included in Part 1, C of the permit.

New effluent monitoring has been added for dissolved orthophosphate (as phosphorus). Dissolved orthophosphate is required by ORC 6111.03 and will occur on a monthly basis. Additionally, new influent and effluent monitoring have been added for arsenic, selenium, silver, and molybdenum.

Due to the Whole Effluent Toxicity (WET) analysis, it has been determined that chronic and acute toxicity WET limits will continue for *Ceriodaphnia dubia* (water flea). Quarterly monitoring for *C. dubia* will be required. Annual chronic toxicity monitoring, with the determination of acute toxicity endpoints, for *Pimephales promelas* is proposed for the life of the permit. This satisfies the minimum testing requirements of Ohio Administrative Code (OAC) 3754-33-07(B)(11) and will adequately characterize toxicity in the plant's effluent.

This permit no longer authorizes the use of method 4500 CN-I from Standard Methods for free cyanide testing. As soon as possible, the permittee must begin using either ASTM D7237-10 or OIA-1677-09, both of which are approved methods for free cyanide listed in 40 CFR 136.

A condition in Part II of the permit provides guidance on the analytical method detection limits (MDLs) the permittee should use in analyzing cadmium, silver and selenium.

In Part II of the permit, special conditions are included that address sanitary sewer overflow (SSO) reporting; operator certification, minimum staffing and operator of record; whole effluent toxicity (WET) testing; mercury variance; phosphorus optimization; and outfall signage.

This permit renewal is proposed for a term of approximately 5 years.

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PROCEDURES FOR PARTICIPATION IN THE FORMULATION OF FINAL DETERMINATIONS

The draft action shall be issued as a final action unless the Director revises the draft after consideration of the record of a public meeting or written comments, or upon disapproval by the Administrator of the U.S. Environmental Protection Agency.

Within thirty days of the date of the Public Notice, any person may request or petition for a public meeting for presentation of evidence, statements or opinions. The purpose of the public meeting is to obtain additional evidence. Statements concerning the issues raised by the party requesting the meeting are invited. Evidence may be presented by the applicant, the state, and other parties, and following presentation of such evidence other interested persons may present testimony of facts or statements of opinion.

Requests for public meetings shall be in writing and shall state the action of the Director objected to, the questions to be considered, and the reasons the action is contested. Such requests should be addressed to:

Legal Records Section
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

Interested persons are invited to submit written comments upon the discharge permit. Comments should be submitted in person or by mail no later than 30 days after the date of this Public Notice. Deliver or mail all comments to:

Ohio Environmental Protection Agency
Attention: Division of Surface Water
Permits Processing Unit
P.O. Box 1049
Columbus, Ohio 43216-1049

The Ohio EPA permit number and Public Notice numbers should appear on each page of any submitted comments. All comments received no later than 30 days after the date of the Public Notice will be considered.

Citizens may conduct file reviews regarding specific companies or sites. Appointments are necessary to conduct file reviews, because requests to review files have increased dramatically in recent years. The first 250 pages copied are free. For requests to copy more than 250 pages, there is a five-cent charge for each page copied. Payment is required by check or money order, made payable to Treasurer State of Ohio.

For additional information about this fact sheet or the draft permit, contact Michael Stevens (Michael.Stevens@epa.ohio.gov or at (330) 963-1200.

INFORMATION REGARDING CERTAIN WATER QUALITY BASED EFFLUENT LIMITS

This draft permit may contain proposed water-quality-based effluent limits (WQBELs) for parameters that **are not** priority pollutants. (See the following link for a list of the priority pollutants: http://epa.ohio.gov/portals/35/pretreatment/Pretreatment_Program_Priority_Pollutant_Detection_Limits.pdf .) In accordance with ORC 6111.03(J)(3), the Director established these WQBELs after considering, to the extent consistent with the Federal Water Pollution Control Act, evidence relating to the technical feasibility and economic reasonableness of removing the polluting properties from those wastes and to evidence relating to conditions calculated to result from that action and their relation to benefits to the people of the state and to accomplishment of the purposes of this chapter. This determination was made based on data and information available at the time the permit was drafted, which included the contents of the timely submitted NPDES permit renewal application, along with any and all pertinent information available to the Director.

This public notice allows the permittee to provide to the Director for consideration during this public comment period additional site-specific pertinent and factual information with respect to the technical feasibility and economic reasonableness for achieving compliance with the proposed final effluent limitations for these parameters. The permittee shall deliver or mail this information to:

Ohio Environmental Protection Agency
Attention: Division of Surface Water
Permits Processing Unit
P.O. Box 1049
Columbus, Ohio 43216-1049

Should the applicant need additional time to review, obtain or develop site-specific pertinent and factual information with respect to the technical feasibility and economic reasonableness of achieving compliance with these limitations, written notification for any additional time shall be sent to the above address no later than 30 days after the Public Notice Date on Page 1.

Should the applicant determine that compliance with the proposed WQBELs for parameters other than the priority pollutants is technically and/or economically unattainable, the permittee may submit an application for a variance to the applicable WQS used to develop the proposed effluent limitation in accordance with the terms and conditions set forth in OAC 3745-33-07(D). The permittee shall submit this application to the above address no later than 30 days after the Public Notice Date.

Alternately, the applicant may propose the development of site-specific WQS pursuant to OAC 3745-1-35. The permittee shall submit written notification regarding their intent to develop site specific WQS for parameters that are not priority pollutants to the above address no later than 30 days after the Public Notice Date.

LOCATION OF DISCHARGE/RECEIVING WATER USE CLASSIFICATION

The Geauga County McFarland Creek WWTP discharges to the Aurora Branch of the Chagrin River via Outfall 3PK00010001 at River Mile (RM) 3.4 (Lat: 41° 23' 27" N; Long: 81° 23' 23" W). The approximate location of the facility is shown in Figure 1.

This segment of the Aurora Branch of the Chagrin River is described by Ohio EPA River Code: 15-005, U.S. EPA Hydrologic Unit Code (HUC): 041100030303, County: Geauga, Ecoregion: Erie-Ontario Lake Plain (EOLP). This segment of the Aurora Branch is designated for the following uses under Ohio's Water Quality Standards (OAC 3745-1-22): Warmwater Habitat (WWH), Agricultural Water Supply (AWS), Industrial Water Supply (IWS) and Primary Contact Recreation (PCR). The Aurora Branch of the Chagrin River, from State Route 82 (RM 17.08) to the mouth, is also designated as an Outstanding State Waters (OSW) under Ohio's Antidegradation Rule (OAC 3745-1-05).

Use designations define the goals and expectations of a waterbody. These goals are set for aquatic life protection, recreation use and water supply use, and are defined in the Ohio WQS (OAC 3745-1-07). The use designations for individual waterbodies are listed in rules -08 through -32 of the Ohio WQS. Once the goals are set, numeric water quality standards are developed to protect these uses. Different uses have different water quality criteria.

Use designations for aquatic life protection include habitats for coldwater fish and macroinvertebrates, warmwater aquatic life and waters with exceptional communities of warmwater organisms. These uses all meet the goals of the federal Clean Water Act. Ohio WQS also include aquatic life use designations for waterbodies which cannot meet the Clean Water Act goals because of human-caused conditions that cannot be remedied without causing fundamental changes to land use and widespread economic impact. The dredging and clearing of some small streams to support agricultural or urban drainage is the most common of these conditions. These streams are given Modified Warmwater or Limited Resource Water designations.

Recreation uses are defined by the depth of the waterbody and the potential for wading or swimming. Uses are defined for bathing waters, swimming/canoeing (Primary Contact) and wading only (Secondary Contact - generally waters too shallow for swimming or canoeing).

Water supply uses are defined by the actual or potential use of the waterbody. Public Water Supply designations apply near existing water intakes so that waters are safe to drink with standard treatment. Most other waters are designated for agricultural and industrial water supply.

FACILITY DESCRIPTION

The Geauga County McFarland Creek WWTP was originally constructed in 1976 as an extended aeration activated sludge biological treatment system. In 2005, the plant was expanded and retrofitted to a membrane bioreactor (MBR) advanced treatment system with a design capacity of 1.8

MGD and peak capacity of 3.6 MGD. Presently, the facility serves a population of approximately 4,580 people. The wet-stream treatment processes and/or equipment, as identified in Figure 2, include the following components:

- Off-Line Sludge and Septage Receiving Station
- Influent Pumping
- Grit Removal
- Fine Screening
- Flow Equalization
- Activated Sludge Membrane Bioreactor (4 basins @ 18 cassettes/basin)
- Ultraviolet (UV) Disinfection
- Post-Aeration

Phosphorus removal is achieved through the addition of ferric chloride. The off-line flow equalization basins are used to divert and store excess wastewater flows during wet weather events. Under high flow conditions, however, the secondary equalization tank overflows. The wastewater passes through a travelling bridge sand filter prior to commingling with the treated MBR effluent. Due to these potential bypasses, the UV system is kept online year round.

The Geauga County McFarland Creek WWTP collection system is comprised of separate sanitary sewers. There are currently 19 separate sanitary lift stations in the collection system. The County estimates the current average inflow and infiltration rate to be at 70,000 gallons per day (GPD).

The Geauga County McFarland Creek WWTP is not mandated to have an approved pretreatment program. It does, however, have technically-based local limits. There is one categorical industrial user in the service area that contributes approximately 0.0015 MGD of flow to the plant.

Waste activated sludge is processed by aerobic digestion, followed by mechanical dewatering in a filter press. Historical methods of disposal for Geauga County McFarland Creek WWTP's stabilized sewage sludge included land application (Class B biosolids) or hauling to an authorized solid waste landfill.

Table 1 lists the quantity of sewage sludge removed from the Geauga County McFarland Creek WWTP for the past five (5) years. More recently, the County has entered into an agreement with Quasar Energy Group for use of its sludge as a feedstock in Quasar's anaerobic digestion process. The County will retain the capabilities for land application and/or hauling to a landfill.

In 2013, the Geauga County McFarland Creek WWTP began to experience significant operational and performance issues related to its MBR equipment. In essence, the MBRs had reached the end of their "design life". Due to premature membrane failures and reduction in the membrane flux rate rates, the operational capacity of the treatment plant was significantly reduced below the design flow. Hence, flows in excess of 1.2 MGD, particularly during wet-weather, were routinely bypassed at the secondary EQ basin. The combination of reduced membrane efficiency and frequent bypasses resulted in significant violations of the NPDES permit limits. During the fourth quarter of 2015, the plant was returned to its full design and operational capacity with the complete replacement of the four (4) MBR trains by the County.

DESCRIPTION OF EXISTING DISCHARGE

The average annual effluent flow rate for the Geauga County McFarland Creek WWTP for the previous four (4) years is presented in
Table 2.

Geauga County McFarland Creek WWTP had several effluent violations which are shown in
Table 3. Most of the violations are attributed to the operational and hydraulic deficiencies associated with the MBR process from 2013 thru 2015.

Table 4 presents a summary of unaltered Discharge Monitoring Report (DMR). Data are presented for the period September 2011 – March 2016; the current permit limits are provided for comparison. Supplemental DMR data is also provided in Attachment 1 for the influent, sludge, and stream monitoring stations.

Table 5 summarizes the chemical specific data for Outfall 3PK00001001 by presenting the average and maximum PEQ values.

Table 6 summarizes the results of acute and chronic WET tests of the final effluent using the water flea (*Ceriodaphnia dubia*) and fathead minnow (*Pimephales promelas*) as the test organisms.

ASSESSMENT OF IMPACT ON RECEIVING WATERS

The McFarland Creek-Aurora Branch watershed assessment unit, which includes the Aurora Branch of the Chagrin River in the vicinity of the Geauga County McFarland Creek WWTP is listed as impaired for Aquatic Life Use and Recreational Use on Ohio's 303(d) list.

The Chagrin River Watershed Total Maximum Daily Load (TMDL) report was approved by U.S. EPA on July 10, 2007. TMDL reports identify and evaluate water quality problems in impaired water bodies and propose solutions to bring those waters into attainment with water quality standards. The March 24, 2015, Supreme Court of Ohio decision, Fairfield Cty. Bd. of Commrs. v. Nally, Slip Opinion No. 2015-Ohio-991, vacated all previously approved TMDLs. As a result, all TMDL reports are presently considered to be technical guidance documents.

The TMDL report is available online via the Chagrin River tab at:

http://epa.ohio.gov/dsw/tmdl/AshtabulaChagrinRivers.aspx

Monitoring in support of the TMDL report was conducted in 2003 and 2004. The 2006 report, *Biological and Water Quality Study of the Chagrin River and Selected Tributaries 2003-04*, is available via the following link:

http://www.epa.ohio.gov/portals/35/documents/ChagrinRiverTSD_2003to2004.pdf

An assessment of the impact of a permitted point source on the immediate receiving waters includes an evaluation of the available chemical/physical, biological, and habitat data which have been collected by Ohio EPA pursuant to the Five-Year Basin Approach for Monitoring and NPDES Reissuance. Other data may be used provided it was collected in accordance with Ohio EPA methods and protocols as specified by the Ohio Water Quality Standards and Ohio EPA guidance documents. Other information which may be evaluated includes, but is not limited to: NPDES permittee self-monitoring data; effluent and mixing zone bioassays conducted by Ohio EPA, the permittee, or U.S. EPA.

In evaluating this data, Ohio EPA attempts to link environmental stresses and measured pollutant exposure to the health and diversity of biological communities. Stresses can include pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. Indicators of exposure to these stresses include whole effluent toxicity tests, fish tissue chemical data, and fish health biomarkers (for example, fish blood tests).

Use attainment is a term which describes the degree to which environmental indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1). Assessing use attainment status for aquatic life uses primarily relies on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-15). These criteria apply to rivers and streams outside of mixing zones. Numerical biological criteria are based on measuring several characteristics of the fish and macroinvertebrate communities; these characteristics are combined into multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), which indicate the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community. Numerical criteria are broken down by ecoregion, use designation, and stream or river size. Ohio has five ecoregions defined by common topography, land use, potential vegetation and soil type.

Three attainment status results are possible at each sampling location -full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the biocriteria. Partial attainment means that one or more of the applicable indices meet the biocriteria or one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table (see Table 7) is constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by river mile, the applicable biological indices, the use attainment status (i.e., full, partial, or non), the Qualitative Habitat Evaluation Index (QHEI), and comments and observations for each sampling location.

The 2006 Report noted that the Chagrin River showed improved conditions compared to previous biological surveys due to better effluent treatment, intact riparian corridors, and more stormwater controls. The segment of the Aurora Branch where the plant discharges had partial attainment status due to fish community impairment. According to the report, the impairment was caused by organic

enrichment, excess nutrients, and sedimentation, as well as possible periodic toxicity. The Geauga County McFarland Creek WWTP was found to be a major contributor of pollutant loadings, such as phosphorus, to the receiving stream. "Inefficient wastewater treatment due to hydraulic overload above design flow" was cited as a "significant causal factor of biological nonattainment observed in 2003." While the treatment plant was subsequently expanded in 2005 to address the hydraulic issues, a site specific biological survey of the Aurora Branch upstream and downstream from the facility has not been performed. Ohio EPA anticipates monitoring of McFarland Creek-Aurora Branch watershed assessment unit in 2019.

The TMDL recommended the following limits for the Geauga County McFarland Creek WWTP:

Total Phosphorus: 1.0 mg/L
Total Suspended Solids: 12.0 mg/L

The current permit limits are more stringent than the TMDL limits.

DEVELOPMENT OF WATER-QUALITY-BASED EFFLUENT LIMITS

Determining appropriate effluent concentrations is a multiple-step process in which parameters are identified as likely to be discharged by a facility, evaluated with respect to Ohio water quality criteria, and examined to determine the likelihood that the existing effluent could violate the calculated limits.

Parameter Selection

Effluent data for the Geauga County McFarland Creek WWTP were used to determine what parameters should undergo wasteload allocation. The parameters discharged are identified by the data available to the Ohio EPA - Discharge Monitoring Report (DMR) data submitted by the permittee, compliance sampling data collected by Ohio EPA, and any other data submitted by the permittee, such as priority pollutant scans required by the NPDES application or by pretreatment, or other special conditions in the NPDES permit. The sources of effluent data used in this evaluation are as follows:

Self-monitoring data (DMR) September 2011 through March 2016

The data were examined for potential statistical outliers and other non-representative values. The following values were removed from the evaluation to give a more reliable PEQs:

Parameter	Date	Reported Value	Units	Explanation/Justification
Mercury	7/1/2015	217	ng/L	Extreme high value (> 10X PEQ avg.)
Mercury	7/22/2015	304	ng/L	Extreme high value (> 10X PEQ avg.)
Total Dissolved Solids	1/10/2013	7.21	mg/L	Unrepresentative value (< 10X PEQ avg.)
Total Dissolved Solids	9/3/2015	7.22	mg/L	Unrepresentative value (< 10X PEQ avg.)

This data is evaluated statistically and Projected Effluent Quality (PEQ) values are calculated for each pollutant. Average PEQ (PEQ_{avg}) values represent the 95^{th} percentile of monthly average data, and maximum PEQ (PEQ_{max}) values represent the 95^{th} percentile of all data points. The PEQ_{avg} and PEQ_{max} values are presented in Table 5.

The PEQ values are used according to Ohio rules to compare to applicable water quality standards (WQS) and allowable wasteload allocation (WLA) values for each pollutant evaluated. Initially, PEQ values are compared to the applicable average and maximum WQS. If both PEQ values are less than 25 percent of the applicable WQS, the pollutant does not have the reasonable potential to cause or contribute to exceedances of WQS, and no wasteload allocation is done for that parameter. If either PEQ_{avg} or PEQ_{max} is greater than 25 percent of the applicable WQS, a wasteload allocation is conducted to determine whether the parameter exhibits reasonable potential and needs to have a limit or if monitoring is required. See Table 5 for a summary of the screening results.

Wasteload Allocation

For those parameters that require a WLA, the results are based on the uses assigned to the receiving waterbody in OAC 3745-1. Dischargers are allocated pollutant loadings/concentrations based on the Ohio Water Quality Standards (OAC 3745-1). Most pollutants are allocated by a mass-balance method because they do not degrade in the receiving water. Wasteload allocations using this method are done using the following general equation: Discharger WLA = (downstream flow x WQS) - (upstream flow x background concentration). Discharger WLAs are divided by the discharge flow so that the allocations are expressed as concentrations.

The applicable waterbody uses for this facility's discharge and the associated stream design flows are as follows:

Aquatic life (WWH)		
Toxics (metals, organics, etc.)	Average	Annual 7Q10
	Maximum	Annual 1Q10
Ammonia	Average	Summer 30Q10
		Winter 30Q10
Wildlife		Annual 90Q10
Agricultural Water Supply		Harmonic mean flow
Human Health (nondrinking)		Harmonic mean flow

Allocations are developed using a percentage of stream design flow as specified in Table 9; allocations cannot exceed the Inside Mixing Zone Maximum criteria.

In November 2010, the use of mixing zones to determine the waste load allocation for bioaccumulative chemicals of concern (BCCs) was discontinued. This means that limits for BCCs, such as mercury, must meet the applicable water quality standards with no allowance for in-stream dilution. In other words, the WLA is set equal to the respective WQS value.

The data used in the WLA is listed in Table 8 and Table 9. The wasteload allocation results to maintain all applicable criteria are presented in Table 10.

Whole Effluent Toxicity WLA

Whole effluent toxicity (WET) is the total toxic effect of an effluent on aquatic life measured directly with a toxicity test. Acute WET measures short term effects of the effluent while chronic WET measures longer term and potentially more subtle effects of the effluent.

Water quality standards for WET are expressed in Ohio's narrative "free from" WQS rule [OAC 3745-1-04(D)]. These "free froms" are translated into toxicity units (TUs) by the associated WQS Implementation Rule (OAC 3745-2-09). Wasteload allocations can then be calculated using TUs as if they were water quality criteria.

The wasteload allocation calculations for WET are similar to those for aquatic life criteria - using the chronic toxicity unit (TU_c) and 7Q10 flow for the average and the acute toxicity unit (TU_a) and 1Q10 flow for the maximum. These values are the levels of effluent toxicity that should not cause instream toxicity during critical low-flow conditions. For the Geauga County McFarland Creek WWTP, the wasteload allocation values are 1.0 TU_a and 1.6 TU_c.

The chronic toxicity unit (TU_c) is defined as 100 divided by the IC_{25}:

$TU_c = 100/IC_{25}$

This equation applies outside the mixing zone for warmwater, modified warmwater, exceptional warmwater, coldwater, and seasonal salmonid use designations except when the following equation is more restrictive (*Ceriodaphnia dubia* only):

TU_c = 100/geometric mean of NOEC and LOEC

The acute toxicity unit (TU_a) is defined as 100 divided by the LC_{50} for the most sensitive test species:

$TU_a = 100/LC_{50}$

This equation applies outside the mixing zone for warmwater, modified warmwater, exceptional warmwater, coldwater, and seasonal salmonid use designations.

When the acute WLA is less than 1.0 TU_a, it may be defined as:

Dilution Ratio (downstream flow to discharger flow)	Allowable Effluent Toxicity (percent effects in 100% effluent)
up to 2 to 1	30
greater than 2 to 1 but less than 2.7 to 1	40
2.7 to 1 to 3.3 to 1	50

$$\text{Stream Dilution Ratio} = \frac{1Q10 + [\text{WWTP flow rate}]}{[\text{WWTP flow rate}]} = \frac{3.9 \text{ cfs} + 2.785 \text{ cfs}}{2.785 \text{ cfs}} = 2.4$$

The acute WLA for Geauga County McFarland Creek WWTP is 40 percent mortality in 100 percent effluent based on the dilution ratio of 2.4 to 1.

REASONABLE POTENTIAL/ EFFLUENT LIMITS/HAZARD MANAGEMENT DECISIONS

After appropriate effluent limits are calculated, the reasonable potential of the discharger to violate the water quality standards must be determined. Each parameter is examined and placed in a defined "group". Parameters that do not have a water quality standard or do not require a wasteload allocation based on the initial screening are assigned to either group 1 or 2. For the allocated parameters, the

preliminary effluent limits (PEL) based on the most restrictive average and maximum wasteload allocations are selected from Table 10. The average PEL (PEL_{avg}) is compared to the average PEQ (PEQ_{avg}) from Table 5, and the PEL_{max} is compared to the PEQ_{max}. Based on the calculated percentage of the allocated value [($PEQ_{avg} \div PEL_{avg}$) X 100, or ($PEQ_{max} \div PEL_{max}$) X 100)], the parameters are assigned to group 3, 4, or 5. The groupings are listed in Table 11.

The final effluent limits are determined by evaluating the groupings in conjunction with other applicable rules and regulations. Table 12 presents the final effluent limits and monitoring requirements proposed for Geauga County McFarland Creek WWTP outfall 001 and the basis for their recommendation. See below for further information on monitoring requirements and limits for outfall 001.

Dissolved Oxygen (DO), Total Suspended Solids (TSS), Ammonia- Nitrogen, Oil and Grease, Phosphorus, and 5-Day Carbonaceous Biochemical Oxygen Demand (CBOD5)

The limits proposed for DO, TSS, ammonia-nitrogen, oil and grease, phosphorus, and 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) are a continuation of previous limits and are all based on plant design criteria. These limits are protective of water quality standards.

Escherichia Coli (E. coli) and pH

Limits for *E. coli* and pH are based on Water Quality Standards (OAC 3745-1-07). Revisions to water quality standards that protect primary contact recreation became effective on January 4, 2016. As a result, the monthly and weekly *E. coli* limits have become more stringent.

Dissolved Orthophosphate (aka Dissolved Reactive Phosphorus)

New monthly monitoring is proposed for dissolved orthophosphate (as P). This monitoring is required by Ohio Senate Bill 1, which was signed by the Governor on April 2, 2015 and incorporated into ORC 6111.03. Monitoring for orthophosphate is proposed to further develop nutrient datasets for dissolved reactive phosphorus and to assist in stream and watershed assessments and studies. Ohio EPA monitoring, as well as other in-stream monitoring, are generally performed via the collection of grab samples. Thus, orthophosphate is proposed to be collected by grab sample to maintain consistent data to support watershed and stream surveys. The grab sample must be filtered within 15 minutes of collection using a 0.45-micron filter. The filtered sample must be analyzed within 48 hours of sample collection.

Flow Rate and Water Temperature

Monitoring of flow rate and water temperature is required to assist in the evaluation of effluent quality and treatment plant performance. Monitoring frequency will remain the same as in the previous permit.

Mercury

The Ohio EPA risk assessment (Table 11) places mercury in group 5. This placement as well as the data in Table 4 and Table 5 indicates that the reasonable potential to exceed WQS exists and limits are necessary to protect water quality.

To comply with mercury limits, the permittee was granted a general mercury variance of 6.7 ng/L pursuant to Rule 3745-33-07(D)(10) of the Ohio Administrative Code under the current NPDES permit, effective August 1, 2012. Based on the results of low-level mercury monitoring, the permittee determined that the wastewater treatment plant could not meet the 30-day average water quality-based effluent limit (WQBEL) of 1.3 nanograms per liter (ng/L). However, the permittee believed that the plant would be able to achieve an annual average mercury effluent concentration (AAMEC) of 12 ng/L within 5 years of the effective date of the variance, i.e. July 31, 2017. The variance application also demonstrated to the satisfaction of Ohio EPA that there is no readily apparent means of complying with the WQBEL without constructing prohibitively expensive end-of-pipe controls for mercury.

During 2015, the facility did not achieve compliance with the 12 ng/L AAMEC. The County believes that the reduced mercury removal efficiency during this period was directly related to the failing membranes in the MBR process. With replacement of the membranes by the end of 2015, the overall plant performance has significantly improved.

Ohio EPA has reviewed the current mercury variance renewal application for the Geauga County McFarland Creek WWTP pursuant to OAC 3745-33-07(D)(8). Based upon these demonstrations, the facility is eligible for renewal of the mercury variance. A condition in Part II of the NPDES permit lists the provisions of the mercury variance renewal, and includes the following requirements:

- A continuation of the previous variance-based monthly average effluent limit of 6.7 ng/L;
- A requirement that the permittee make reasonable progress to meet the water-quality-based effluent limit for mercury by implementing the plan of study, which has been developed as part of the Pollutant Minimization Program (PMP);
- Low-level mercury monitoring of the plant's influent and effluent;
- A requirement that the annual average mercury effluent concentration of 12 ng/L as specified in the plan of study be achieved as expeditiously as practicable but by no later than July 31, 2017;
- A requirement to submit an annual report on implementation of the PMP; and
- A requirement for submittal of a certification stating that all permit conditions related to implementing the plan of study and the PMP have been satisfied, but that compliance with the monthly average water quality-based effluent limit for mercury has not been achieved.

Copper

The Ohio EPA risk assessment (Table 11) places copper in group 5. This placement as well as the data in Table 4 and Table 5 indicates that the reasonable potential to exceed WQS exists and limits are necessary to protect water quality. For these parameters, the PEQ is greater than 100 percent of the WLA and certain conditions exist that increase the risk to the environment. Pollutants that meet this requirement must have permit limits under OAC 3745-33-07(A)(1).

Lead, Zinc, and Total Filterable Residue (Total Dissolved Solids)

Ohio EPA risk assessment (Table 11) places these parameters in group 3. This placement as well as the data in Table 4 and Table 5 support that these parameters do not have the reasonable potential to contribute to WQS exceedances, and limits are not necessary to protect water quality.

Monitoring for lead and zinc on a quarterly basis is proposed to document that these pollutants continue to remain at low levels. Monitoring for TDS is recommended at 2/month.

Arsenic, Cadmium, Chromium, Hexavalent Chromium (Dissolved), Free Cyanide, Molybdenum, Nickel, Nitrate-N + Nitrite-N, Selenium, and Silver

Ohio EPA risk assessment (Table 11) places these parameters in group 2. This placement as well as the data in Table 4 and Table 5 support that these parameters do not have the reasonable potential to contribute to WQS exceedances, so limits are not necessary to protect water quality. Monitoring for cadmium, chromium, hexavalent chromium (dissolved), free cyanide, and nickel on a quarterly basis is proposed to document that these pollutants continue to remain at low levels. Annual monitoring is proposed for arsenic, molybdenum, selenium, and silver in order to establish a baseline dataset for these parameters.

Whole Effluent Toxicity Reasonable Potential

Evaluating the acute and chronic toxicity results in Table 7 under the provisions of 40 CFR Part 132, Appendix F, Procedure 6, gives an estimated chronic PEQ of 5.11 TU_c for *Ceriodaphnia dubia.* Reasonable potential for toxicity is demonstrated, since the chronic toxicity values for *Ceriodaphnia dubia* exceed the wasteload allocation value of 1.6 TU_c.

Because toxicity data points for *Ceriodaphnia dubia* have been above the minimum detection level several times throughout the past 5 years, limits will be required. Consistent with Procedure 6 and OAC 3745-33-07(B)(10), a monthly average limit of 1.6 TU_c and a daily maximum limit of 1.0 TU_a for *Ceriodaphnia dubia* are proposed. Chronic toxicity monitoring with acute endpoints will be required quarterly for *Ceriodaphnia dubia*.

Reasonable potential for toxicity was not demonstrated with respect to *Pimephales promelas.* Annual chronic toxicity monitoring with the determination of acute endpoints is proposed for the life of the permit. This satisfies the minimum testing requirement of Ohio Administrative Code (OAC) 3754-33-07(B)(11) and will adequately characterize toxicity in the plant's effluent.

Additional Monitoring Requirements

Additional monitoring requirements proposed at the final effluent, influent and upstream/downstream stations (where applicable) are included for all facilities in Ohio and vary according to the type and size of the discharge. In addition to permit compliance, this data is used to assist in the evaluation of effluent quality and treatment plant performance and for designing plant improvements and conducting future stream studies.

Sludge

Limits and monitoring requirements proposed for the reuse and/or disposal of sewage sludge by the following management practices are based on OAC 3745-40: Agronomic land application (Station 3PK00010581), hauling to another NPDES permit holder (Station 3PK00010588) and removal to an authorized solid waste landfill (Station 3PK00010586).

OTHER REQUIREMENTS

Compliance Schedule(s)

Phosphorus Optimization - The permittee shall prepare and submit a Phosphorus Discharge Optimization Evaluation plan to Ohio EPA Northeast District Office. The plan shall be completed and submitted to Ohio EPA no later than 12 months from the effective date of this permit. Details are in Part I.C of the permit.

Copper - A 24-month compliance schedule has been included for the permittee to meet the monthly average and daily maximum concentrations and loading limits for copper. Details are in Part I.C of the permit.

Wet–Weather Overflows/Bypasses - A compliance schedule is included in the permit for implementation of the required improvements to address wet weather bypasses. Details are in Part I.C of the permit.

Sanitary Sewer Overflow Reporting

Provisions for reporting sanitary sewer overflows (SSOs) are also proposed in this permit. These provisions include: the reporting of the system-wide number of SSO occurrences on monthly operating reports; telephone notification of Ohio EPA and the local health department, and 5-day follow up written reports for certain high risk SSOs; and preparation of an annual report that is submitted to Ohio EPA and made available to the public. Many of these provisions were already required under the "Noncompliance Notification", "Records Retention", and "Facility Operation and Quality Control" general conditions in Part III of Ohio NPDES permits.

Operator Certification and Operator of Record

Operator certification requirements have been included in Part II of the permit in accordance with OAC 3745-7-02. These rules require the Geauga County McFarland Creek WWTP to have a Class III wastewater treatment plant operator in charge of the sewage treatment plant operations discharging through outfall 3PK00010001. These rules also require the permittee to designate one or more operator of record to oversee the technical operation of the "treatment works" and/or "sewerage system".

Low-Level Free Cyanide Testing

Currently there are two approved methods for free cyanide listed in 40 CFR 136.3 that have quantification levels lower than any water quality-based effluent limits:

- ASTM D7237-10 and OIA-1677-09 - Flow injection followed by gas diffusion amperometry

These methods will allow Ohio EPA make more reliable water quality-related decisions regarding free cyanide. Because the quantification levels are lower than any water quality-based effluent limits, it will also be possible to directly evaluate compliance with free cyanide limits.

New NPDES permits no longer authorize the use of method 4500 CN-I from Standard Methods for free cyanide testing. The new permits require permittees to begin using one of these approved methods as soon as possible. If a permittee must use method 4500 CN-I during the transition to an approved method,

they are instructed to report the results on their DMR and enter "Method 4500 CN-I" in the remarks section.

Method Detection Limit (MDL)

The reported data for cadmium shows that the Geauga County McFarland Creek WWTP used an analytical method with a MDL that is not sensitive enough to properly evaluate the discharge with regard to the WLA for this parameter (See Table 10). Additionally, the WLA values for silver and selenium will necessitate the use of low-level analytical test methods. As a result, Part II of the permit includes a condition requiring the permittee to use analytical methods with appropriate MDLs.

Outfall Signage

Part II of the permit includes requirements for signs to be placed at each outfall to the Aurora Branch of the Chagrin River, providing information about the discharge. Signage at outfalls is required pursuant to Ohio Administrative Code 3745-33-08(A).

Part III

Part III of the permit details standard conditions that include monitoring, reporting requirements, compliance responsibilities, and general requirements.

Storm Water Compliance

Parts IV, V, and VI have been included with the draft permit in order to ensure that any storm water flows from the facility site are properly regulated and managed. As an alternative to complying with Parts IV, V, and VI, the Geauga County McFarland Creek WWTP may seek permit coverage under the general permit for industrial stormwater (permit # OHR000005 or subsequent renewal) or submit a "No Exposure Certification." Parts IV, V, and VI will be removed from the final permit if: 1) the Geauga County McFarland Creek WWTP submits a Notice of Intent (NOI) for coverage under the general permit for industrial stormwater or submits a No Exposure Certification, 2) Ohio EPA determines that the facility is eligible for coverage under the general permit or meets the requirements for a No Exposure Certification, and 3) the determination by Ohio EPA can be made prior to the issuance of the final permit.

Figure 1. Approximate Location of Geauga County McFarland Creek WWTP

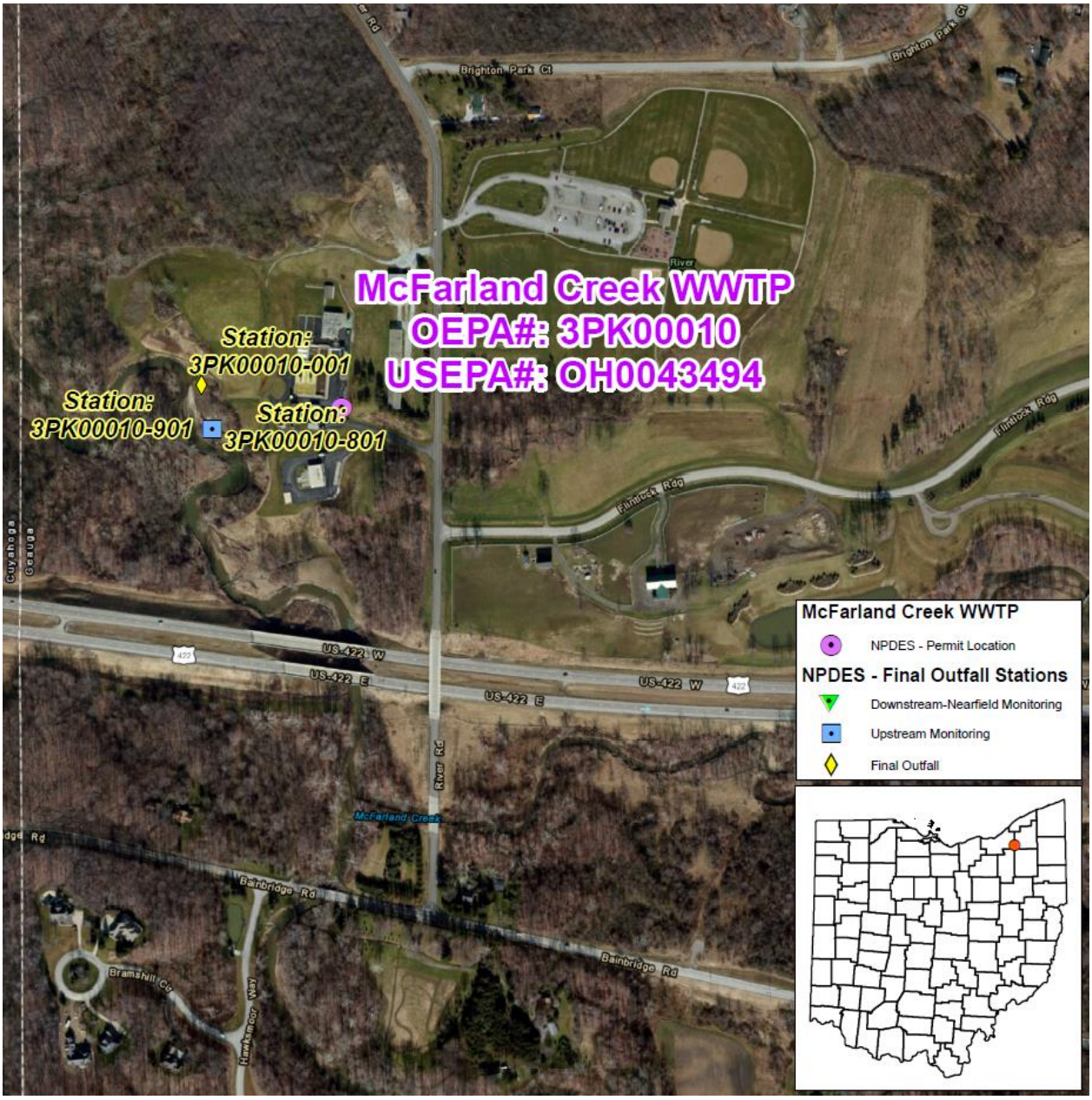

Figure 2. Diagram of Wastewater Treatment System

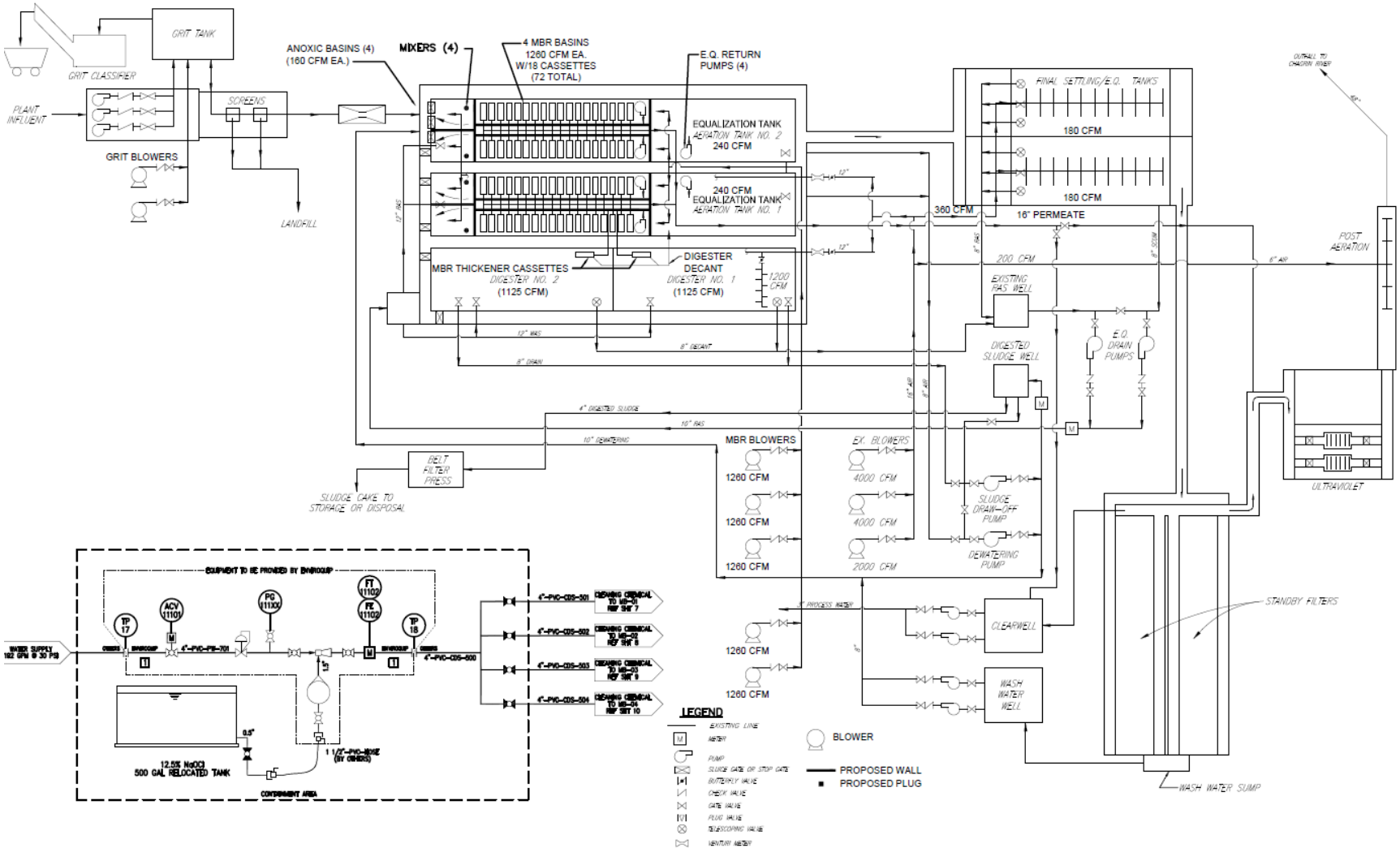

Table 1. Sewage Sludge Removal

Year	Dry Tons Removed (*) (Station 586)
2011	147
2012	273
2013	163
2014	195.95
2015	185.4

(*) – Excludes admixtures

Table 2. Average Annual Effluent Flow Rates

Year	Annual Flow in MGD			
	50th Percentile	95th Percentile	Maximum	Average
2012	1.18	1.9575	4.51	1.3293
2013	1.2	1.878	3.95	1.3034
2014	1.24	2.165	3.11	1.3448
2015	1.22	2.22	6.3	1.3882

Table 3. Summary of Effluent Violations (9/2011 - 3/2016)

Outfall	Parameter	Months with Violations	Total Limit Violations	No. Loading Violations	No. Concentration Violations
001	$CBOD_5$	13	69	28	41
001	Dissolved Oxygen	2	4	0	4
001	E. coli	5	9	0	9
001	Mercury, Total	11	16	5	11
001	Nitrogen, Ammonia (NH_3)	31	171	77	94
001	Phosphorus, Total (P)	9	33	10	23
001	Total Suspended Solids	19	103	43	60
001	pH, Maximum	4	4	0	4

Table 4. Effluent Characterization Based on Self Monitoring Data for Outfall 3PK00010001

Parameter	Season	Units	Current Permit Limits		# Obs.	Percentiles (*)(**)		Data Range
			30 day	Daily		50th	95th	
Water Temperature	Annual	C	--	--	1702	15.1	20.2	1.13-40.5
Dissolved Oxygen	Summer	mg/L	--	6.0	795	9.39	10.9	4.86-15.9
Dissolved Oxygen	Winter	mg/L	--	6.0	907	9.94	11.8	7.25-13.2
Residue, Total Dissolved	Annual	mg/L	--	--	10	764	987	673-1010
Total Suspended Solids	Annual	mg/L	5.3	8.0 [a]	676	2	19	0-60
Oil and Grease, Hexane Method	Annual	mg/L	--	7.0	111	1	4	0-6
Nitrogen, Ammonia (NH3)	Summer	mg/L	1.0	1.5 [a]	312	0.25	6.6	0-13.4
Nitrogen, Ammonia (NH3)	Winter	mg/L	1.0	1.5 [a]	363	0.58	5	0-11.8
Nitrite Plus Nitrate, Total	Annual	mg/L	--	--	56	10.4	17.7	3.5-20.6
Phosphorus, Total (P)	Annual	mg/L	0.67	1.0 [a]	656	0.43	1.09	0.04-2.14
Cyanide, Free	Annual	mg/L	--	--	25	0	0	0-0
Nickel, Total Recoverable	Annual	µg/L	--	--	45	0	14	0-14
Zinc, Total Recoverable	Annual	µg/L	--	--	45	35	80.4	0-91
Cadmium, Total Recoverable	Annual	µg/L	--	--	45	0	0	0-0
Lead, Total Recoverable	Annual	µg/L	--	--	149	0	12	0-19
Chromium, Total Recoverable	Annual	µg/L	--	--	45	0	0	0-0
Copper, Total Recoverable	Annual	µg/L	--	--	160	16	44.1	0-72
Chromium, Dissolved Hexavalent	Annual	µg/L	--	--	19	0	0	0-0
E. coli	Annual	#/100 ml	161	362 [a]	252	0	4220	0-200000
Flow Rate	Summer	MGD	--	--	728	1.14	1.85	0.84-6.3
Flow Rate	Winter	MGD	--	--	907	1.35	2.24	0.701-5.79
Flow Rate	Annual	MGD	--	--	1635	1.23	2.08	0.701-6.3
Mercury, Total (Low Level)	Annual	ng/L	6.7	1700	55	1.37	43.8	0-304

Parameter	Season	Units	Current Permit Limits		# Obs.	Percentiles (*)(**)		Data Range
			30 day	Daily		50th	95th	
Acute Toxicity, Ceriodaphnia dubia	Annual	TUa	--	1.0	18	0	0	0-0
Chronic Toxicity, Ceriodaphnia dubia	Annual	TUc	1.81	--	18	0	1.77	0-5
Acute Toxicity, Pimephales promelas	Annual	TUa	--	--	6	0	0	0-0
Chronic Toxicity, Pimephales promelas	Annual	TUc	--	--	6	0	0	0-0
pH, Maximum	Annual	S.U.	--	9.0	1702	7.96	8.49	7.06-13.2
pH, Minimum	Annual	S.U.	--	6.5	1664	7.61	8.22	6.51-8.68
Residue, Total Filterable	Annual	mg/L	--	--	45	758	979	7.21-1010
CBOD 5 day	Summer	mg/L	5.3	8.0 [a]	310	2	15.3	0-28.7
CBOD 5 day	Winter	mg/L	5.3	8.0 [a]	360	2	14	0-39

All values are based on annual records unless otherwise indicated.
* = For minimum pH, 5th percentile shown in place of 50th percentile
** = For dissolved oxygen, 5th percentile shown in place of 95th percentile
a = weekly average

Table 5. Effluent data for Geauga County McFarland Creek WWTP Outfall 3PK00010001

Parameter	Units	Number of Samples	Number > MDL	PEQ Average	PEQ Maximum
Ammonia (Summer)	mg/L	203	201	3.4389	6.4388
Ammonia (Winter)	mg/L	180	176	3.1212	6.6239
Arsenic - TR	µg/L	--	--	--	--
Cadmium - TR	µg/L	45	0	--	--
Chromium - TR	µg/L	45	0	--	--
Hexavalent Chromium (Dissolved)	µg/L	19	0	--	--
Cyanide - free	mg/L	25	0	--	--
Dissolved Solids	mg/L	42	42	941.63	1145.2
Lead - TR	µg/L	145	11	9.1191	13.243
Mercury	ng/L	52	45	14.057	20.189
Molybdenum	µg/L	--	--	--	--
Nickel - TR	µg/L	44	4	11.242	15.4
Nitrate-N + Nitrite-N	mg/L	55	55	15.942	21.963
Selenium - TR	µg/L	--	--	--	--
Silver	µg/L	--	--	--	--
Zinc - TR	µg/L	45	44	66.812	97.869
Copper - TR	µg/L	156	109	32.442	47.891

MDL = analytical method detection limit
PEQ = projected effluent quality

Table 6. Summary Toxicity Test Results for Outfall 3PK00010001

Date	*Ceriodaphnia Dubia*		*Pimephales promelas*	
	TU_a	TU_c	TU_a	TU_c
12/8/2011	AA	AA	AA	AA
3/26/2012	AA	1.2	AA	AA
6/26/2012	AA	5	AA	AA
8/3/2012	AA	AA	--	--
12/18/2012	AA	AA	--	--
3/7/2013	AA	1.19	--	--
6/24/2013	AE	AE	AA	AA
8/26/2013	AA	AA	--	--
12/5/2013	AA	AA	--	--
12/15/2013	AA	AA	--	--
3/23/2014	AA	AA	--	--
6/29/2014	AA	AA	AA	AA
8/7/2014	AA	AA	--	--
12/15/2014	AA	AA	--	--
3/27/2015	AA	AA	--	--
6/5/2015	AA	1.2	AA	AA
8/21/2015	AA	AA	--	--
12/4/2015	AA	AA	--	--
3/8/2016	AA	AA	--	--

TUa = acute toxicity units
TUc = chronic toxicity units

AA = below detection
AE = Analytical data invalid

Table 7. Summary of Aquatic Life Use Attainment Status

Use attainment table: From the 2006 Biological and Water Quality Report for the Chagrin River and Selected Tributaries (2003-2004 Survey)

River Mile	IBI	MIwb[a]	ICI[b]	#CW[c] Fish/Bugs	QHEI	Attainment Status	Site Locations	Causes[d]	Sources
Aurora Branch Chagrin River (2003-04 Results) EOLP: CWH Use Designation									
7.4/7.3	32*	7.7^{ns}	VG	$(0)^{hi}$ + / 5	74.5	PARTIAL	Brewster Road, downstream sand & gravel operation @ RM 9.0	Organic enrichment, siltation	Urban runoff/Storm sewers, Septic tanks, Urban runoff, gravel mining
$5.6/5.1^{R}$, 5.5^{R}	38	8.5	48/56	$(0)^{I}$ + / 5	74.0	FULL	Adj. Geauga Lake Rd. near Fields Run	-	-
3.8^{+}	44	8.3	--	$(0)^{I}$ + / -	79.5	FULL	Upstream McFarland Creek	-	-
Aurora Branch Chagrin River (2003-04 Results) EOLP: WWH Use Designation									
3.7/3.5, 3.7^{+}	38	8.4	54/50	0+ / 4,2	79.5	FULL	Upstream McFarland Creek WWTP	-	-
3.4	30*	7.8^{ns}	48	0+ / 6	79.5	PARTIAL	Downstream McFarland Creek WWTP	Organic enrichment including P, Siltation	Major Municipal Point Source, Hydromodification-Streambank destabilization (bridge construction)
1.0/0.9	36^{ns}	7.9	VG	0+ / 1	54.0	FULL	Downstream Solon Rd.	-	-
Aurora Branch Chagrin River (2003-04 Results) EOLP: WWH & SSH Use Designation									
0.3	-	-	46	- / 1	-	FULL	Upstream	-	-

							Bridge abutment (Bentleyville)		

a MIwb is not applicable to headwater streams with drainage areas ≤ 20 mi^2

b A qualitative narrative evaluation based on community composition, EPT taxa richness, and other attributes. E = Exceptional, VG = Very Good, G = Good, MG = Marginally Good, F = Fair, P = Poor, VP = Very Poor

c Attainment of CWH evaluated on presence and quality of CW fish [OEPA CW list (trouts, sculpins, brook stickleback, redside dace) & other additional species (e.g. Longnose dace, American Brook lamprey, mudminnow, blacknose dace, and white sucker – specific interpretation based on local collection - presence, distribution & habitat)] and ≥ 4 CW macroinvertebrates (from OEPA current list) & narrative quality. If CW fish from OEPA CW list were present, the total number of different CW fish taxa were listed, and a footnote (+) was added if additional potential coolwater/cold water fish were present from the additional species list. Full but Declining is noted when a lack of quality or decreased quality is documented by decreases in the cold water fish assemblages or macroinvertebrate assemblages over time.

d Causes and Sources listed are considered to be a primary influence on water quality, but may not be the only issue leading to impairment or declines. See discussion in text of additional causes that cumulatively have led to impairment.

* Indicates significant departure from biocriteria (> 4 IBI or ICI units, or > 0.5 MIwb units).

R Regional Reference site

ns Nonsignificant departure from biocriteria (≤ 4 IBI or ICI units, or ≤ 0.5 MIwb units).

\+ Potential coolwater/cold water fish listed were collected during present sampling (e.g. Longnose dace, American Brook lamprey, mudminnow, blacknose dace, and white sucker – specific interpretation based on local collection – presence, distribution & habitat from OEPA data and historical distributions).

I Upper reach historical presence of CW Redside Dace (1991, 1995). CW fish are present in Smith Creek watershed (2004) (confluence to Aurora Branch @ RM 8.98) – Redside Dace and Brook Stickleback. CW fish Brook Trout present in Linton Creek (confluence to Aurora Branch @ RM 5.27). CW fish Brook Stickleback is present in North Branch McFarland Creek (2004).

INDEX - Site Type	WWH	EWH	CWH[c]
IBI – Headwaters	40	50	**No**
IBI – Wading	38	50	**Numerical**
MIwb – Wading	7.9	9.4	**Criteria**
ICI	34	46	**Available**

Table 8. Water Quality Criteria in the Study Area

Parameter	Units	Outside Mixing Zone Criteria					Inside Mixing Zone Maximum
		Average				Maximum Aquatic Life	
		Wildlife	Human Health	Agri-culture	Aquatic Life		
Ammonia - N (Summer)	mg/L	--	--	--	1.1	--	--
Ammonia - N (Winter)	mg/L	--	--	--	1.2	--	--
Arsenic - TR	µg/L	--	580	100	150	340	680
Cadmium - TR	µg/L	--	730	50	4	9.2	18
Chromium - TR	µg/L	--	14000	100	140	3000	6000
Hexavalent Chromium (Dissolved)	µg/L	--	14000	--	11	16	31
Cyanide - free	mg/L	--	48	--	0.0052	0.022	0.044
Dissolved Solids	mg/L	--	--	--	1500	--	--
Lead - TR	µg/L	--	--	100	14	270	540
Mercury	ng/L	1.3	3.1	10000	910	1700	3400
Molybdenum	µg/L	--	10000	--	20000	190000	370000
Nickel - TR	µg/L	--	43000	200	89	800	1600
Nitrate-N + Nitrite-N	mg/L	--	--	100	--	--	--
Selenium - TR	µg/L	--	3100	50	5	--	--
Silver	µg/L	--	11000	--	1.3	4.7	9.4
Zinc - TR	µg/L	--	35000	25000	200	200	410
Copper - TR	µg/L	--	64000	500	16	25	50

Table 9. Instream Conditions and Discharger Flow

Parameter	Units	Season	Value	Basis
Stream Flows				
1Q10	cfs	annual	3.9	USGS Gage 4208900
7Q10	cfs	annual	6.7	USGS Gage 4208900
30Q10	cfs	summer	8.1	USGS Gage 4208900
		winter	18	USGS Gage 4208900
90Q10	cfs	annual	10	USGS Gage 4208900
Harmonic Mean	cfs	annual	20.8	USGS Gage 4208900 (Calculated)
Mixing Assumption	%	average	25	
		maximum	100	
Hardness, OMZ	mg/L	annual	187	STORET Station D01P19, D01S22; 2003-2004; n=15; Median Value
Hardness, IMZ	mg/L	annual	187	STORET Station D01P19, D01S22; 2003-2004; n=15; Median Value
pH (75th percentile)	S.U.	summer	8.1	DMR Station 901; 2011-2016; n=17
		winter	8.5	DMR Station 901; 2011-2016; n=15
Temperature (75th percentile)	ºC	summer	19.4	DMR Station 901; 2011-2016; n=17
		winter	3.6	DMR Station 901; 2011-2016; n=15
McFarland Creek WWTP flow	cfs	annual	2.785	NPDES Application
Background Water Quality				
Ammonia - N (Summer)	mg/L		0.1	DMR; 2011-2016; n=17; 0<MDL; Station 801; Median Value
Ammonia - N (Winter)	mg/L		0.17	DMR; 2011-2016; n=15; 0<MDL; Station 801; Median Value
Arsenic - TR	µg/L		2.5	Ohio EPA; 2003-2004; n=12; 2<MDL; STORET Station D01P22; Median Value
Cadmium - TR	µg/L		0	Ohio EPA; 2003-2004; n=12; 12<MDL; STORET Station D01P22; Median Value
Chromium - TR	µg/L		0	Ohio EPA; 2003-2004; n=12; 12<MDL; STORET Station D01P22; Median Value
Hexavalent Chromium (Dissolved)	µg/L		0	No representative data available.
Cyanide - free	mg/L		0	No representative data available.
Dissolved Solids	mg/L		360	Ohio EPA; 2003-2004; n=13; 0<MDL; STORET Station D01P22; Median Value
Lead - TR	µg/L		1	Ohio EPA; 2003-2004; n=12; 10<MDL; STORET Station D01P22; Median Value
Mercury	ng/L		0	No representative data available.
Molybdenum	µg/L		0	No representative data available.

Parameter	Units	Season	Value	Basis
Nickel - TR	µg/L		0	Ohio EPA; 2003-2004; n=12; 12<MDL; STORET Station D01P22; Median Value
Nitrate-N + Nitrite-N	mg/L		0.5	DMR; 2012-2016; n=45; 1<MDL; Station 801; Median Value
Selenium - TR	µg/L		0	Ohio EPA; 2003-2004; n=12; 12<MDL; STORET Station D01P22; Median Value
Silver	µg/L		0	No representative data available.
Zinc - TR	µg/L		5	Ohio EPA; 2003-2004; n=12; 9<MDL; STORET Station D01P22; Median Value
Copper - TR	µg/L		0	Ohio EPA; 2003-2004; n=12; 12<MDL; STORET Station D01P22; Median Value

Table 10. Summary of Effluent Limits to Maintain Applicable Water Quality Criteria

Parameter	Units	Outside Mixing Zone Criteria					Inside Mixing Zone Maximum
		Average				Maximum	
		Wildlife	Human Health	Agri-culture	Aquatic Life	Aquatic Life	
Ammonia - N (Summer)	mg/L	--	--	--	4.01	--	--
Ammonia - N (Winter)	mg/L	--	--	--	7.86	--	--
Arsenic - TR	µg/L	--	580	100	239	813	680
Cadmium - TR	µg/L	--	730	50	6.4	22	18
Chromium - TR	µg/L	--	14000	100	224	7201	6000
Hexavalent Chromium (Dissolved)	µg/L	--	14000	--	18	38	31
Cyanide - free	mg/L	--	48	--	0.0083	0.053	0.044
Dissolved Solids	mg/L	--	--	--	2186	--	--
Lead - TR	µg/L	--	--	100	22	647	540
Mercury	ng/L	1.3	3.1	10000	910	1700	3400
Molybdenum	µg/L	--	10000	--	32029	456068	370000
Nickel - TR	µg/L	--	43000	200	143	1920	1600
Nitrate-N + Nitrite-N	mg/L	--	--	100	--	--	--
Selenium - TR	µg/L	--	3100	50	8	--	--
Silver	µg/L	--	11000	--	2.1	11	9.4
Zinc - TR	µg/L	--	35000	25000	317	473	410
Copper - TR	µg/L	--	64000	500	26	60	50

Table 11. Parameter Assessment for Outfall 3PK00010001

Group 1: Due to a lack of criteria, the following parameters could not be evaluated at this time.

No parameters placed in this group

Group 2: PEQ < 25 percent of WQS or all data below minimum detection limit. WLA not required. No limit recommended; monitoring optional.

Arsenic - TR	Cadmium - TR	Chromium - TR
Hexavalent Chromium (Dissolved)	Cyanide - free	Molybdenum
Nickel - TR	Nitrate-N + Nitrite-N	Selenium - TR
Silver		

Group 3: PEQmax < 50 percent of maximum PEL and PEQavg < 50 percent of average PEL. No limit recommended; monitoring optional.

Total Dissolved Solids	Lead - TR	Zinc - TR

Group 4: PEQmax >= 50 percent, but < 100 percent of the maximum PEL or PEQavg >= 50 percent, but < 100 percent of the average PEL. Monitoring is appropriate.

No parameters placed in this group

Group 5: Maximum PEQ >= 100 percent of the maximum PEL or average PEQ >= 100 percent of the average PEL, or either the average or maximum PEQ is between 75 and 100 percent of the PEL and certain conditions that increase the risk to the environment are present. Limit recommended.

Limits to Protect Numeric Water Quality Criteria

		Recommended Effluent Limits	
Parameter	*Units*	*Average*	*Maximum*
Mercury	ng/L	1.3	1700
Copper - TR	µg/L	26	50

PEL = preliminary effluent limit
PEQ = projected effluent quality
WLA = wasteload allocation
WQS = water quality standard

Table 12. Final Effluent Limits and Monitoring Requirements for Outfall 3PK00010001

Parameter	Units	Concentration		Loading (kg/day)[a]		Basis[b]
		30 Day Average	Daily Maximum	30 Day Average	Daily Maximum	
Water Temperature	°C	- - - - - - - - - - Monitor - - - - - - - - - - -				M[c]
Flow Rate	MGD	- - - - - - - - - - Monitor - - - - - - - - - - -				M[c]
pH	SU	6.5 - 9.0		--	--	WQS
Dissolved Oxygen	mg/L	6.0 (Minimum)				M[c]
Total Suspended Solids	mg/L	5.3	8.0[d]	36.2	54.6[d]	PD
Oil & Grease	mg/L	--	7.0	--	--	PD
Ammonia (as N)	mg/L	1.0	1.5[d]	6.82	10.3[d]	BTJ
Total Kjeldahl Nitrogen	mg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Nitrate+Nitrite (as N)	mg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Phosphorus	mg/L	0.67	1.0[d]	4.57	6.82[d]	PD
Dissolved Orthophosphate	mg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				SB1
Total Filterable Residue	mg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Nickel	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Zinc	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Cadmium	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Lead	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Chromium	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Arsenic	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Silver	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Selenium	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Molybdenum	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Copper	µg/L	26	50	0.18	0.35	WLA/RP
Hexavalent Chromium	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				BTJ
Mercury	ng/L	6.7	1700	0.000046	0.0116	VAR/ABS
Free Cyanide	µg/L	- - - - - - - - - - Monitor - - - - - - - - - - -				WLA/RP
E. coli	#/100 mL	126	284[d]	--	--	WQS
Carbonaceous Biochemical Oxygen Demand (5 day)	mg/L	5.3	8.0[d]	36.2	54.6[d]	PD
Acute Toxicity						
Ceriodaphnia dubia	TU_a	--	1.0	--	--	WET/RP
Pimephales promelas	TU_a	--	--	--	--	WET
Chronic Toxicity						
Ceriodaphnia dubia	TU_c	1.6	--	--	--	WET/RP
Pimephales promelas	TU_c	--	--	--	--	WET

[a] Effluent loadings based on average design discharge flow of 1.8 MGD.

[b] Definitions:

BTJ = Best Technical Judgment
M = Division of Surface Water NPDES Permit Guidance 1: Monitoring frequency requirements for Sanitary Discharges
OAC = Ohio Administrative Code
PD = Plant Design (OAC 3745-33-05(E))
PTS = Phosphorus Treatment Standards (OAC 3745-33-06 (C))
RP = Reasonable Potential for requiring water quality-based effluent limits and monitoring requirements in permits (OAC 3745-33-07(A))
SB1 = Implementation of Senate Bill 1 [ORC 6111.03]
VAR = Mercury variance (OAC 3745-33-07(D)(10)(a))
WET = Whole Effluent Toxicity (OAC 3745-33-07(B))
WLA = Wasteload Allocation procedures (OAC 3745-2)
WQS = Ohio Water Quality Standards (OAC 3745-1)

[c] Monitoring of flow and other indicator parameters is specified to assist in the evaluation of effluent quality and treatment plant performance.

[d] 7 day average limit.

Attachment 1. Supplemental DMR Data (Influent, Sludge, Upstream, Downstream, etc.)

Parameter	Season	Units	# Obs.	Percentiles		Data Range
				50th	95th	
SSO Station 3PK00010300						
Overflow Occurrence	Annual	No./Month	3	1	1	1-1
Sludge Station 3PK00010586						
Sludge Fee Weight	Annual	dry tons	5	185	258	147-273
Influent Station 3PK00010601						
Total Suspended Solids	Annual	mg/L	676	160	463	1-1150
Cyanide, Free	Annual	mg/L	10	0	0	0-0
Lead, Total Recoverable	Annual	µg/L	152	0	21.5	0-108
Copper, Total Recoverable	Annual	µg/L	163	98	319	0-1100
Mercury, Total (Low Level)	Annual	ng/L	54	44.7	307	0.9-448
pH, Maximum	Annual	S.U.	1704	7.61	7.8	7.03-8.36
pH, Minimum	Annual	S.U.	1704	7.22	7.54	6.13-7.75
CBOD 5 day	Summer	mg/L	309	110	247	0-1220
CBOD 5 day	Winter	mg/L	360	93.9	202	4.2-425
Upstream Station 3PK00010801						
Water Temperature	Annual	C	56	9.15	19.2	0.6-21.7
Dissolved Oxygen	Summer	mg/L	26	9.38	10.4	6.98-13.8
Dissolved Oxygen	Winter	mg/L	30	11.4	13.1	7.27-13.5
pH	Annual	S.U.	56	8.11	8.71	6.56-8.97
Nitrogen, Ammonia (NH3)	Summer	mg/L	26	0.084	0.286	0.05-0.37
Nitrogen, Ammonia (NH3)	Winter	mg/L	30	0.14	0.546	0-0.685
Nitrite Plus Nitrate, Total	Annual	mg/L	45	0.51	0.938	0-3.41
Phosphorus, Total (P)	Annual	mg/L	45	0.06	0.184	0.01-0.78
Fecal Coliform	Annual	#/100 ml	4	230	2180	120-2500
E. coli	Annual	#/100 ml	20	245	526	56-540
48-Hr. Acute Toxicity Ceriodaphnia dubia	Annual	% Affected	16	0	0	0-0
96-Hr. Acute Toxicity Pimephales promelas	Annual	% Affected	4	13	43.5	2-48
7-Day Chronic Toxicity Ceriodaphnia dubia	Annual	% Affected	16	0	12.5	0-20
7-Day Chronic Toxicity Pimephales promelas	Annual	% Affected	4	21	48.7	8-52

Parameter	Season	Units	# Obs.	Percentiles		Data Range
				50th	95th	
Downstream Station 3PK00010901						
Water Temperature	Annual	C	56	9.25	19.8	0.4-21.8
Dissolved Oxygen	Summer	mg/L	26	8.77	11.6	6.47-14.2
Dissolved Oxygen	Winter	mg/L	30	11.3	13.2	7.29-13.8
pH	Annual	S.U.	56	8.1	8.81	6.83-9.5
Nitrogen, Ammonia (NH3)	Summer	mg/L	26	0.077	0.293	0.05-0.41
Nitrogen, Ammonia (NH3)	Winter	mg/L	30	0.12	0.488	0-0.842
Nitrite Plus Nitrate, Total	Annual	mg/L	45	1.02	1.68	0.39-1.7
Phosphorus, Total (P)	Annual	mg/L	45	0.09	0.18	0.01-0.3
Cyanide, Free	Annual	mg/L	10	0	0	0-0
Lead, Total Recoverable	Annual	µg/L	58	0	11.3	0-14
Copper, Total Recoverable	Annual	µg/L	58	0	19	0-35
Fecal Coliform	Annual	#/100 ml	4	190	1820	60-2100
E. coli	Annual	#/100 ml	20	210	1050	24-1900

Addendum 1. Acronyms

ABS	Anti-backsliding
BPJ	Best professional judgment
CFR	Code of Federal Regulations
CMOM	Capacity Management, Operation, and Maintenance
CONSWLA	Conservative substance wasteload allocation
CSO	Combined sewer overflow
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DMT	Dissolved metal translator
IMZM	Inside mixing zone maximum
LTCP	Long-term Control Plan
MDL	Analytical method detection limit
MGD	Million gallons per day
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
ORSANCO	Ohio River Valley Water Sanitation Commission
PEL	Preliminary effluent limit
PEQ	Projected effluent quality
PMP	Pollution Minimization Program
PPE	Plant performance evaluation
SSO	Sanitary sewer overflow
TMDL	Total Daily Maximum Load
TRE	Toxicity reduction evaluation
TU	Toxicity unit
U.S. EPA	United States Environmental Protection Agency
WET	Whole effluent toxicity
WLA	Wasteload allocation
WPCF	Water Pollution Control Facility
WQBEL	Water-quality-based effluent limit
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant