Permit Fact Sheet

General Information

Permit Number	WI-0030848-10-0
Permittee Name and Mailing Address	Village of Cleveland PO Box 87, Cleveland, WI 53015
Permitted Facility Name and Address	Cleveland Wastewater Treatment Facility 245 Whitetail Ln, Cleveland, WI
Permit Term	July 01, 2025 to June 30, 2030
Discharge Location	500 feet offshore (Latitude 43° 56’ 8” N; Longitude 87° 43’ 1” W)
Receiving Water	Lake Michigan in the Sevenmile and Silver Creeks Watershed (MA01) of the Lakeshore Basin in Manitowoc County
Stream Flow ($Q_{7,10}$)	N/A – Lake discharge; a 10:1 dilution factor is applied
Water Body Classification	Cold Water and Public Water Supply
Discharge Type	Existing; Continuous
Annual Average Design Flow	0.239 MGD
Industrial or Commercial Contributors	None
Plant Classification	A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; P - Total Phosphorus; D - Disinfection; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

The Village of Cleveland owns and operates the Cleveland Wastewater Treatment Facility that treats residential and commercial domestic wastewater from the Village sanitary sewer collection system. Class B sludge generated from the treatment facility is land applied on Department approved sites. The paragraphs below describe the liquid and solids treatment train of the Cleveland Wastewater Treatment Facility.

Liquid Treatment Train: The raw influent wastewater from the Village of Cleveland flows to the main Hika lift station. The lift station pumps the wastewater to the headworks. At the headworks, the influent passes through a mechanical fine screen. The screenings are disposed of to a dumpster. There is a bypass channel with a manual bar screen. The screened influent then drops by gravity to a pipe where influent composite samples are collected by an automatic sampler and the influent flow is measured by a magnetic flow meter at Sampling Point 701. Following the headworks, the influent flows to the activated sludge treatment and biological phosphorus removal process. At the activated sludge treatment and biological phosphorus removal process, the influent flows to a set of three selector tanks. The influent flows to Selector 1 operating in the anaerobic condition. Selector 2 only receives return activated sludge operating in the anoxic condition. Selector 3 receives the mixed liquor flow operating in anaerobic condition. Selectors 1 and 3 have their mixers run continuously. The mixed liquor then flows to a set of two aeration basins. Each aeration basin has full floor coverage fine

bubble diffusers. The sludge decant is pumped to the aeration basins. The mixed liquor then flows over a weir where alum is fed prior to following to the final clarifier splitter box. The mixed liquor is then split between two final clarifiers. The clarified effluent is then pumped to the effluent channel. The effluent flow rate is measured by a magnetic flow meter as it passes through the pipe to the effluent channel. At the effluent channel, effluent composite samples are collected by an automatic sampler prior to disinfection with an ultraviolet (UV) system via Sampling Point 001. The final effluent then flows by gravity out to Lake Michigan about 500 feet from the shore via Outfall 001.

Solids Treatment Train: All waste activated sludge is sent to an aerobic digestor. The aerobic digestor has two cells. Each basin has a row of floor diffusers down the center of each cell. The aerobically digested sludge is then sent to a sludge storage tank. The facility has a mixer to mix the sludge prior to disposal. The liquid sludge is then hauled, and land applied on Department approved sites via Outfall 002.

Substantial Compliance Determination

Enforcement During Last Permit: A Notice of Noncompliance (NON) was sent in November 2020 for a treatment facility overflow (TFO). The facility has completed all previously required actions as part of the enforcement process.

After a desk top review of all discharge monitoring reports, compliance maintenance annual reports (CMARs), land application reports, compliance schedule items, and a site visit on April 25, 2023, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Trevor Moen, Wastewater Engineer on January 16, 2025.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	0.163 MGD (Avg. 4/1/19-12/31/24)	INFLUENT: At Sampling Point 701, the permittee shall collect representative samples of the influent from the influent automatic sampler drawing 24-hour flow proportional composite samples from the port on the influent pipe following fine screening and prior to recycled flows. The permittee shall measure the influent flow rate using a continuous flow recording device on the influent pipe after fine screening and prior to any recycled flows.
751	N/A – no flow monitoring required	MUNICIPAL WELL #1: This sample point is for the voluntary sampling and reporting of arsenic results from the Village's Municipal Well #1, WUWN #BG236. If the permittee performs this voluntary sampling at Sampling Point 751, the permittee must collect representative grab samples of the raw or finished drinking water for arsenic at Municipal Well #1 on the same day as sampling the effluent for arsenic under Sampling Point 001. The permittee shall report the results of this voluntary monitoring on the electronic Discharge Monitoring Report (eDMR) form.
752	N/A – no flow monitoring required	MUNICIPAL WELL #2: This sample point is for the voluntary sampling and reporting of arsenic results from the Village's Municipal Well #2, WUWN #HJ180. If the permittee performs this voluntary sampling at Sampling Point 752, the permittee must collect representative grab samples of the raw or finished drinking

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
		water for arsenic at Municipal Well #2 on the same day as sampling the effluent for arsenic under Sampling Point 001. The permittee shall report the results of this voluntary monitoring on the electronic Discharge Monitoring Report (eDMR) form.
001	0.153 MGD (Avg. 4/1/19-12/31/24)	EFFLUENT: At Sampling Point 001, the permittee shall collect representative samples of the final effluent from the effluent automatic sampler drawing 24-hour flow proportional composite samples from the effluent trough prior to disinfection except that the permittee shall collect grab samples of the effluent for pH prior to disinfection and E. coli after disinfection and prior to being discharged to Lake Michigan via Outfall 001. The permittee shall measure the effluent flow rate using a continuous flow recording device on the effluent pipe prior to disinfection.
002	230,616 gallons (Avg. 4/1/19-12/31/24)	LIQUID SLUDGE: Class B liquid sludge that has been aerobically digested and sent to a storage tank. At Sampling Point 002, the permittee shall collect representative composite samples of the liquid sludge from the sludge storage tank after complete mixing and prior to being land applied on Department approved sites via Outfall 002.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Week	24-Hr Flow Prop Comp	

1.1.1 Changes from Previous Permit:

Influent limitations and monitoring requirements were evaluated for this permit term and no changes were required.

1.1.2 Explanation of Limits and Monitoring Requirements

Monitoring of influent flow, BOD_5 and total suspended solids is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code, and in the Standard Requirements section of the permit.

1.2 Sample Point Number: 751- MUNICIPAL WELL #1 and 752- MUNICIPAL WELL #2

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Arsenic, Total Recoverable		ug/L	Quarterly	Grab	

1.2.1 Changes from Previous Permit:

Influent limitations and monitoring requirements were evaluated for this permit term and no changes were required.

1.2.2 Explanation of Limits and Monitoring Requirements

Sampling points for the Villages' two municipal wells are included for voluntary reporting of arsenic data from those wells. If that monitoring is conducted, the well(s) in use is to be sampled concurrently with arsenic monitoring of the effluent, to allow correlations to be made between the concentration of arsenic in the well water to that of the effluent.

2 Surface Water - Monitoring and Limitations

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Weekly Avg	45 mg/L	2/Week	24-Hr Flow Prop Comp	.
BOD5, Total	Monthly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	
pH Field	Daily Min	6.0 su	5/Week	Grab	
pH Field	Daily Max	9.0 su	5/Week	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective May through September annually.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective May through September annually. See the E. coli Percent Limit permit section. Enter the result in the eDMR on the last day of the month.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	11 mg/L	Weekly	24-Hr Flow Prop Comp	Limit effective February through May annually.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	11 mg/L	Weekly	24-Hr Flow Prop Comp	Limit effective February through May annually.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	11 mg/L	Weekly	24-Hr Flow Prop Comp	Limit effective February through May annually.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring permit section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring permit section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring permit section. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Phosphorus, Total	6-Month Avg	0.6 mg/L	Weekly	24-Hr Flow Prop Comp	
Arsenic, Total Recoverable	Daily Max	3.0 ug/L	Quarterly	24-Hr Flow Prop Comp	Interim Limit. See the Arsenic Variance permit section and the Arsenic Pollutant Minimization Program Schedule.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring only January 2029 through December 2029.

2.1.1 Changes from Previous Permit

Effluent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit.

- Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits.
- Reduced ammonia nitrogen daily max, weekly avg and monthly avg limits.
- Addition of annual total nitrogen (TKN, NO_2+NO_3 and Total N) monitoring in rotating quarters.
- Removed total phosphorus interim monthly avg limit.
- Reduced arsenic daily max limit to 3.0 ug/L from 4.1 ug/L.
- Addition of monthly chloride monitoring for one year (2029).

2.1.2 Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the water quality-based effluent limits (WQBEL) memo, by Nicole Krueger, Water Resources Engineer, dated January 9, 2025.

Monitoring Frequencies – The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Expression of Limits – In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average limits whenever practicable. Minor changes have been made to the limits for ammonia nitrogen.

E. coli – Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. Section NR 102.04(5)(a), Wis. Adm. Code, states that all surface waters shall be suitable for recreational use and meet the E. coli criteria established to protect this use.

Arsenic – The Village of Cleveland applied for an arsenic variance, under the provisions of s. 283.15, Wis. Stats., with its application for permit reissuance. The previous permit also included an arsenic variance. The Department reviewed Cleveland's application for an arsenic variance and the information supplied in the application supports the establishment of an interim effluent limit. The permittee and the Department have reached agreement on an interim arsenic limit of 3.0 ug/L (expressed as a daily maximum), implementation of an arsenic pollutant minimization plan, and submittal of annual progress reports each year by January 31st. The arsenic pollutant minimization measures that are required to be implemented can be found in the proposed permit. The Department concludes that Cleveland is qualified for a variance from the water quality standard for arsenic and proposes reissuance of this permit with the proposed variance.

Total Nitrogen Monitoring (TKN, NO_2+NO_3, and Total N) – The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under s. 283.55(1)(e), Wis. Stats. Testing is required during the following quarters: October – December 2025; April – June 2026; July – September 2027; January – March 2028; and October – December 2029.

PFOS and PFOA – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Pursuant to s. NR 106.98(3)(b), Wis. Adm. Code, the Department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, the Department has determined the permittee does not need to sample for PFOS or PFOA as part of this permit reissuance. The Department may re-evaluate the need for sampling at the next permit.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
002	B	Liquid	Fecal Coliform	Incorporation; Injection	Land Application or Disposal at another WWTF	16 MT Land Applied (Avg. 4/1/19-12/31/24)
Does sludge management demonstrate compliance? Yes.						
Is additional sludge storage required? No.						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No.						
Is a priority pollutant scan required? N/A						

3.1 Sample Point Number: 002- LIQUID SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

3.1.1 Changes from Previous Permit:

Sludge limitations and monitoring requirements were evaluated for this permit term and the following changes were made.

- Removed PCB monitoring. PCB monitoring results were low in 2020 (during the previous permit term) therefore PCB monitoring is not required during the proposed permit term.
- Addition of annual PFAS (PFOA + PFOS) monitoring pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code.

3.1.2 Explanation of Limits and Monitoring Requirements

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5). Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k). Radium requirements are addressed in s. NR 204.07(3)(n).

PFAS – The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA is currently developing a risk assessment to determine future land application rates and a draft risk assessment was released in early 2025. In the interim, the department has developed the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS."

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

4 Schedules

4.1 Arsenic Pollutant Minimization Program

As a condition of the variance to the water quality standard for arsenic granted in accordance with s. 283.15, Wis. Stats., the permittee shall perform the following actions.

Required Action	Due Date
Annual Arsenic Progress Reports: Submit an annual arsenic progress report related to the pollutant minimization activities for the previous year. The annual arsenic progress report shall: Indicate which arsenic pollutant minimization activities or activities outlined in the Pollutant Minimization Plan have been implemented and state which, if any, activities from the Pollutant Minimization Plan were not pursued and why; Include an assessment of whether each implemented pollutant minimization activity appears to be effective or ineffective at reducing pollutant discharge concentrations and identify actions planned for the upcoming year; Identification of barriers that have limited program effectiveness and adjustments to the program that will be implemented during the next year to help address these barriers; Include an analysis of trends in total effluent arsenic concentrations based on arsenic sampling; and Include an analysis of arsenic results from the municipal water system. The first annual arsenic progress report is to be submitted by the Due Date.	01/31/2026
Annual Arsenic Progress Report #2: Submit an arsenic progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2027
Annual Arsenic Progress Report #3: Submit an arsenic progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2028
Annual Arsenic Progress Report #4: Submit an arsenic progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2029
Final Arsenic Report: Submit a final report documenting the success in reducing arsenic concentrations in the effluent, as well as the anticipated future reduction in arsenic sources and arsenic effluent concentrations. The report shall: Summarize arsenic pollutant minimization activities that have been implemented during the current permit term and state which, if any, activities from the Pollutant Minimization Plan were not pursued and why; Include an assessment of which pollutant minimization activities appear to have been effective or ineffective. Evaluate any needed changes to the pollutant reduction strategy accordingly; Identification of barriers that have limited program effectiveness and adjustments to the program that will be implemented during the next variance term (if applicable) to help address these barriers; Include an analysis of trends in arsenic concentrations based on sampling and data during the current permit term; and Include an analysis of how effluent arsenic varies with time and with significant loadings of arsenic. If the permittee intends to reapply for an arsenic variance per s. 283.15, Wis. Stats., for the reissued	12/31/2029

permit, a detailed Pollutant Minimization Plan outlining the pollutant minimization activities proposed for the upcoming permit term shall be submitted along with the final report. An updated pollutant minimization plan shall: Include an explanation of why or how each pollutant minimization activity will result in reduced discharge of the target pollutant; Evaluate any new available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant, and Identify any information needs that would help to better determine pollutant sources and make plans to collect that information.	
Annual Arsenic Reports After Permit Expiration: In the event that this permit is not reissued by the date the permit expires, the permittee shall continue to submit annual arsenic reports for the previous year following the due date of Annual Arsenic Progress Reports listed above. Annual Arsenic Progress reports shall include the information as defined above.	

4.1.1 Explanation of Schedule

Arsenic Pollutant Minimization Program – This schedule is required to ensure that the permittee maintains compliance with the conditions and requirements of receiving a variance from the water quality standard for arsenic. Since a compliance schedule is being granted, an interim limit is required, and for Cleveland the limit is established as 3.0 ug/L (as a daily maximum). The schedule requires that annual reports shall indicate which pollutant minimization measures Cleveland has implemented during each calendar year and an analysis of arsenic concentration data based on sampling. The annual reports shall document progress made towards meeting the arsenic effluent limit by the end of the permit term.

4.2 Sludge Management Plan

A sludge management plan is required 60 days prior to sludge removal.

Required Action	Due Date
Sludge Management Plan Submittal: Submit a management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all landspreading activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes.	06/30/2026

4.2.1 Explanation of Schedule

Sludge Management Plan – A sludge management plan submittal is required at least 60 days prior to sludge removal, but no later than the Due Date.

Attachments

WQBEL Memo: Water Quality-Based Effluent Limitations for Cleveland Wastewater Treatment Facility WPDES Permit No. WI-0030848-10, by Nicole Krueger, Water Resources Engineer, dated January 9, 2025

Arsenic Variance EPA Data Sheet

Arsenic Pollutant Minimization Plan, Village of Cleveland, dated June 2023

Justification Of Any Waivers From Permit Application Requirements

No waivers from permit application requirements were requested or granted.

Prepared By: Sarah Donoughe, Wastewater Specialist-Adv **Date:** February 13, 2025

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 01/09/2025

TO: Sarah Donoughe – SER

FROM: Nicole Krueger – SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for Cleveland Wastewater Treatment Facility WPDES Permit No. WI-0030848-10

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from Cleveland Wastewater Treatment Facility in Manitowoc County. This municipal wastewater treatment facility (WWTF) discharges to Lake Michigan. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Bacteria						3
E. coli				126 #/100 mL geometric mean		
Ammonia Nitrogen February – May	11 mg/L		**11mg/L**	**11 mg/L**		4
TKN, Nitrate+Nitrite, and Total Nitrogen						5
Phosphorus					0.6 mg/L	1,6
Arsenic				0.2 µg/L		7
Chloride						8

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
5. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total Kjeldahl nitrogen (TKN) (all expressed as N).
6. This limit became effective February 2023.

7. This is the WQBEL for arsenic. If this limit is included in the permit, mass limits would also need to be included. An alternative effluent limitation of 3.0 µg/L, equal to the 1-day P_{99} of representative data, as a daily maximum may be included in the permit in place of the WQBEL if the arsenic variance application that was submitted is approved by EPA.
8. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.

No WET testing is required because information related to the discharge indicates low to no risk for toxicity.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at Nicole.Krueger@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (2) – Narrative & Outfall Map

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Trevor Moen, Wastewater Engineer – NER
Heidi Schmitt Marquez, Regional Wastewater Supervisor – NER
Diane Figiel, Water Resources Engineer – WY/3
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Cleveland Wastewater Treatment Facility

WPDES Permit No. WI-0030848-10

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The Cleveland Wastewater Treatment Facility (WWTF) serves the Village of Cleveland, providing treatment from domestic and commercial sources. The facility is an activated sludge system with fine bubble aeration and biological and chemical phosphorus removal capabilities. During the previous permit term, the facility upgraded to include an anoxic/oxic with RAS denitrification configuration to achieve compliance with the phosphorus limit. Seasonal ultraviolet disinfection is also provided. Sludge is treated via aerobic digestion, with on-site liquid sludge storage and disposal by land application.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations

The current permit, which expired on March 31, 2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5			45 mg/L	30 mg/L		2,3
TSS			45 mg/L	30 mg/L		2,3
pH	9.0 s.u.	6.0 s.u.				2
Fecal Coliform May – September			**656#/100 mL geometric mean**	400#/100 mL geometric mean		4
E. coli						1
Ammonia Nitrogen February – May	16 mg/L		**16 mg/L**	**16 mg/L**		4
Phosphorus					0.6 mg/L	
Arsenic	4.1 µg/L					5

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. These limits are based on the requirements per s. NR 210.05, Wis. Adm. Code.
4. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
5. This is an interim variance limit to the monthly average WQBEL of 0.2 µg/L.

Receiving Water Information

- Name: Lake Michigan
- Waterbody Identification Code (WBIC): 20
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Cold Water and Public Water Supply.
- Flow: A ten-to-one dilution ratio will be used for calculating effluent limitations based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code, because the receiving water does not exhibit a unidirectional flow at the point of discharge.
- Hardness =131 mg/L as $CaCO_3$. This value represents the geometric mean of data from WET tests from 06/18/2019 – 08/16/2022 from Manitowoc WWTF.
- Source of background concentration data: Metals data from Lake Michigan 7 miles off Milwaukee from the "Water Quality Rules Implementation" (1995) is used for this evaluation. Background arsenic data was collected by WE Port Washington. Background mercury data is from intake data from WI Power and Light Edgewater Generating Station near Sheboygan. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are several other dischargers to Lake Michigan; however, they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: Lake Michigan is 303(d) listed as impaired for PCBs and mercury.

Effluent Information

- Design flow rate(s):
  Annual average = 0.239 MGD (Million Gallons per Day)
  For reference, the actual average flow from 05/01/2019 – 10/31/2024 was 0.15 MGD.
- Hardness = 349 mg/L as $CaCO_3$. This value represents the geometric mean of data from the permit reissuance application from 04/30/2023 – 05/11/2023.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells.
- Additives: Aluminum sulfate is added for phosphorus removal.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.". Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Effluent Copper Data

Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
04/30/2023	16	05/14/2023	16	05/29/2023	17
05/04/2023	14	05/18/2023	15	06/01/2023	21
05/07/2023	15	05/21/2023	17	06/04/2023	28
05/11/2023	15	05/25/2023	15		
1-day P_{99} = 28.7 µg/L					

Attachment #1

Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
4-day P_{99} = 22.4 µg/L					

Effluent Arsenic Data

	Arsenic µg/L
1-day P_{99}	2.96
4-day P_{99}	2.19
30-day P_{99}	1.38
Mean	1.01
Std	0.54
Sample size	23
Range	<0.39 - 2.6

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.

Effluent Chloride Data

Sample Date	Chloride mg/L
04/30/2023	243
05/04/2023	224
05/07/2023	229
05/11/2023	228
Average	231

The following table presents the average concentrations and loadings at Outfall 001 from 05/01/2019 – 10/31/2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameter Averages with Limits

	Average Measurement
BOD_5	6.58 mg/L*
TSS	4.8 mg/L*
pH field	7.31 s.u.
Phosphorus	1.26 mg/L
Ammonia Nitrogen	0.84 mg/L*
Arsenic	1.01 µg/L*
Fecal Coliform	51.6 #/100 mL

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)

2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

10:1 dilution

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	1	680			2.96	2.6
Cadmium	349	18.3	0.01	36.5	7.3	<0.3		
Chromium	301	4446	0.49	8892	1778	1.3		
Copper	349	50.5	0.44	101			28.7	28
Lead	349	358	0.05	715	143	<3.5		
Nickel	268	1080		2161	432	3.7		
Zinc	333	345	0.39	689	138	13		
Chloride (mg/L)		757		1514	303	231		

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

10:1 dilution

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		148	1	1618			2.19
Cadmium	131	3.04	0.01	33.4	6.67	<0.3	
Chromium	131	108	0.49	1178	235.6	1.3	
Copper	131	13.0	0.44				22.4
Lead	131	36.4	0.05	399	79.9	<3.5	
Nickel	131	66		721	144	3.7	
Zinc	131	152	0.39	1673	335	13	
Chloride (mg/L)		395		4345	869	231	

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Attachment #1

Monthly Average Limits based on Human Threshold Criteria (HTC)

10:1 dilution

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	4.4	0.01	48	9.7	<0.3
Chromium (+3)	100	0.49	1095	219	1.3
Lead	10	0.05	109	21.9	<3.5
Nickel	100		1100	220	3.7

Monthly Average Limits based on Human Cancer Criteria (HCC)

10:1 dilution

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Arsenic	0.2	1	0.2			**1.38**

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations

Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are required for arsenic.

Chloride – Considering available effluent data from the current permit term (04/30/2023 – 05/11/2023), the average chloride concentration of 231 mg/L.

These effluent concentrations are below the calculated WQBELs for chloride, therefore no effluent limits are needed. **Chloride monitoring is recommended to ensure that 11 sample results are available at the next permit issuance to meet the data requirements of s. NR 106.85, Wis. Adm. Code.**

Arsenic – Considering available effluent data from the current permit term (08/08/2019 – 11/14/2024), the 30-day P_{99} is 1.38 µg/L. Because the 30-day P_{99} exceeds the calculated weekly average WQBEL, an effluent limit is needed in accordance with s. NR 106.05(4)(c), Wis. Adm. Code.

However, ch. NR 106, Wis. Adm. Code, provides a variance from water quality standards for arsenic, and Cleveland has requested such a variance. If a variance is approved, an interim limit is required to continue in the reissued permit. **The interim limit is recommended to be set equal to the 1-day P_{99} of 3.0 µg/L (rounded), expressed as a daily maximum.**

In absence of a variance, a monthly average limit of 0.2 µg/L would apply. A respective mass limit and a weekly average limit to meet the expression of limits requirements outlined in s. NR 106.07, Wis. Adm. Code, would also be required.

Mercury – The permit application did not require monitoring for mercury because Cleveland is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. All reported samples were non-detect. Therefore, no mercury monitoring is recommended at Outfall 001.

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the type of discharge, the effluent flow rate, and known levels of PFOS/PFOA in the source water, PFOS and PFOA monitoring is not recommended. The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.
- The maximum expected effluent pH has changed

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.275 and B = 39.0 for a Cold-Water Category 1 fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1436 sample results were reported from 05/02/2019 – 10/31/2024. The maximum reported value was 8.2 s.u. (Standard pH Units). The effluent pH was 8.0 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.0 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.9 s.u. Therefore, a value of 8.0 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.0 s.u. into the equation above yields an ATC = 5.6 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the 10:1 dilution if it is determined that the previous method of acute ammonia limit calculation

(2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q_{10} (estimated as 80 % of 7-Q_{10}) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	11
10:1 dilution	61

The 2×ATC method yields the most stringent limits for Cleveland.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – Cold water

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	72	7.0 < pH ≤ 7.1	44	8.0 < pH ≤ 8.1	9.3
6.1 < pH ≤ 6.2	71	7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
6.2 < pH ≤ 6.3	69	7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
6.3 < pH ≤ 6.4	67	7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
6.4 < pH ≤ 6.5	65	7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
6.5 < pH ≤ 6.6	63	7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
6.6 < pH ≤ 6.7	60	7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
6.7 < pH ≤ 6.8	56	7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
6.8 < pH ≤ 6.9	52	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
6.9 < pH ≤ 7.0	48	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, because those limits relate to the assimilative capacity of the receiving water.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria in ch. NR 105, Wis. Adm. Code.

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified for a Cold-Water Community is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

$$CTC = E \times \{[0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})]\} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,
C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$,
T = the temperature (ºC) of the receiving water

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q_3, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 ºC, 25% of the flow is used if the Temperature < 11 ºC, and 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used to derive weekly average limitations, and the 30-day criteria are used to derive monthly average limitations, both by a mass-balance using a ten-to-one dilution ratio.

The "default" basin assumed values are used for Temperature, pH and background ammonia concentrations, because minimum ambient data is available. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – CW

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	0.239	0.239	0.239
	Ammonia (mg/L)	0.04	0.05	0.105
	Average Temperature (°C)	11	16	4
	Maximum Temperature (°C)	13	18	9
	pH (s.u.)	8.17	8.24	8.05
	Dilution factor	10	10	10
Criteria mg/L	4-day Chronic	4.73	3.39	5.65
	30-day Chronic	1.89	1.35	2.26
Effluent Limits mg/L	Weekly Average	51.6	36.7	61.1
	Monthly Average	20.4	14.4	23.8

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 05/02/2019 – 10/17/2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in Cleveland's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Data prior to February 2023 was excluded from this evaluation due to Cleveland running trials for phosphorus removal and upgrading the plant to meet the final phosphorus limit. These activities affected the effluent ammonia concentrations and may not have been representative of current treatment conditions.

Ammonia Nitrogen Effluent Data

	Ammonia Nitrogen mg/L
1-day P_{99}	2.89

Attachment #1

	Ammonia Nitrogen mg/L
4-day P_{99}	1.64
30-day P_{99}	0.68
Mean*	0.14
Std	1.78
Sample size	229
Range	<0.1 - 8.3

*Values lower than the level of detection were substituted with a zero

Based on this comparison, there is no reasonable potential for any ammonia limits.

The permit currently has daily maximum, weekly average, and monthly average limits February – May. **Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:**

> (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

Expression of Limits

Revisions to ch. NR 106, Wis. Adm. Code, in September 2016 aligned Wisconsin's WQBELs with 40 CFR § 122.45(d), which specifies that effluent limits for continuous dischargers must be expressed as weekly and monthly averages for publicly owned treatment works and as daily maximums and monthly averages for all other dischargers, unless shown to be impracticable. Because a daily maximum ammonia limit is necessary for Cleveland, weekly and monthly average limits are also required under this code revision.

The methods for calculating limitations for municipal treatment facilities to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), Wis. Adm. Code, and are as follows:

Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.

The daily maximum limit of 11 mg/L is more stringent than the calculated weekly and monthly average limits; therefore, the weekly and monthly average limits are recommended to be equal to 11 mg/L.

Conclusions and Recommendations

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code. Additional limits to meet the requirements in s. NR 106.07, Wis. Adm Code, are shown below in bold.

Attachment #1

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
February – May	11	**11**	**11**

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because Cleveland's permit requires weekly monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season. The nearest drinking water intake from Lake Michigan is over 10 miles from Cleveland's outfall so year-round disinfection is not required per s. NR 210.06(3)(b), Wis. Adm. Code.

Effluent Data

Cleveland has monitored effluent *E. coli* from 05/03/2019 – 09/30/2024 and a total of 133 results are available. A geometric mean of 126 counts/100 mL was not exceeded, with a maximum monthly geometric mean of 86 counts/100 mL. Effluent data has exceeded 410 counts/100 mL once (which is 0.75% of the total sample results). The maximum reported value was 585 counts/100 mL. Based on this effluent data, it appears that the facility can meet the new *E. coli* limits and a compliance schedule is not needed in the reissued permit.

PART 5 – PHOSPHORUS

Technology-Based Effluent Limit

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because Cleveland currently has a limit of 0.6 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

In addition, the need for a WQBEL for phosphorus must be considered.

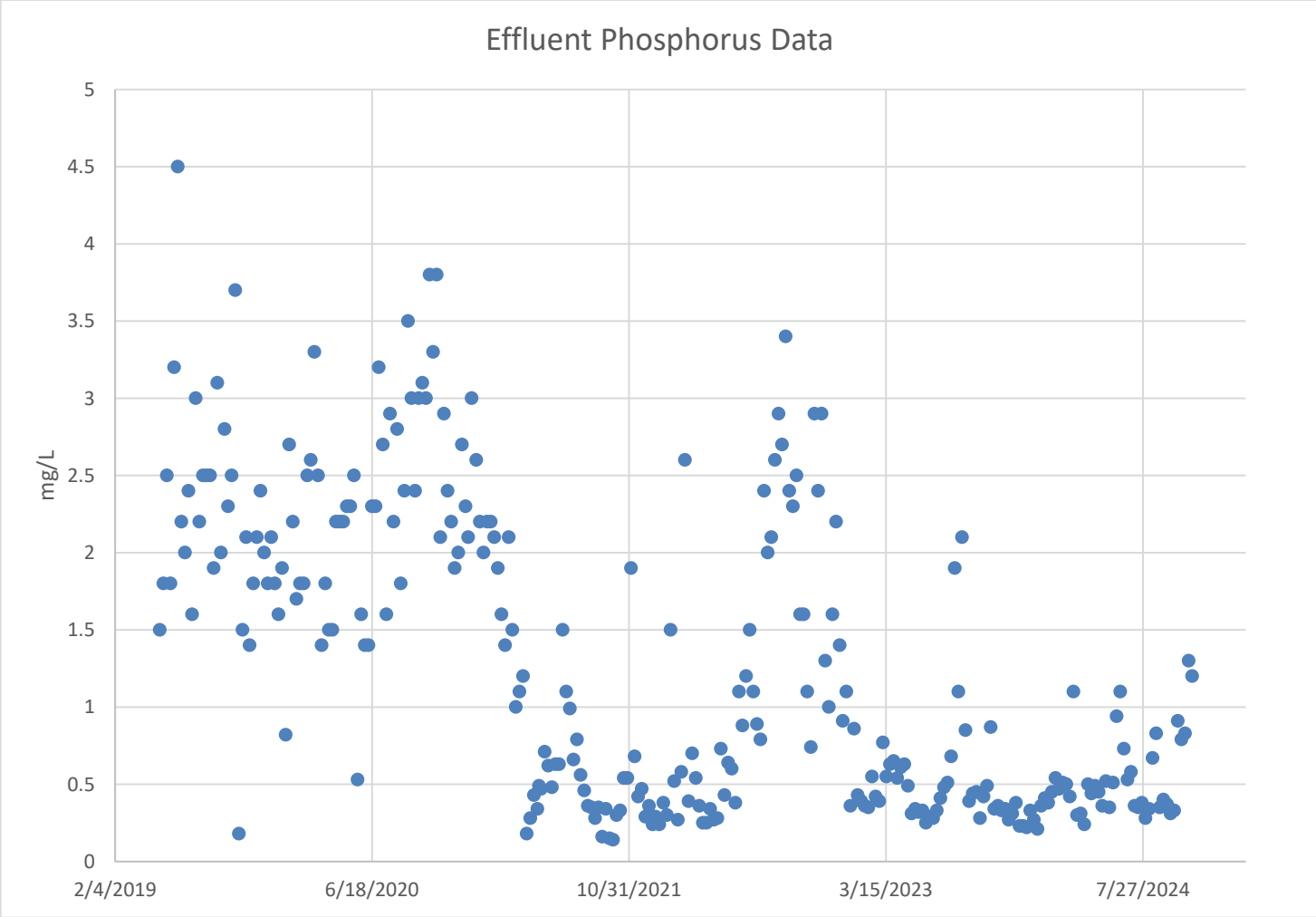
Water Quality-Based Effluent Limits (WQBEL)
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(5)(b) specifies that a total phosphorus criterion of 7 µg/L (0.007 mg/L) applies for the open and nearshore water of Lake Michigan. For direct discharges to Lake Michigan such as Cleveland, s. NR 217.13(4), Wis. Adm. Code, states that the Department shall set effluent limits consistent with nearshore or whole lake models approved by the Department. In the absence of an approved model, **a WQBEL of 0.6 mg/L as a six-month average is recommended. This limit became effective on February 1, 2023 in the current permit and is recommended to continue in the reissued permit.**

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from 05/02/2019 – 10/31/2024, for informational purposes.

Total Phosphorus Effluent Data

mg/L	05/02/2019 – 10/31/2024	02/01/2023 – 10/31/2024
1-day P_{99}	4.89	1.66
4-day P_{99}	2.80	1.01
30-day P_{99}	1.73	0.67
Mean	1.26	0.52
Std	0.97	0.32
Sample size	289	92
Range	0.14 – 4.5	0.21 - 2.1



PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >20:1), the lowest calculated limitation is 120° F (s. NR 106.55(6)(a), Wis. Adm. Code).

At temperatures above approximately 103° F, conventional biological treatment systems do not function properly and experience upsets. There is no indication that this has ever occurred in this treatment system.

Therefore, there is no reasonable potential for the discharge to exceed this limit. **No monitoring or effluent limits are recommended for temperature.**

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (2022).*

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of **9%** shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

  The IWC is 9% based on dilution of 10 parts lake water to 1-part effluent, as specified in s. NR 106.06(4)(b)2, Wis. Adm. Code, or a factor of 1 in 11 to calculate the IWC.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.
- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

Attachment #1

WET Data History

Date Test Initiated	Acute Results LC_{50} %			
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?
10/09/2001	>100	>100	Pass	Yes
07/10/2013	>100	>100	Pass	Yes

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

  Acute Reasonable Potential = [(TUa effluent) (B)(AMZ)]
  Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

  According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

  Acute Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

The WET checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: https://dnr.wisconsin.gov/topic/Wastewater/WET.html.

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 9%. **0 Points**
Historical Data	2 tests used to calculate RP – over 5 years old. No tests failed. **5 Points**	0 tests used to calculate RP. **5 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**

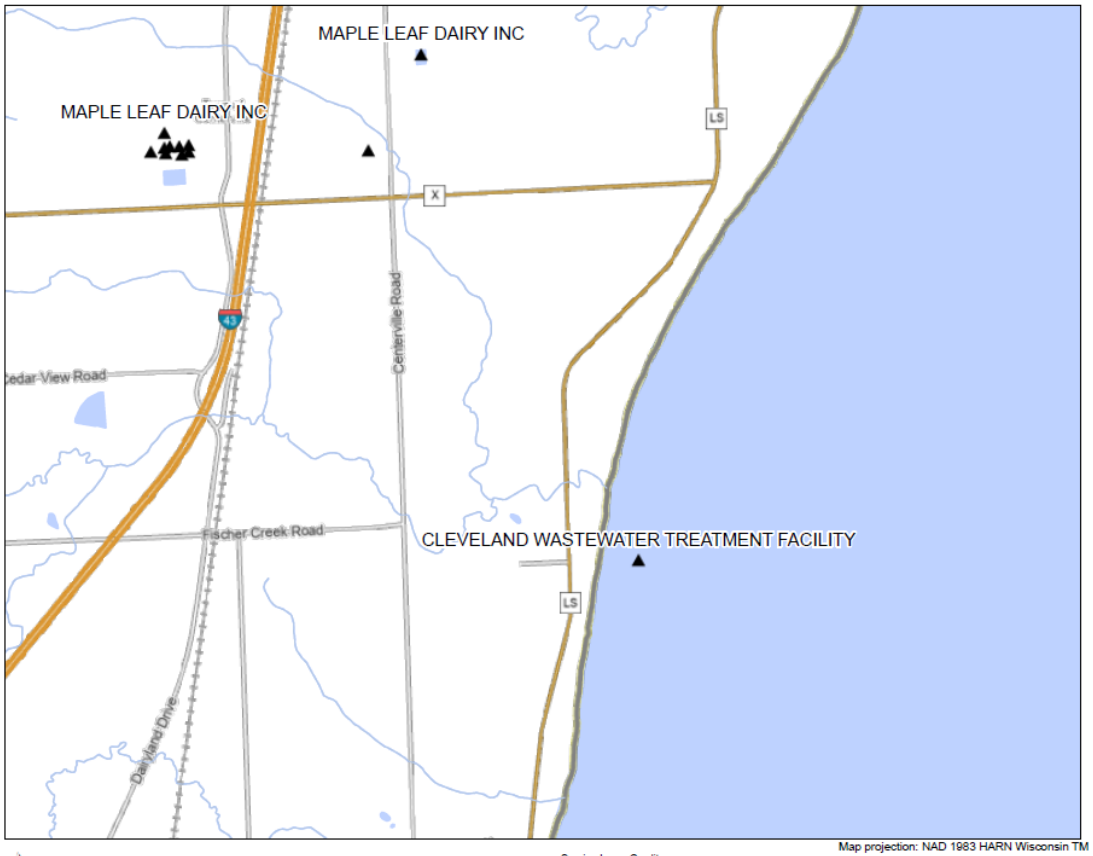
Attachment #1

	Acute	Chronic
Receiving Water Classification	Coldwater community. **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	No reasonable potential for limits based on ATC; Ammonia nitrogen limit carried over from the current permit. Arsenic, chromium, copper, nickel, zinc, ammonia and chloride detected. Additional Compounds of Concern: None. **3 Points**	No reasonable potential for limits based on CTC; Ammonia nitrogen limit carried over from the current permit. Arsenic, chromium, copper, nickel, zinc, chloride, and ammonia detected. Additional Compounds of Concern: None. **3 Points**
Additives	1 Water Quality Conditioner added. Permittee has proper P chemical SOPs in place. **1 Point**	All additives used more than once per 4 days. **1 Point**
Discharge Category	0 Industrial Contributors. **0 Points**	Same as Acute. **0 Points**
Wastewater Treatment	Secondary or Better **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**14 Points**	**14 Points**
Recommended Monitoring Frequency (from Checklist):	No tests recommended.	No tests recommended.
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- No WET testing is required because information related to the discharge indicates the potential for effluent toxicity is believed to be low.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Cleveland Outfall Location



Legend: (some map layers may not be displayed)

- Surface Water Outfalls
- 24K Streams and Rivers
- Rivers and Streams
- Intermittent Streams
- Open Water
- water

Latest Leaf Off Imagery

- Red: Band_1
- Green: Band_2
- Blue: Band_3

Notes:

N

Map: 0 1,000 2,000 Feet
0 550 1,100 Meters

Map projection: NAD 1983 HARN Wisconsin TM

Service Layer Credits:
Latest Leaf Off Imagery: , Basic Basemap (Cached):

This map is a product generated by a DNR web mapping application.

This map is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The user is solely responsible for verifying the accuracy of information before using for any purpose. By using this product for any purpose user agrees to be bound by all disclaimers found here: https://dnr.wisconsin.gov/legal.

Date Printed: 12/11/2024 10:11 AM

Facility Specific Arsenic Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Village of Cleveland

B. Facility Name: Cleveland Wastewater Treatment Facility

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Arsenic **Date completed:** February 13, 2025

E. Permit #: WI-0030848-10-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** July 1, 2025 **End Date:** June 30, 2030

G. Date of Variance Application: September 15, 2023

H. Is this permit a: ☐ **First time submittal for variance**
☒ **Renewal of a previous submittal for variance** *(Complete Section X)*

I. Description of proposed variance:

The Village of Cleveland Wastewater Treatment Facility (WWTF) discharges to Lake Michigan in Manitowoc County. The Village of Cleveland seeks a variance to the water quality standard for arsenic for its WWTF.

The Department concludes that the Village of Cleveland has met the requirements of s. 283.15, Wisconsin Statutes. The Department therefore proposes that this permit include a discharger-specific variance to the arsenic water quality standard for human cancer.

The proposed variance for arsenic, from the monthly average WQBEL of 0.2 µg/L to an interim limit of 3.0 µg/L, is expressed as a daily maximum limit. The Department concludes that this interim limit reflects the greatest pollutant reduction achievable by the permittee with the pollutant control technologies currently applied in the permittee's WWTF. The permit requires the permittee to implement an arsenic Pollutant Minimization Plan (PMP). The Department considers the highest attainable condition (HAC) of the receiving water to be the interim limits – applied for the term of the variance – combined with the permittee's implementation of the PMP. The term of the proposed variance is five years, concurrent with the term of the proposed WPDES permit. The underlying designated uses and criteria of Wisconsin's arsenic WQS will be retained, and all other applicable WQSs will remain in effect with adoption of the proposed variance.

This is the renewal of a previous submittal to EPA for an arsenic variance for this permittee. The previous permit for this facility contained an interim arsenic limit in accordance with s. 283.15, Wis. Stats.

Citation: An interim arsenic effluent limitation represents a variance to water quality standards authorized by s. 283.15, Wis. Stats., and 40 CFR §131.14

J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Sarah Donoughe	Sarah.Donoughe@Wisconsin.gov	920-366-6076	Permit Drafter
Trevor Moen	Trevor.Moen@Wisconsin.gov	920-410-5192	Compliance Engineer
Nicole Krueger	Nicole.Krueger@Wisconsin.gov	414-897-5750	Parts II D-H and J

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: Arsenic, Human Cancer Criterion of 0.2 µg/L

B. List other criteria likely to be affected by variance: None

C. Source of Substance: Arsenic is naturally occurring in the groundwater, which is the source of the municipal water supply for the Village of Cleveland. The Village's municipal water system consists of two wells that are operated on a split-duty basis. The current average arsenic concentrations of Well #1 (ID #BG236) and Well #2 (ID #HJ180) are 6.2 µg/L and 3.8 µg/L, respectively. Average concentrations were calculated for each well

from quarterly sampling results voluntarily reported to the Department during the current permit term (2019-2024). The Village's municipal water system does not include an arsenic treatment process.

D. Ambient Substance Concentration: 1 µg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation. The ambient concentration was collected from Lake Michigan from a different facility (We Energies Port Washington).

F. Average effluent discharge rate: 0.15 MGD (05/01/2019 – 10/31/2024) **Maximum effluent discharge rate:** 0.83 MGD (05/18/2020)

G. Effluent Substance Concentration: 1-day P99 = 2.96 µg/L; 4-day P99 = 2.19 µg/L; 30-day P99 = 1.38 µg/L; Mean = 1.01 µg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. Permit-required monitoring from 05/01/2019 – 10/31/2024.

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its Arsenic PMP. Thus, the HAC at commencement of this variance is 3.0 µg/L, which reflects the greatest arsenic reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's Arsenic PMP. The current effluent condition is reflective of on-site optimization measure that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for the Village of Cleveland at this time (see Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Variance Limit: 3.0 µg/L

L. Level Currently Achievable (LCA): 3.0 µg/L as a daily maximum

M. What data were used to calculate the LCA, and how was the LCA derived? (*Immediate compliance with LCA is required.)*

The LCA is equal to the 1-day P99 from the current permit term (05/01/2019 – 10/31/2024).

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.

The variance limit = 1 Day P99. The limit is established in accordance with s. 283.15 (5), Wis. Stats. and ch. NR 106 Subchapter II, Wis. Adm. Code.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☒ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☒ **6**

The source of the arsenic discharged by the Cleveland WWTF is naturally occurring arsenic in the groundwater, which is the source of the municipal water supply for the Village of Cleveland. The Department considers treating to produce effluent at concentrations to meet the arsenic WQBEL to be technically infeasible. Using Lake Michigan as the source of the Village's municipal water supply is considered to be economically infeasible.

Section III: Location Information

A. Counties in which water quality is potentially impacted: The Cleveland WWTF, located in Manitowoc County, discharges to Lake Michigan. There are 10 other Wisconsin counties that border Lake Michigan – Marinette, Oconto, Brown, Door, Kewaunee, Sheboygan, Ozaukee, Milwaukee, Racine and Kenosha – along with other

bordering counties in the states of Illinois, Indiana and Michigan.

B. Receiving waterbody at discharge point: Lake Michigan

C. Flows into which stream/river? N/A **How many miles downstream?** N/A

D. Coordinates of discharge point (UTM or Lat/Long): 43° 56' 8" N Latitude, 87° 43' 1" W Longitude

E. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?
Considering the effluent concentrations and known ambient concentrations collected from Lake Michigan, the chronic criterion of 148 µg/L is met at the outfall.

F. Provide the equation used to calculate that distance:
Not applicable.

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?
Lake Michigan is designated for fish and aquatic life (cold water community), public water supply and recreational uses.

H. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody: See attached map, "Arsenic Variances Along Lake Michigan Shoreline"; please note, both permittees listed below appear on the map as "Arsenic (Pending)" but both have current arsenic variances approved since the creation of the map.

Permit Number	Facility Name	Facility Location	Variance Limit [µg/L]
WI-0001589	Wisconsin Power and Light Edgewater Generating Station	Sheboygan	4.7 µg/L (Outfall 004) 2.4 µg/L (Outfall 009)
WI-0000914	WE Oak Creek Plant Elm Road Generating Station	Oak Creek	1.2 µg/L (Outfall 007)

I. Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet
See attached map, "Arsenic Variances Along Lake Michigan Shoreline"

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☒ Yes ☐ No ☐ Unknown

River Mile	Pollutant	Impairment
Lake Michigan	Mercury	Contaminated fish tissue
Lake Michigan	PCBs	Contaminated fish tissue

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing arsenic to the POTW? If so, please list.
N/A

B. Are all industrial users in compliance with local pretreatment limits for mercury? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)
N/A

C. When were local pretreatment limits for mercury last calculated?
N/A

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW
N/A

Section V: Public Notice

A. Has a public notice been given for this proposed variance? ☒ Yes ☐ No

B. If yes, was a public hearing held as well? ☒ Yes ☐ No ☐ N/A

C. What type of notice was given?
☒ Notice of variance included in notice for permit
☐ Separate notice of variance

D. Date of public notice: TBD (mid-Feb 2025) **Date of hearing:** April 14, 2025

E. Were comments received from the public in regards to this notice or hearing? *(If yes, please attach on a separate sheet)* ☐ **Yes** ☐ **No**

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☒ **Yes** ☐ **No**

B. Applicable criteria affected by variance: Public health and welfare

C. Identify any expected impacts that the variance may have upon human health, and include any citations:

Arsenic loading to Lake Michigan is complex, involving over 45,000 square miles of drainage area from four states, regional impacts and even global effects. Several interrelated and continually changing systems affect the lake including streamflow, storm water runoff, precipitation, groundwater flow, point source discharges, legacy contamination, air deposition, soil mobilization, and sedimentation; these systems impact the arsenic concentrations in the water column. Arsenic is widely distributed in the Earth's crust as various minerals in bedrock and soils. Terrestrial contributions of arsenic are high relative to atmospheric contributions because arsenic is largely associated with particles. Particulate arsenic likely deposits to land or water surfaces relatively near its source. In water, arsenic is mobile over a wide range of redox conditions and its tendency to remain in a dissolved state at near neutral and alkaline pH values (Smedley & Kinniburgh, 2002).

Lake Michigan is fed by a vast network of rivers and streams. Baseline concentrations of arsenic in river waters vary according to the composition of the surface recharge, contribution from baseflow, and bedrock lithology. Relatively high concentrations of naturally occurring arsenic can occur in some areas as a result of inputs from geothermal sources or high-arsenic groundwaters. A large source of arsenic to river water is via groundwater. Concentrations of arsenic in groundwater are generally considered to be due to dissolution of arsenic from arsenic-bearing rocks (Smedley & Kinniburgh, 2002).

In areas of southeast Wisconsin and in some glaciated areas of Northern Wisconsin, arsenic is bound to iron oxide minerals in the aquifer sediments. In these settings, groundwater at depth is susceptible to elevated arsenic due to a lack of oxygen in the groundwater system. A USGS study of groundwater wells from 1973 to 2001 found that the arsenic concentration in at least 25% of samples in southeast Wisconsin exceeded 1.0-3.0 µg/L (USGS, 2001). Pumping of groundwater for uses like public drinking water likely exacerbates the release of arsenic to groundwater as redox conditions change with the change in groundwater level.

In considering the loading from individual point sources to the overall loading of arsenic to Lake Michigan through natural and anthropogenic sources, it is unlikely that water quality standards would be met in Lake Michigan if the arsenic loading from this facility was suspended altogether. For this reason, this variance is not believed to have a significant impact on human health at this time. The results of individual permittees' actions in addition to pollution minimization efforts will also reduce any potential for negative impacts from the discharge. Additionally, the variance may help provide data and information that in general will help better define the scope and basis of the arsenic issues in Lake Michigan and actions that might be fruitful in reducing risk.

Citations: Hutchinson, T. C. and Meema, K. M. (Editors). Lead, Mercury, Cadmium and Arsenic in the Environment. Scope 31. John Wiley & Sons, Chichester, 1987; 360 pp.

Neff, Brian P. and Nicholas, J.R. Uncertainty in the Great Lakes Water Balance. Scientific Investigations Report 2004-5100. United States Geological Service, 2005.

Smedley, P.L. and Kinniburgh, D.G. "A Review of the Source, Behavior, and Distribution of Arsenic in Natural Waters." Applied Geochemistry 17 (2002) 517-568.

USGS National Water Quality Assessment Program. http://water.usgs.gov/nawqa/trace/arsenic/. Ryker, 2001. Retrieved November 2014.

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Full fish and aquatic life – cold water community

B. Applicable criteria affected by variance: Acute aquatic life toxicity = 340 µg/L

Chronic aquatic life toxicity = 148 µg/L

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:

Ambient arsenic concentrations in surface water resulting from the variance will be substantially less than levels that result in direct toxicity to aquatic organisms. EPA's current chronic aquatic life criterion for arsenic is 150 µg/L, which is approximately four orders of magnitude greater than the public health and welfare criteria (0.2 µg/L). Wisconsin's criteria are 340 µg/L and 148 µg/L for chronic and acute toxicity, respectively.

Although this variance will allow permitted dischargers additional time to identify and control sources of arsenic in their discharges, the pollutant minimization component of the variance should result in a net reduction in the amount of arsenic discharged to Wisconsin surface waters from permitted point sources further reducing risk to aquatic life and wildlife. In addition, the pollutant minimization programs for arsenic typically result in other pollution prevention efforts that have a beneficial indirect effect of reducing the use and production of products and processes that use or contribute arsenic to the environment. These efforts will also reduce any potential for negative impacts from the discharge. It is noted that a key source of arsenic pollution to Wisconsin's surface waters is atmospheric deposition from sources within and outside the State. Arsenic is also present in natural sources through soil and rock erosion. Given the magnitude of the arsenic loading from these sources, it is unlikely that arsenic water quality criteria would be met if the arsenic loading from this facility was suspended altogether. For these reasons, arsenic pollution from this discharge is believed to have a negligible impact on fish and aquatic life in Lake Michigan.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:

The following are State Endangered, Threatened, and Proposed Species in Manitowoc County, Wisconsin from the Natural Heritage Inventory, January 2025:

MAMMALS
Big Brown Bat (T)
Little Brown Bat (T)
Northern Long-eared Bat (T)
Tricolored Bat (T)

BIRDS
Henslow's Sparrow (T)
Upland Sandpiper (T)
Red-shouldered Hawk (T)
Black Tern (E)
Acadian Flycatcher (T)
Peregrine Falcon (E)
Cerulean Warbler (T)
Hooded Warbler (T)

SNAILS
Cherrystone Drop (T)
Callused Vertigo (Hubricht's Vertigo) (E)

BEETLES
Hairy-necked Tiger Beetle (E)

FISHES
Redfin Shiner (T)

MUSSELS
Slippershell Mussel (T)
Monkeyface (T)
Ellipse (T)
Elktoe (P)

AMPHIBIANS
Blanchard's Cricket Frog (E)

PLANTS
Sand Reedgrass (T)
Shore Sedge (T)
Pitcher's Thistle (T)
Thickspike (T)
Clustered Broomrape (T)
Sand Dune Willow (E)
Snow Trillium (T)
Forked Aster (T)
Cooper's Milkvetch (E)
Prairie Dunewort (E)

REPTILES
Blanding's Turtle (P)

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:
Treatment processes include preliminary treatment using screens; secondary treatment using activated sludge, and final clarifiers; biological phosphorus removal; seasonal disinfection using ultraviolet radiation; and sludge aerobic digestion. The Cleveland WWTF experiences approximately 10% removal of the arsenic from the wastewater to the sludge through treatment.

B. What modifications would be necessary to comply with the current limits? Include any citations.
Treatment processes used to treat water supplies for arsenic removal involve oxidation followed by filtration, and it would be these same treatment processes that potentially could be used to treat wastewater. EPA set the drinking water MCL for arsenic at 10 µg/L, as a concentration that approximates the lowest practicable level of treatment. The MCL is an order of magnitude higher than the arsenic WQBEL in this case, thus treatment to the level of the WQBEL is not technically achievable. Therefore, the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

C. How long would it take to implement these changes?
The Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

D. Estimate the capital cost *(Citation)***:** Not estimated, as the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

E. Estimate additional O & M cost *(Citation)***:** Not estimated, as the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

F. Estimate the impact of treatment on the effluent substance concentration, and include any citations:
As described above, 10 µg/L approximates the lowest practicable level of arsenic treatment in drinking water. That threshold may likely be higher in wastewater given the higher levels of suspended solids and organics found in wastewater effluent compared to drinking water. Since the arsenic concentration of the Cleveland WWTF effluent is less than 10 µg/L, subjecting the effluent to an additional arsenic treatment process would likely have negligible effect on its arsenic concentration. Thus, the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible.

G. Identify any expected environmental impacts that would result from further treatment, and include any citations:

While the Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible, the environmental impacts from that activity were nonetheless assessed. Arsenic treatment processes used to treat drinking water generate wastewater from backwashing filters, and the arsenic removed during treatment is contained in the wastewater. In most cases that wastewater is discharged to the municipal WWTF. If such a treatment process were installed in the Village of Cleveland, in which the arsenic removed from the drinking water would be discharged to the WWTF, the WWTF would receive the same amount of arsenic as it currently does, and thus there would be no expected change in the amount discharged from the WWTF.

Alternatively, if the wastewater from an arsenic treatment process were to be hauled from the Village of Cleveland to another WWTF for disposal, much of the arsenic removed from treatment would be transferred to the receiving water of that WWTF. The Manitowoc and Sheboygan WWTFs are the two major (> 1 MGD) municipal WWTFs closest to Cleveland, with the potential capability to accept such waste. However, since both of those WWTFs also discharge to Lake Michigan, there would be no change in the arsenic loading to Lake Michigan if either of those WWTFs accepted such waste from the Village of Cleveland.

Other environmental impacts would include those from the additional electrical power that would need to be generated to operate an arsenic treatment process, and from the additional air emissions generated if the wastewater was transported to another WWTF for disposal (it's noted that the lakeshore regions of Manitowoc and Sheboygan Counties are designated as ozone non-attainment areas by EPA).

H. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the discharge? ☐ **Yes** ☐ **No** ☒ **Unknown**

The Department considers treatment to produce effluent to meet the arsenic WQBEL to be technically infeasible. It is unknown if modifications to the treatment process to reduce the level of arsenic in the discharge (but not to the level of the WQBEL) are technically and economically feasible.

I. If treatment is possible, is it possible to comply with the limits on the substance? ☐ **Yes** ☒ **No** ☐ **Unknown**

J. If yes, what prevents this from being done? Include any citations.

See above.

K. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:

Since the municipal water supply is the source of arsenic, alternate sources of drinking water were considered as alternatives to lower the arsenic concentration in the WWTF discharge.

1) In 2009 the Village of Cleveland identified water purchase from the City of Manitowoc at an estimated cost of $10 million. This cursory cost estimate was developed by the Village's engineering consultant, based upon presumed industry standards for pipeline projects at a rate of approximately $1 million/mile. That estimate did not include the cost of pumping stations(s), and the assumed rate may be low based upon a comparable project during that same time period – the Central Brown County Water Authority pipeline from Manitowoc to the Green Bay suburbs. That 65-mile pipeline was installed at a cost of approximately $106 million ($1.63 million/mile). Furthermore, the 10-mile distance of the estimate appears to be the distance 'as the crow flies' between the municipal boundaries, whereas a pipeline would likely follow road right of ways (a longer route than the straight-line distance between the two municipalities) and would need to connect to existing pumping stations (which are not located at the closest municipal boundaries). Thus, 15 miles may be a better estimate of the distance of a pipeline from Manitowoc to Cleveland, and the cost of a pipeline of that length may in reality be closer to $36 million, applying a factor of $2.4 million/mile (adjusted from $1.63 million/mile for inflation as of Nov. 2024). As the Village of Cleveland is situated approximately equidistant between Manitowoc and Sheboygan, the cost of purchasing water from Sheboygan would reasonably be expected to be similar to that of obtaining water from Manitowoc.

Below is a simplified economic analysis considering only the $24 million capital cost of a pipeline (which does not include water purchase costs, operations and maintenance costs, financing costs [current market rate is 4.0%] and inflation), based upon the following factors for the Village of Cleveland:

- Number of Households: 672 (Source: 2020 Decennial Census)
- Median Household Income: $75,000 (Source: 2023 American Community Survey 5-Year Estimates)
- Sewer Cost per Household: $686/yr (Source: 2016 Wisconsin Sewer User Charge Survey Report, MSA Professional Services)

Projected Capital Cost for Alternate Water Supply: $36,000,000 Capital Cost over 20 years = $1,800,000/yr

$1,800,000/yr / 672 Households = $2,679/yr/Household (assumes 100% of the cost would be paid by residential users)

Projected Additional Sewer Cost for Alternate Water Supply = $2,679+ $686 = $3,365/yr

Projected Additional Cost for Alternate Water Supply as % MHI = $3,365/$75,000 x 100 = 4.5% of MHI

2) The Village of Cleveland has not obtained cost estimates for installing its own water intake to Lake Michigan. However, for comparison, in 2011 the City of Marinette constructed a 5 MGD surface water treatment plant, at a cost of $20 million. Adjusting that value for inflation produces a cost of $28 million (as of Nov. 2024). While the Village of Cleveland would not need that level of capacity, the construction costs would not be significantly reduced because the majority of the costs are fixed (intake structure, main, and filtration plant) and not proportional to the capacity of the plant.

Considering only the $28 million capital cost of a surface water treatment plant (and not operations and maintenance costs and financing costs), using the same factors listed above, and following the same simplified economic analysis shown above, the estimated cost for the installation of a surface water treatment plant for the Village of Cleveland is 3.7% of MHI.

Regardless of the source, the Department believes the cost of providing the Village of Cleveland with an alternate water supply – with a lower arsenic concentration – would cause substantial adverse economic impact to the Village of Cleveland, based upon simplified analyses that consider only the capital costs of providing an alternate water supply. The actual cost of implementing such a practice would be expected to be significantly more as costs associated with water purchase, operations and maintenance, financing and additional inflation were not considered in those analyses. Thus, the Department considers that the cost of connecting to an existing water system that draws water from Lake Michigan (Manitowoc or Sheboygan), or installing and operating such a system in the Village of Cleveland, to be economically infeasible.

3) Given the difference in arsenic concentrations between the Village's two wells (averages of 6.2 µg/L and 3.8 µg/L for Wells #1 and #2, respectively), consideration was given to whether the installation of another well (perhaps to replace one of the existing wells) might have the potential to lower the arsenic concentration of the WWTF's discharge. The Department reviewed recent arsenic data of other high-capacity wells supplying public drinking water within 10 miles of the Village of Cleveland and also within 5 miles of Lake Michigan (to compare results from wells in the same geologic formation as that underlying the Village of Cleveland). There are four such wells with recent arsenic data; they are owned by the Howards Grove School District (two wells), Kohler Company and the Town of Sheboygan. For each of those wells there are three arsenic results from the period 2010-2018. The averages for each of those wells are: 7.3, 1.7, 3.7 and 5.0 µg/L, with individual results that ranged from 1-9 µg/L. These results are similar to those from the Village of Cleveland, in terms of both their concentration range and the variability in arsenic concentration among individual wells. Thus, if the Village of Cleveland were to install another well, the arsenic concentration would be expected to be in the range of that of its current wells. Since there is no means of precisely predicting arsenic concentrations (to the nearest µg/L) of groundwater drawn from potential well sites at a scale fine enough to differentiate any site in the Village from another, there is no certainty that locating a well at any particular location in the Village will result in water with a lower arsenic concentration than that of either of the existing wells. Considering the cost of installing a new well, $500,000-1,000,000, and the uncertainty associated with actually achieving reduction in the arsenic concentration of the WWTF discharge as a result, this alternative would be best classified as a risk. Therefore, the Department considers the installation of another well (to replace an existing one) as an activity

that would have no certainty in reducing the arsenic concentration of the Cleveland WWTF's discharge, thus the Village would be better advised to focus its resources on alternatives that are certain to result in reductions in the arsenic discharge from the WWTF to Lake Michigan.

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

1. Evaluated the feasibility of adding an arsenic treatment system to the municipal water system and/or the wastewater treatment facility, which – if operated – would result in a net reduction of arsenic delivered to Lake Michigan. Develop plans and implement any treatment system identified to be technically and economically feasible to operate.
2. Evaluated the feasibility of converting the wastewater treatment facility's discharge from surface water to groundwater, and develop plans to implement the change to a groundwater discharge system.

See the submitted Annual Arsenic Progress Reports for further details.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

1. Continue to monitor drinking water and wastewater treatment facility effluent arsenic concentrations and add biosolids monitoring to understand the background concentrations and historical trends for minimization.
2. Evaluate the extent and technical and economic feasibility of reducing arsenic in the wastewater treatment effluent using Alum for phosphorus removal.
3. Evaluate the feasibility of converting from a groundwater source of drinking water to a surface water source of drinking water. Develop plans and implement a surface water treatment system identified to be technically and economically feasible to operate.
4. Evaluate the feasibility of regionalizing the wastewater treatment facility with another community to eliminate the discharge. Develop plans and implement a new sanitary sewage collection system if identified to be technically and economically feasible to operate.
5. Continue evaluating the feasibility of obtaining water from another community. Develop plans and implement a new drinking water conveyance system from another community if identified to be technically and economically feasible to operate.
6. Continue evaluating the feasibility of adding an arsenic treatment system to the municipal water system and/or the wastewater treatment facility, which, if operated, would result in a net reduction of arsenic delivered to Lake Michigan. Develop plans and implement any treatment system if identified to be technically and economically feasible to operate.

Citation: Arsenic Pollutant Minimization Plan, Village of Cleveland

Section X: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: November 26, 2018 **Date of EPA Approval:** February 4, 2019

B. Previous Permit #: WI-0030848-09-0 **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: 1-day P99 2.96 µg/L; Avg. 1.01 µg/L **Variance Limit:** 4.1 µg/L

D. Target Value(s): N/A **Achieved?** ☒ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance

Annual Arsenic Progress Report #1	☒ **Yes** ☐ **No**
Annual Arsenic Progress Report #2	☒ **Yes** ☐ **No**
Annual Arsenic Progress Report #3	☒ **Yes** ☐ **No**
Annual Arsenic Progress Report #4	☒ **Yes** ☐ **No**
Final Arsenic Report	☒ **Yes** ☐ **No**
Annual Arsenic Progress Report #6 (*After permit expiration*)	☒ **Yes** ☐ **No**

Arsenic Pollutant Minimization Plan

Village of Cleveland

WPDES Permit No. WI-0030848-09

2024-2029

Interim Limit: 3.0 µg/L, Daily Maximum

Water Quality Based Limit: 0.2 µg/L, Monthly Avg

Pollutant Minimization	Actions	Start Completion/Frequency
Continue to monitor drinking water and wastewater treatment facility effluent arsenic concentrations and add biosolids monitoring to understand the background concentrations and historical trends for minimization.	Continue to monitor the arsenic concentration from the two drinking water wells and the wastewater treatment facility effluent and monitor the wastewater treatment facility biosolids.	Start: 7/1/2024 Completion: 6/30/2029 Frequency: Drinking Water Wells: 1x/quarter Wastewater Treatment Facility Effluent: 1x/quarter Biosolids: 1x/Annually

Pollutant Minimization	Actions	Start Completion/Frequency
Evaluate the extent and technical and economic feasibility of reducing arsenic in the wastewater treatment effluent using Alum for phosphorus removal.	Monitor monthly alum usage for phosphorus removal monitoring at the wastewater treatment plant and compare to monthly wastewater treatment facility effluent arsenic. Determine the extent of arsenic removal from Alum used for phosphorus removal.	Start: 7/1/2024 Completion: 6/30/2029
	Pilot chemical arsenic reduction with dosing Alum at the end of the aeration basin, which will be used for phosphorus removal. Evaluate the extent and technical and economic feasibility of using Alum to reduce phosphorus.	Start: 7/1/2026 Completion:9/1/2026
Evaluate the feasibility of converting from a groundwater source of drinking water to a surface water source of drinking water. Develop plans and implement a surface water treatment system identified to be technically and economically feasible to operate.	Evaluate the technical and economic feasibility of converting to a surface water source for drinking water with less arsenic.	Start: 7/1/2024 Completion: 6/30/2025
	If determined feasible, develop an implementation plan for design and construction of treatment system	Start: 7/1/2025 Completion: 6/30/2026
	If determined feasible, begin implementation of treatment system upgrades.	Start: 7/1/2026 Completion: 6/30/2027

Pollutant Minimization	Actions	Start Completion/Frequency
Evaluate the feasibility of regionalizing the wastewater treatment facility with another community to eliminate the discharge. Develop plans and implement a new sanitary sewage collection system if identified to be technically and economically feasible to operate.	Evaluate the technical and economic feasibility of regionalizing the wastewater treatment facility with another community.	Start: 7/1/2025 Completion: 6/30/2026
	If determined feasible, develop an implementation plan for design and construction of treatment system	Start: 7/1/2026 Completion: 6/30/2027
	If determined feasible, begin implementation of treatment system upgrades.	Start: 7/1/2027 Completion: 6/30/2028

Pollutant Minimization	Actions	Start Completion/Frequency
Continue evaluating the feasibility of obtaining water from another community. Develop plans and implement a new drinking water conveyance system from another community if identified to be technically and economically feasible to operate.	Evaluate the technical and economic feasibility of obtaining drinking water from another community.	Start: 7/1/2026 Completion: 6/30/2027
	If determined feasible, develop an implementation plan for design and construction of treatment system	Start: 7/1/2027 Completion: 6/30/2028
	If determined feasible, begin implementation of treatment system upgrades.	Start: 7/1/2028 Completion: 6/30/2029

Pollutant Minimization	Actions	Start Completion/Frequency
Continue evaluating the feasibility of adding an arsenic treatment system to the municipal water system and/or the wastewater treatment facility, which, if operated, would result in a net reduction of arsenic delivered to Lake Michigan. Develop plans and implement any treatment system if identified to be technically and economically feasible to operate.	Evaluate the technical and economic feasibility of adding an arsenic treatment system to the municipal water system and/or the wastewater treatment facility.	Start: 7/1/2027 Completion: 6/30/2028
	If determined feasible, develop an implementation plan for design and construction of treatment system	Start: 7/1/2028 Completion: 6/30/2029
	If determined feasible, begin implementation of treatment system upgrades.	Start: 7/1/2029 Completion: 6/30/2030