

Permit Fact Sheet

General Information

Permit Number:	WI-0024601-10-0	
Permittee Name:	City of Manitowoc, Manitowoc Public Utilities	
Mailing Address:	1303 South 8th Street, Manitowoc, WI 54221	
Facility Address:	1015 South Lakeview Dr, Manitowoc, WI 54420	
Discharge Location:	Manitowoc Wastewater Treatment Facility, 1015 South Lakeview Dr, Manitowoc, WI 54420 Lake Michigan, about 500 feet offshore, at approximately Latitude 44° 05' 07" North and Longitude 87° 38' 57" West	
Receiving Water:	Lake Michigan (Water Body Identification Code number 20) in Manitowoc County and groundwater via land application in Brown, Calumet, and Manitowoc Counties.	
Stream Flow (Q _{7,10}):	N/A – A 10:1 dilution factor for a lake discharge is used in deriving effluent limits, where applicable	
Stream Classification (Designated Uses):	Coldwater aquatic life community, recreation and public water supply	
Discharge Type:	Continuous	
Design Flow(s)	Daily Maximum	26 MGD
	Weekly Maximum	Not determined
	Monthly Maximum	19 MGD
	Annual Average	15.5 MGD
Significant Industrial Loading?	There are 16 categorical contributors and 7 other significant industrial contributors in the collection system.	
Operator at Proper Grade?	<p>Facility Subclasses & Classification: Facility is classified at the advanced level for the following subclasses: A2 (Attached Growth Processes), B (Solids Separation), C (Biological Solids/Sludges), D (Disinfection), and P (Total Phosphorus); and at the basic level for L (Laboratory) and SS (Sanitary Sewage Collection System).</p> <p>OIC Subclasses & Grade: Michael Jaeger is certified at the advanced level for the following subclasses: A1 (Suspended Growth Processes), A2 (Attached Growth Processes), B (Solids Separation), C (Biological Solids/Sludges), D (Disinfection), L (Laboratory), and P (Total Phosphorus); and at the basic level for SS (Sanitary Sewage Collection System).</p>	
Approved Pretreatment Program?	June 19, 1984	

Facility Description

Manitowoc Public Utilities (MPU) is a public utility that operates the Manitowoc Wastewater Treatment Facility. The sanitary sewer collection system is operated by the City of Manitowoc. The facility treats residential and commercial domestic wastewater, industrial wastewaters, and hauled waste from the hauled waste receiving station. Class B sludge generated from the treatment facility is either land applied on department approved sites or landfilled. The paragraphs below describe the liquid and solids treatment train of the Manitowoc Wastewater Treatment Facility.

Liquid Treatment Train: The facility provides preliminary, primary, secondary, and tertiary treatment to the influent. Preliminary treatment consists of influent pumping, fine screening and grit removal. Primary clarification is followed by the stack trickling filters and then treatment passes through the rock filters. Ferric chloride is added prior to the secondary clarifiers for phosphorus removal. Secondary clarification then follows and removes the sloughed biomass and then mono media tertiary filtration prior to disinfection. Disinfection consists of a chlorine contact tank using gaseous chlorine and liquid sodium bisulfite for dechlorination. The final effluent then flows by gravity through a submerged outfall structure to Lake Michigan via Outfall 001.

Solids Treatment Train: The solids treatment includes anaerobic digestors, belt filter presses, and sludge storage structures. The two-stage anaerobic digestors treat primary and secondary sludge settled from primary and secondary clarifiers. The process includes two parallel primary anaerobic digestors and one secondary anaerobic digester. The digested sludge can be then processed through belt filter presses. The facility has two parallel belt filter presses. The facility currently does not use the belt filter presses. The belt filter presses currently serve as emergency backup and the cake sludge can be land applied on department approved sites via Outfall 003. The digested sludge is either hauled by truck to be land applied on department approved sites via Outfall 002 or sent to 10 lagoons to be stored. The lagoons are located on the west side of the City between Highway 10 and Michigan Ave. The facility does land apply the stored sludge in the lagoons each year. The land application from the storage lagoons is now being tracked via Outfall 005.

Recent and Proposed Facility Upgrades: A new primary clarifier was constructed in 2018 to replace the rectangular clarifiers from the 1950s. The clarifier can be run in primary mode for wet weather higher flows or intermediate mode between the stack filters and rock filters to capture biomass and generate gas for anaerobic digestors under normal flow conditions. During the permit term, the facility proposes to rehab the trickling filters and the secondary clarifiers.

Substantial Compliance Determination

Enforcement During Last Permit: The facility received notices of noncompliance (NONs) on June 7, 2022 and May 9, 2023 for repeated exceedances of effluent limitations for total BOD₅. The NON on May 9, 2023 also included several land application violations. The facility is currently taking corrective actions for the total BOD₅ effluent limitations exceedances by way of a facility upgrade and the facility has completed all previously required actions for the land application violations as part of the enforcement process.

After a desk top review of all discharge monitoring reports, compliance maintenance annual reports, land application reports, compliance schedule items, and a site visit on September 7, 2022, this facility has been found to be in substantial compliance with their current permit.

Compliance determination entered by Trevor Moen, Wastewater Compliance Engineer, on January 23, 2024.

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)
701	Daily Average: 7.41 MGD (April 2018 to December 2023)	INFLUENT - Total combined influent from the sanitary sewage collection system and hauled waste receiving station. At Sampling Point 701, the permittee shall collect representative samples of the influent from the automatic sampler drawing 24-hour flow proportional composite samples from the 60-inch influent sewer, prior to the preliminary treatment building and the addition of any sidestreams. The permittee shall measure the influent flow rate with a continuous flow recording device following the preliminary treatment building.

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)
103	Not applicable	FIELD BLANK - At Sampling Point 103, the permittee shall collect a field blank for each day a mercury sample is collected. The permittee shall report the field blank concentrations when reporting mercury sample results.
104	New sampling point.	OTHER BYPASS - At Sampling Point 104, the permittee shall report the diverted flow which bypasses the tertiary filtration system prior to disinfection.
001	Not required to report the flow rate during the previous permit term.	EFFLUENT - At Sampling Point 001, the permittee shall collect representative samples of effluent from the effluent automatic composite sampler drawing 24-hour flow proportional samples from the outfall pipeline following dechlorination, except that the permittee shall collect grab samples of the effluent at the final weir in the chlorine tank or at the effluent sampler, after dechlorination for pH, total residual chlorine, fecal coliform, E. coli, mercury, PFOA, and PFOS prior to being discharged to Lake Michigan via Outfall 001. The permittee shall measure the effluent flow rate using a continuous flow recording device prior the tertiary filter building.
002	Average Annual Sludge Generated: 14.2 MG (2018 to 2022) Average Annual Sludge Land Applied: 757 metric tons (2018 to 2023)	LIQUID SLUDGE - Class B liquid sludge from the anaerobic digesters. At Sampling Point 002, the permittee shall collect representative composite samples of liquid sludge from the anaerobic digestors prior to being land applied on department approved sites via Outfall 002.
003	This outfall was not used during the previous permit term.	CAKE SLUDGE - Class B cake sludge that is anaerobically digested and treated with belt presses. At Sampling Point 003, the permittee shall collect representative composite samples of cake sludge following the belt presses and prior to being land applied on department approved sites via Outfall 003.
005	New land application outfall.	LAGOON SLUDGE - Class B sludge removed from sludge storage lagoons. At Sampling Point 005, the permittee shall collect representative composite samples of the sludge removed from the storage lagoons prior to being land applied to department approved sites via Outfall 005.

1 Influent – Monitoring Requirements

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	
BOD ₅ , Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Quarterly	24-Hr Flow Prop Comp	

Changes from Previous Permit:

- No changes from previous permit.

Explanation of Limits and Monitoring Requirements

Flow Rate, BOD₅, and TSS Monitoring: Influent monitoring is needed to assess loading to the facility and treatment performance. Requirements for flow, BOD, and TSS are established in accordance with s. NR 210.04(2), Wis. Adm. Code. Influent monitoring for flow, BOD₅, and TSS remains unchanged from the previous permit.

Metals Monitoring: Monitoring for metals is required because the design flow is greater than 5 MGD and this facility operates an industrial pretreatment program as required under ch. NR 211, Wis. Adm. Code. Influent monitoring for metals remains unchanged from the previous permit. Additionally, as part of the mixing zone phase-out for mercury under the exception for technical and economic considerations, the department requires quarterly influent monitoring for mercury to continue to characterize the mercury loading coming into the wastewater treatment facility and better assess mercury reductions.

Sampling Frequency: The department shall determine on a case-by-case basis the monitoring frequency to be required for each parameter in a permit pursuant to s. NR 205.066, Wis. Adm. Code. The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in

individual WPDES 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 fairness and 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. Previously permitted monitoring frequencies for influent flow, BOD₅ and TSS are consistent with the standard monitoring frequency outlined in guidance. The sampling frequencies for influent flow, BOD₅ and TSS remain unchanged from the previous permit.

Sample Type: The department shall require the use of 24-hour flow proportional samplers for monitoring influent wastewater quality except where the department determines through the permit issuance process that other sample types may adequately characterize the influent quality pursuant to s. NR 210.04(4), Wis. Adm. Code. The 24-hour flow-proportional sampling is the most representative method of collecting wastewater samples for wastewater coming into and being discharged from a wastewater treatment plant on a continuous basis. The sample type for BOD₅, TSS, and metals remains unchanged from the previous permit. For municipal waste at a treatment facility, methods of flow measurement shall include a continuous recording device pursuant to s. NR 218.05(1), Wis. Adm. Code. The sample type of flow rate remains unchanged from the previous permit.

2 Inplant - Monitoring and Limitations

Sample Point Number: 103- FIELD BLANK

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Mercury, Total Recoverable		ng/L	Quarterly	Blank	

Changes from Previous Permit:

- No changes from previous permit.

Explanation of Limits and Monitoring Requirements

Field Blank Monitoring: Collection of a field blank during mercury sampling events is required to satisfy the sampling requirements of s. NR 106.145(9)(c), Wis. Adm. Code.

Sample Point Number: 104- OTHER BYPASS

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Per Occurrence	Estimated	Start flow measurement at the commencement of bypass operations. Measure flow in daily increments until operation ends and report daily bypass flow on the eDMR. See the Other Bypass Requirements section below.
Time		hours	Per Occurrence	Calculated	Report the total duration of 'Other Bypass' within a given day (12:00am - 11:59pm) in which the other bypass occurs. See the Other Bypass Requirements section below.

Changes from Previous Permit:

- This is a new sample point and was not included in the previous permit.

Explanation of Limits and Monitoring Requirements

Other Bypass Monitoring: The department has determined that an other bypass as defined in s. NR 205.07(1)(u)3., Wis. Adm. Code, may occur at the wastewater treatment facility. Furthermore, the department has previously approved plans in accordance with s. 281.41, Wis. Stats., for the partial bypass around the tertiary treatment process prior to disinfection.

Section NR 205.07(1)(u), Wis. Adm. Code, requires that the department approve all other bypasses. The department included to this sampling point to constitute permitting and approval of the other bypass provided the other bypass monitoring requirements and conditions are followed. The other bypass may only divert flow around the tertiary sand filters prior to disinfection. A bypass that is defined as a controlled diversion in s. NR 205.07(1)(v), Wis. Adm. Code, is not covered under this sample point. In no case shall this include flow diversion which would constitute blending, as defined in s. NR 210.03(2e), Wis. Adm. Code, unless otherwise approved in this permit.

3 Surface Water - Monitoring and Limitations

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	5/Week	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
Chlorine, Total Residual	Daily Max	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Weekly Avg	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Monthly Avg	38 ug/L	Daily	Grab	
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Weekly	Grab	Monitoring and Limit applies October through April each year.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and Limit applies May through September each year.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and Limit applies May through September each year. See the E. coli Percent Limit section below. Enter the result in the DMR on the last day of the month.
Phosphorus, Total	Monthly Avg	0.9 mg/L	5/Week	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Total	6-Month Avg	0.6 mg/L	5/Week	24-Hr Flow Prop Comp	Interim limit effective on May 1, 2024. See the Total Phosphorus Interim Limit Schedule below.
Nitrogen, Ammonia Variable Limit		mg/L	2/Week	See Table	See the Daily Maximum Ammonia Nitrogen Limits section below.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	2/Week	24-Hr Flow Prop Comp	See the Daily Maximum Ammonia Nitrogen Limits section below.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	39 mg/L	2/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies April through September each year.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	34 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies October through March each year.
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	
Mercury, Total Recoverable	Daily Max	6.9 ng/L	Quarterly	Grab	Interim limit for mercury. See Mercury Pollutant Minimization Program schedule below.
Arsenic, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	Monitoring only from January 1, 2027 to December 31, 2027. See Total Recoverable Arsenic Monitoring section below.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	See Nitrogen Series Monitoring section below.

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	See Nitrogen Series Monitoring section below.
Nitrogen, Total		mg/L	Quarterly	Calculated	See Nitrogen Series Monitoring section below. Total Nitrogen = Total Kjeldahl Nitrogen (mg/L) + Total (Nitrite + Nitrate) Nitrogen (mg/L).
PFOA		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Sampling and Reporting Requirements section below and PFOS/PFOA Minimization Plan Determination of Need section below and compliance schedule.
PFOS		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Sampling and Reporting Requirements section below and PFOS/PFOA Minimization Plan Determination of Need section below and compliance schedule.
Acute WET	Daily Max	1.0 TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity Testing section below.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity Testing section below.

Changes from Previous Permit

- The permit requires effluent flow rate monitoring.
- Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits. E. coli limits during the recreation season (May to September).
- A total phosphorus interim limit of 0.6 mg/L as a six-month average has been added and will become effective per a schedule.
- The daily maximum ammonia variable limits have been expanded throughout the pH range (6.0 to 9.0 s.u.).
- The interim daily maximum limit for mercury has been lowered to 6.9 ng/L.
- Monthly total recoverable arsenic monitoring for 2027 has been added to the permit.

- Quarterly nitrogen series monitoring has been added to the permit.
- Monthly PFOA and PFOS monitoring has been added to the permit.
- The sampling frequency for acute WET testing has been reduced to once per year in rotating quarters.

Explanation of Limits and Monitoring Requirements

More information and explanation about the proposed water quality-based effluent limits (WQBELs) is found in the “Water Quality-Based Effluent Limitations for Manitowoc Wastewater Treatment Facility (WI-0024601-10)” memo dated February 24, 2023.

Flow Rate Monitoring: For municipal waste at a treatment facility, methods of flow measurement shall include a continuous recording device pursuant to s. NR 218.05(1), Wis. Adm. Code. The permittee already has an effluent flow meter installed so no schedule is necessary to install one.

Secondary Treatment Limits for BOD₅, TSS, and pH: Publicly owned treatment works with a discharge to a surface water classified as a fish and aquatic life water shall meet the secondary treatment effluent limits specified for BOD₅, TSS, and pH in s. NR 210.05(1), Wis. Adm. Code. The permittee discharges to Lake Michigan which is classified as a fish and aquatic life water. Therefore, effluent limitations in s. NR 210.05(1), Wis. Adm. Code apply. The limits for BOD₅, TSS, and pH remain unchanged from the previous permit.

Total Residual Chlorine: The permittee currently uses chlorine gas to disinfect the final effluent prior to discharge to Lake Michigan. Therefore, the department must evaluate effluent limitations to assure proper operation of the dechlorination system. Section NR 210.06(2)(b), Wis. Adm. Code, states that when chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L. However, the department must also evaluate WQBELs for total residual chlorine. Chlorine effluent limits were calculated using current acute and chronic chlorine toxicity criteria for the protection of aquatic life included in Tables 1 and 5 of ch. NR 105, Wis. Adm. Code. The WQBELs were determined to be more restrictive than the technology based effluent limitations in s. NR 210.06(2)(b), Wis. Adm. Code. The effluent limits for total residual chlorine remain unchanged from the previous permit.

E. coli and Fecal Coliform: Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period and establish effluent limitations for E. coli established in s. NR 210.06(2), Wis. Adm. Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to E. coli to protect recreation in ch. NR 102, Wis. Adm. Code.; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code; revised permit requirements for publicly owned sewage treatment works in ch. NR 210, Wis. Adm. Code; and, updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code.

The permittee discharges to Lake Michigan which is classified as a public drinking water supply and the discharge is in proximity to a public drinking water supply intake. Permits for publicly and privately owned sewage treatment works that discharge to public drinking water supply waters are required to disinfect year-round pursuant to s. NR 210.06(1)(b), Wis. Adm. Code. 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 in order to protect recreation season (May to September): The geometric mean of E. coli bacteria in effluent samples collected in any calendar month cannot exceed 126 counts/100 mL. No more than 10% of E. coli bacteria samples collected in any calendar month can exceed 410 counts/100 mL. Fecal coliform limits and monitoring are no longer required for recreational protection. Additionally, if a facility is required to disinfect to protect public drinking water supplies outside of the recreation period, the facility may either continue to meet the E. coli limits specified year-round, or the geometric mean of the fecal coliform bacteria for effluent samples collected in a period of 30 consecutive days may not exceed 400 counts/100 mL pursuant to s. NR 210.06(2)(a)2., Wis. Adm. Code. The facility selected to meet the E. coli limits during the recreational season and a fecal coliform limit of 400# /100 mL outside of the recreation season.

The permittee had monitored effluent E. coli weekly from 05/07/2018 – 09/26/2022 with a total of 109 results. The geometric mean monthly limit of 126 #/100 mL was exceeded 1 of 25 months during this period with a maximum monthly geometric mean of 297#/100 mL. The maximum limit of 410 #/100 mL was exceeded 7 times during this period (approximately 6.4% of total sample results). The maximum reported value was 2800 #/100 mL. Based on the effluent E. coli monitoring data, the permittee has demonstrated that the final E. coli limits can be met immediately with the existing disinfection system.

Total Phosphorus: Phosphorus requirements are based on the Phosphorus Rules as detailed in ch. NR 102 (water quality standards) and NR 217, Wis. Adm. Code (effluent standards and limitations for phosphorus). Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. Currently, there are three types of limit calculations used to determine if a phosphorus limit is needed: a technology based effluent limit (TBEL), a WQBEL determined from water quality criteria and an effluent limit based on a total maximum daily load (TMDL) allocation.

- A TBEL of 1.0 mg/L is needed if a facility discharges more than the threshold of 150 pounds per month (s. NR 217.04(1)(a)1., Wis. Adm. Code). The data demonstrates that the monthly average phosphorus loading is more than 150 lbs/month. However, the current interim monthly average total phosphorus limit of 0.9 mg/L is more restrictive than the TBEL limitation; therefore, a TBEL of 1.0 mg/L is not necessary.
- Section NR 102.06(5)(b), Wis. Adm. Code, 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 Manitowoc, 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 six-month average limit has also been set for other municipal wastewater treatment facilities that discharge to Lake Michigan. These facilities have proven that this limit is achievable. Past total phosphorus effluent data from reissuance -08 demonstrates that the facility can meet 0.6 mg/L as a six-month average immediately. The department has included a one-month compliance schedule to allow the facility to optimize the wastewater treatment system to meet the 0.6 mg/L as a six-month average and begin a new six-month average period (May-October). The interim monthly average limit of 0.9 mg/L remains in effective and unchanged from the previous permit.
- The discharge is directly to Lake Michigan. There is no approved TMDL effective for Lake Michigan. Therefore, an effluent limit based on a TMDL allocation is not applicable.

Ammonia: Ammonia limits were calculated using current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Tables 2C and 4B of ch. NR 105, Wis. Adm. Code. Subchapter IV of ch. NR 106 establishes the procedure for calculating WQBELs for ammonia. The weekly average and monthly average limits have not changed from the previous permit. Section NR 106.33(2), Wis. Adm. Code, was updated effective on September 1, 2016. As a result, seasonal 20 and 40 mg/L thresholds for including ammonia limits in municipal discharge permits are no longer applicable under current rules. As such, the daily maximum variable limit table (see below) has been expanded from the table in the previous permit to include ammonia nitrogen limits throughout the pH range (6.0 to 9.0 s.u.)

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

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.9 < pH ≤ 7.0	48	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

Metals Monitoring: Monitoring for metals is required because the design flow is greater than 5 MGD and this facility operates an industrial pretreatment program as required under ch. NR 211, Wis. Adm. Code. Effluent monitoring for metals remains unchanged from the previous permit.

Mercury: The WQBEL for total recoverable mercury is set equal to the most stringent criterion of 1.3 ng/L, according to s. NR 106.06(6), Wis. Adm. Code, because the background concentration in the receiving water and similar inland streams is known to exceed 1.3 ng/L. A review of data from 04/03/2018 – 10/05/2022 indicates the 30-day P99 is 2.9 ng/L, which is above the wildlife criterion of 1.3 ng/L. Therefore, a mercury effluent limit is required for Manitowoc WWTF. However, the permittee has requested a continued exception to the mixing zone phase out when calculating effluent limitations for mercury beyond November 15, 2010, under the exception for technical and economic considerations to the mixing zone phase-out for bioaccumulating chemicals of concern. The department granted the exception for technical and economic considerations to the mixing zone phase-out for mercury. The interim limit was set at 6.9 ng/L as a daily maximum, with quarterly monitoring. This is the maximum result reported during the previous permit term. See the Mixing Zone Phase-Out Exception for Mercury section of the WQBEL memo for more information.

Arsenic: The sample that was collected for the permit reissuance application had a limit of detection (LOD) of 2.6 µg/L which is greater than the most stringent calculated limit of 0.2 µg/L based on the human cancer criteria. The previous permit reissuance application had one data point that was reported as <1.0 µg/L. Because the LODs are greater than the most stringent calculated limit, reasonable potential cannot be determined at this time. Monthly monitoring is required in 2027 to ensure that 11 sample results are available at the next permit reissuance to meet the reasonable potential data requirements of s. NR 106.85, Wis. Adm. Code. The arsenic test method shall be sensitive enough so that the LOD is below 0.2 µg/L and reasonable potential can be determined for the next permit reissuance. To demonstrate that Manitowoc does not contribute additional mass of arsenic at the point of discharge, the permittee may perform monthly monitoring of arsenic from the untreated drinking water supply intake (water supply from Lake Michigan).

PFOA and PFOS: NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for major municipal dischargers, with an average flow rate greater than or equal to 5 MGD, at a minimum sample effluent on a monthly basis for PFOS and PFOA pursuant s. NR 106.98(2)(a), Wis. Adm. Code. The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

Nitrogen Series Monitoring (NO₂+NO₃, TKN and Total N): The department has included monthly effluent monitoring for total nitrogen since the permittee is a major discharge (>1 MGD) in the permit through the authority under s. 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the “Guidance for Total Nitrogen Monitoring in Wastewater Permits” dated October 1, 2019.

Whole Effluent Toxicity Testing: Whole effluent toxicity (WET) testing requirements and limits are determined in accordance with ss. NR 106.08 and NR 106.09, Wis. Adm. Code, as revised August 2016. (See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at <http://dnr.wisconsin.gov/topic/wastewater/wet.html>). Additionally, major municipal discharger with a design flow greater than 1.0 MGD and/or with approved pretreatment program must at a minimum perform annual WET testing pursuant to 40 CFR Part 122.21(j)(5).

After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above, 2x yearly acute and chronic WET tests were recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after

the permit expiration date (until the permit is reissued). However, if Manitowoc submits an approvable standard operating procedure (SOP) for the ferric chloride chemical feed system, 15 points would be removed from the acute and chronic checklists and would result in the recommendation of annual acute and chronic WET testing. The permittee submitted a SOP for the chemical feed system on August 23, 2023. Therefore, the sampling frequency was reduced to annual acute and chronic WET testing in rotating quarters in the permit.

The department has determined that due to the available acute WET testing data and requirements specified in s. NR 106.08, Wis. Adm. Code, an acute WET limit is required to be continued in the permit and shall be 1.0 TUc expressed as a daily maximum limit.

Sample Type: The department shall require the use of 24-hour flow proportional samplers for monitoring effluent wastewater quality except where the department determines through the permit issuance process that other sample types may adequately characterize the effluent quality pursuant to s. NR 210.04(4), Wis. Adm. Code. The 24-hour flow-proportional sampling is the most representative method of collecting wastewater samples for wastewater coming into and being discharged from a wastewater treatment plant on a continuous basis. Grab samples for pH, TRC, fecal coliform, and E. coli are required as compositing and holding such samples would change the test results and is noncompliant with maximum holding times specified in ch. NR 219, Wis. Adm. Code. The sample type for all parameters remains unchanged from the previous permit.

Sampling Frequency: The department shall determine on a case-by-case basis the monitoring frequency to be required for each parameter in a permit pursuant to s. NR 205.066, Wis. Adm. Code. The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual WPDES 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 fairness and 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.

Previously permitted monitoring frequencies for all parameters, except ammonia nitrogen, are consistent with the standard monitoring frequency outlined in the guidance. These sampling frequencies remain unchanged from the previous permit. If performance levels begin to vary during the permitted term, the department may re-evaluate current sampling frequencies and implement more frequent monitoring via permit modification or at permit reissuance.

Permitted monitoring frequencies for ammonia nitrogen fall below the standard monitoring frequencies outlined in the guidance document. The permittee demonstrates a history of consistent compliance with existing ammonia nitrogen effluent limits. Data submitted during the previous permit term continues to show consistent compliance with ammonia effluent limitations, and the set monitoring frequencies are consistent with requirements of state code. The current monitoring frequency for ammonia nitrogen shall continue this permit term. If performance levels begin to vary during the permitted term, the department may re-evaluate current sampling frequency for ammonia nitrogen and implement more frequent monitoring via permit modification or at permit reissuance.

4 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
002	B	Liquid	Fecal Coliform	Injection or Incorporation	Land Applied or Landfilled	757 metric tons (Average Land Applied)
003	B	Cake	Not Used	Not Used	Not Used	Not Used
005	B	Liquid	New Outfall	New Outfall	New Outfall	New Outfall
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? Yes, the priority pollutant scan was last conducted in 2013. Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

Sample Point Number: 002- LIQUID SLUDGE; and 005- LAGOON SLUDGE

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

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	
Nitrogen, Ammonium (NH ₄ -N) Total		Percent	Quarterly	Composite	
Phosphorus, Total		Percent	Quarterly	Composite	
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Monitoring required once in 2026.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	
PFOA + PFOS		µg/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.
Municipal Sludge Priority Pollutant Scan			Once	Composite	Monitoring required once in 2026. As specified in ch. NR 215.03 (1-4), Wis. Adm. Code.

Sample Point Number: 003- CAKE SLUDGE

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Solids, Total		Percent	Quarterly	Composite	Monitoring required and limits applicable only when cake sludge is land applied.
Arsenic Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Quarterly	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Quarterly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Quarterly	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Quarterly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Quarterly	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Quarterly	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Quarterly	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Quarterly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Quarterly	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	
Nitrogen, Ammonium (NH ₄ -N) Total		Percent	Quarterly	Composite	
Phosphorus, Total		Percent	Quarterly	Composite	
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Monitoring required once only when cake sludge is land applied.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
PFOA + PFOS		µg/kg	Annual	Calculated	Monitoring required only when cake sludge is land applied. 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.
Municipal Sludge Priority Pollutant Scan			Once	Composite	Monitoring required once only when cake sludge is land applied. As specified in ch. NR 215.03 (1-4), Wis. Adm. Code.

Changes from Previous Permit:

- Outfall 005 has been added to track land application of lagoon sludge.
- Sludge sampling frequency has been reduced to quarterly.
- Annual PFAS monitoring has been added to the permit for each sludge outfall.
- A priority pollutant scan has been added to the permit for each sludge outfall.

Explanation of Limits and Monitoring Requirements

Outfall 005: The department added Outfall 005 from the previous permit. The permittee will land apply sludge from the sludge storage lagoons each year. If a permittee generates more than one type of sludge, each sludge type shall be sampled and analyzed in accordance with the WPDES permit pursuant to s. NR 204.05(2)(a), Wis. Adm. Code.

Metals, Nutrients, Pathogen Control, Vector Attraction Reduction: The parameters to be analyzed in the sludge were determined pursuant to s. NR 204.06(2)(b), Wis. Adm. Code. The ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogen control are specified in s. NR 204.07(6), Wis. Adm. Code and in s. NR 204.07(7), Wis. Adm. Code for vector attraction reduction requirements. Nutrients are required to be analyzed to track that nutrient recommendations for the crop are not exceeded. Specifically, the amount of available nitrogen from sludge and other nitrogen sources applied per growing season may not exceed the nitrogen requirement of the crop pursuant to s. NR 204.07(8)(a), Wis. Adm. Code.

Water extractable phosphorus (WEP) is the coefficient for determining plant available phosphorus from measured total phosphorus. In Wisconsin, the Penn State Method is utilized and is expressed in percent. While a total P may be significant, the WEP may show that only a small percentage of the P is available to plants because of factors such as treatment processes and chemical addition that “tie-up” phosphorus limiting the amount of phosphorus that is plant available. As part of the Wisconsin’s nutrient management plan (NMP) requirements, the accounting of all fertilizers must

be included over the NMP cycle. The fertilizer value of the waste needs to be communicated to the farmer and accounted for in the NMP.

The metals and nutrients monitoring, pathogen control, and vector attraction reduction requirements are unchanged from the previous permit.

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 expects to release this risk assessment by the end of 2024. 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 the proposed WPDES permit pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code.

Priority Pollutant Scan: The department requires that major dischargers with design flows between 5 MGD and 40 MGD, perform a priority pollutant scan once every 10 years on their sludge pursuant to s. NR 204.06(2)(b)6., Wis. Adm. Code. The permittee last conducted a priority pollutant scan on the sludge in 2013. The department requires that the permittee perform the priority pollutant scan in 2026.

Sample Frequency: The frequency of monitoring for metals, nutrients, pathogen control, and vector attraction reduction requirements of the sludge is based on the amount of sludge land applied each year pursuant to s. NR 204.06(2)(c)3., Wis. Adm. Code. The facility land applied on annual average of 757 dry metric tons each year (2018 to 2023). This result is between 290 dry metric tons of sludge each year and 1500 dry metric tons of sludge each year based on Table A in s. NR 204.06(2)(c)3., Wis. Adm. Code which results in a sampling frequency of once per quarter. Also the facility mainly land applies sludge in Spring and Fall each year. Therefore, the sampling frequency has been reduced to once per quarter to be consistent with Table A in s. NR 204.06(2)(c)3., Wis. Adm. Code and the frequency of land application.

5 Schedules

5.1 Total Phosphorus Interim Limit (0.6 mg/L)

The permittee shall comply with the interim limit for phosphorus as specified under s. NR 217.13(4), Wis. Adm. Code. The permittee shall perform the following actions.

Required Action	Due Date
Achieve Compliance: The permittee shall optimize the wastewater treatment system to achieve compliance with the total phosphorus interim limit of 0.6 mg/L as a six-month average.	05/01/2024

5.2 Mercury Pollutant Minimization Program

As a condition of the mixing zone phase-out for mercury under the exception for technical and economic considerations, the permittee shall implement a Mercury Pollutant Minimalization Program pursuant to s. NR 106.145(7), Wis. Adm. Code. The permittee shall perform the following actions.

Required Action	Due Date
<p>Annual Mercury Progress Reports: Submit an annual mercury progress report related to the pollutant minimization activities for the previous year. The annual mercury progress report shall:</p> <p>Indicate which mercury pollutant minimization activities or activities outlined in the Pollutant Minimization Program Plan have been implemented and state which, if any, activities from the Pollutant Minimization Program Plan were not pursued and why;</p> <p>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;</p> <p>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;</p> <p>Include an analysis of trends in total effluent mercury concentrations based on mercury sampling; and</p> <p>Include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury.</p> <p>The first annual mercury progress report is to be submitted by the Due Date.</p>	01/31/2025
Annual Mercury Progress Report #2: Submit a mercury progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2026
Annual Mercury Progress Report #3: Submit a mercury progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2027
Annual Mercury Progress Report #4: Submit a mercury progress report, related to the pollutant minimization activities for the previous year, as defined above.	01/31/2028
<p>Final Mercury Report: Submit a final report documenting the success in reducing mercury concentrations in the effluent, as well as the anticipated future reduction in mercury sources and mercury effluent concentrations.</p> <p>The report shall:</p> <p>Summarize mercury pollutant minimization activities that have been implemented during the current permit term and state which, if any, activities from the Pollutant Minimization Program Plan were not</p>	09/30/2028

Required Action	Due Date
<p>pursued and why;</p> <p>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;</p> <p>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;</p> <p>Include an analysis of trends in mercury concentrations based on sampling and data during the current permit term; and</p> <p>Include an analysis of how influent and effluent mercury varies with time and with significant loadings of mercury.</p> <p>If the permittee intends to request a continued exception to the mixing zone phase out when calculating effluent limitations for mercury per 40 CFR, Part 132, Appendix F, Procedure 3 C. 6., for the reissued permit, a detailed Pollutant Minimization Program 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:</p> <p>Include an explanation of why or how each pollutant minimization activity will result in reduced discharge of the target pollutant;</p> <p>Evaluate any new available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant, and</p> <p>Identify any information needs that would help to better determine pollutant sources and make plans to collect that information.</p>	
<p>Annual Mercury 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 mercury reports for the previous year following the due date of Annual Mercury Progress Reports listed above. Annual Mercury Progress reports shall include the information as defined above.</p>	

5.3 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
<p>Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code.</p> <p>This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.</p>	03/31/2025
<p>Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan.</p> <p>This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.</p> <p>The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan.</p>	03/31/2026

<p>If the Department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for Department approval no later than 90 days after written notification was sent from the Department. The Department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued.</p> <p>If, however, the Department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.</p>	
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5.4 Sludge Management Plan

A management plan is required for the permittee’s sludge management program.

Required Action	Due Date
<p>Sludge Management Plan Submittal: Submit a sludge management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. 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 sludge management 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.</p>	06/30/2024

5.5 Facility Upgrade

The permittee shall complete the proposed treatment upgrades/modifications as listed in the approved facility plan amendment.

Required Action	Due Date
<p>Begin Construction: The permittee shall initiate construction of the treatment upgrades/modifications consistent with the department approved plans and specifications.</p>	04/01/2025
<p>Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades modifications.</p>	08/31/2025
<p>Complete Construction: The permittee shall complete construction of the treatment upgrades/modifications.</p>	12/31/2026
<p>Report on Effluent Discharges: Submit a report on effluent discharges of total BOD5 with conclusions regarding compliance with total BOD5 effluent limitations. If the report concludes that that the recent facility upgrades cannot achieve compliance with the total BOD5 effluent limits, the permittee shall initiate a Facility Planning Study.</p>	12/31/2028

Explanation of Schedules

Total Phosphorus Interim Limit (0.6 mg/L): Section NR 102.06(5)(b), Wis. Adm. Code, 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 Manitowoc, 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 six-month average limit has also been set for other municipal wastewater treatment facilities that discharge to Lake Michigan. These facilities have proven that this limit is achievable. Past total phosphorus effluent data from reissuance -08 demonstrates that the facility can meet 0.6 mg/L as a six-month average immediately. The department has included a one-month compliance schedule to allow the facility to optimize the wastewater treatment system to meet the 0.6 mg/L as a six-month average and begin a new six-month average period (May-October).

Mercury Pollutant Minimization Program: This schedule requires the permittee to submit annual reports on activities conducted through its Mercury Pollutant Minimization Program which is a condition of the mixing zone phase-out for mercury under the exception for technical and economic considerations.

PFOS/PFOA Minimization Plan Determination of Need: As stated above, NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. S. NR 106.98, Wis. Adm. Code, specifies steps to generate data in order to determine the need for reducing PFOS and PFOA in the discharge. Data generated per the effluent monitoring requirements will be used to determine the need for developing a PFOS/PFOA minimization plan. As part of the schedule, the permittee is required to submit two annual Reports on Effluent Discharge.

If the department determines that a minimization plan is needed, the permit will be modified or revoked/reissued to include additional requirements.

Sludge Management Plan: Per s. NR 204.11(1), Wis. Adm. Code, the department may require the permittee to develop a sludge management plan, submit the plan to the department for approval and operate in compliance with the approved plan. The plan shall include a description of the facility's sludge management program and how the permittee plans to operate the facility in compliance with the requirements of the permit and ch. NR 204, Wis. Adm. Code. The sludge management plan shall be submitted to the department for approval by the due date in the permit.

Facility Upgrade: The permittee is currently going through facility upgrades to rehab the trickling filters and final clarifiers. This schedule serves as a reminder to keep the department updated on the construction progress of the facility upgrades and report if the facility upgrades will maintain compliance with current total BOD5 effluent limitations.

6 Standard Requirements

Changes from Previous Permit:

The Standard Requirements section contains conditions and requirements that are, for the most part, applicable to all municipal permittees consistent with ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code. Other standard requirements may be added as reminders. Changes to the standard requirements section include:

- Section 6.1.5: A reminder was added about the reporting requirements when there is no discharge through a permitted outfall for flow related parameters.
- Section 6.4.7: The department has added a reminder to enter a value of 1 for a result of 0 when calculating the geometric mean for fecal coliform.
- Section 6.4.8: The department has added a reminder about the expression of the E. coli limits and to enter a value of 1 for a result of 0 when calculating the geometric mean.
- Section 6.4.9: The department has updated the year-round disinfection requirements to reflect the changes in the disinfection rules. Also, the facilities selection of monitoring and limits of E. coli during the recreational season and monitoring and limits of fecal coliform during the non-recreational season.
- Section 6.4.10: The department revised the total residual chloride reporting requirements consistent with s. NR 106.07(6), Wis. Adm. Code.
- Section 6.4.13: The department has added the laboratory certification requirements for PFOA and PFOS testing.
- Section 6.6.6: The department has revised the monitoring and calculation requirements for PCB Concentrations in Sludge.
- Section 6.6.13: The department has removed the anaerobic digestion process requirement as the facility has never used the anaerobic digestion process to demonstrate compliance with the sludge pathogen control requirements.
- Section 6.6.14: The department has removed the PSRP equivalent process requirement as the facility has never submitted an alternative process to treat sludge that is equivalent a process to significantly reduce pathogens and comply with the sludge pathogen control requirements.

7 Summary of Reports Due

A summary of reports due has been added for informational purposes for the permittee to keep track of the due dates of reports and schedule items.

Other Comments/Changes from Previous Permit:

- None

Justification Of Any Waivers from Permit Application Requirements

- No waivers were requested from permit application requirements.

Attachments:

“Water Quality-Based Effluent Limitations for Manitowoc Wastewater Treatment Facility (WI-0024601-10)” memo dated February 24, 2023.

Expiration Date:

March 31, 2029

Prepared By:

**Sarah Adkins
Wastewater Specialist**

Date: 01/31/2024

Post Fact Check Revision Date: 02/15/2024

Post Public Notice Revision Date:

Cc: Trevor Moen -Wastewater Engineer

CORRESPONDENCE/MEMORANDUM

DATE: 02/24/2023

TO: Sarah Adkins – NER

FROM: Nicole Krueger – SER *Nicole Krueger*

SUBJECT: Water Quality-Based Effluent Limitations for Manitowoc Wastewater Treatment Facility
WPDES Permit No. WI-0024601-10

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 Manitowoc 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.

The following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
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
Residual Chlorine	38 µg/L		38 µg/L	38 µg/L	1,2
Bacteria					3
Fecal Coliform				400 #/100 mL geometric mean	
<i>E. coli</i>				126 #/100 mL geometric mean	
Phosphorus				0.9 mg/L	1
Ammonia Nitrogen					1,4
April – September	Variable		39 mg/L	30 mg/L	
October – March	Variable		39 mg/L	34 mg/L	
Mercury	6.9 ng/L				1,5
PFOS and PFOA					6
TKN, Nitrate + Nitrite, and Total Nitrogen					7
Arsenic					8
Acute WET	1.0 TUa				9,10
Chronic WET					9,10

Footnotes:

1. No changes from the current permit.
2. The limits shown in bold are required to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code.
3. Bacteria limits apply during the disinfection season year-round. The *E. Coli* limits may apply year-round at the end of the compliance schedule or *E. Coli* limits may apply May – September and the fecal coliform limits may apply November – March. 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. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit. These limits apply year-round.

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

5. Due to technical and economic considerations, the Department granted a mixing zone phase-out exception for mercury, which the interim limit equals the current 1-day P₉₉ of 7.1 ng/L.
6. Monthly monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code.
7. As recommended in the Department's October 1, 2019, Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major permittees. Total nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total Kjeldahl nitrogen (TKN) (all expressed as N).
8. Untreated drinking water intake and effluent monitoring is recommended for arsenic.
9. Acute and chronic WET testing is recommended 2x/yearly. The Instream Waste Concentration (IWC) to assess chronic test results is 9%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Lake Michigan.
10. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

The recommended limits meet the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, and additional limits are not required.

Continued monitoring for total recoverable cadmium, chromium, copper, lead, nickel and zinc is also required because Manitowoc operates a local pretreatment program for the many industries that discharge to the treatment facility.

If Manitowoc submits an approvable SOP for ferric chloride, 1x annual acute and chronic WET testing would be recommended.

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 (5) – Narrative, Mixing Zone Phase-Out Exception, 2011 Ammonia Calculation, Thermal Table, & Outfall Map

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Attachment #1
**Water Quality-Based Effluent Limitations for
 Manitowoc Wastewater Treatment Facility**

WPDES Permit No. WI-0024601-10

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The City of Manitowoc owns and operates an advanced secondary wastewater treatment facility (WWTF). It utilizes a two-stage, high-rate trickling filter system. The WWTF includes the following unit processes, in sequential order: mechanically cleaned bar screens, vortex-type grit removal, primary clarification, plastic media (stack) trickling filters, rock media trickling filters, phosphorus removal by precipitation with ferric chloride, secondary clarification, tertiary filters, disinfection with chlorine, and dechlorination with sodium bisulfite. Treated effluent is discharged to Lake Michigan via Outfall 001, extending 500 feet from the lakeshore. Sludge from the primary and secondary clarifiers is sent to a conventional anaerobic digestion system. This system consists of two completely mixed primary digesters and one secondary digester. Sludge can either be directly land applied or hauled off-site and stored in lagoons with a total capacity of about 9.6 million gallons. A pair of belt presses is available for dewatering. The resulting cake sludge can either be hauled to the lagoons for storage until land application or disposed at a licensed landfill, however the belt presses are not used routinely.

Attachment #5 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations

The current permit, expiring on 03/31/2023, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
BOD ₅			45 mg/L	30 mg/L	1,2
TSS			45 mg/L	30 mg/L	1,2
pH	9.0 s.u.	6.0 s.u.			1
Residual Chlorine	38 µg/L		38 µg/L	38 µg/L	3
Fecal Coliform May – September			656#/100 mL geometric mean	400#/100 mL geometric mean	3
E. coli					4
Phosphorus				0.9 mg/L	
Ammonia Nitrogen April – September October – March	Variable Variable		39 mg/L 39 mg/L	30 mg/L 34 mg/L	5
Cadmium					6
Chromium					6
Copper					6
Lead					6
Nickel					6

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Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Zinc					6
Mercury	7.1 ng/L				
Acute WET	1.0 TUa				7
Chronic WET					7

Footnotes:

1. 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.
2. These limits are based on requirements in s. NR 210.05(1), Wis. Adm. Code.
3. 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.
4. Monitoring only.
5. The pH-based variable daily maximum ammonia limits are listed below.

Effluent pH s.u.	Ammonia mg/L	Effluent pH s.u.	Ammonia mg/L
pH ≤ 7.1	> 39	8.0 < pH ≤ 8.1	9.3
7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8
		9.0 < pH	< 1.8

6. Monitoring for total recoverable cadmium, chromium, copper, lead, nickel and zinc is required because Manitowoc operates a local pretreatment program for the many industries that discharge to the treatment facility.
7. Acute WET tests are required quarterly, and chronic WET tests are required annually. The IWC for chronic WET was 9.1%.

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. A mixing zone is not allowed for discharges of bioaccumulating compounds of concern (BCCs) in the Great Lakes system as described in s. NR 106.06(2)(br), Wis. Adm. Code.
- Hardness = 128 mg/L as CaCO₃. This value represents the geometric mean of data from WET testing from 09/26/2017 – 01/07/2020.

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- 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 from 10/03/2017 – 07/12/2022. 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 mercury and PCBs.

Effluent Information

- Design flow rate(s):
Annual average =15.5 MGD (Million Gallons per Day)
For reference, the actual average flow from 04/01/2018 – 11/30/2022 was 7.6 MGD.
- Hardness = 252 mg/L as CaCO₃. This value represents the geometric mean of data from permit application data from 07/07/2022 – 07/17/2022.
- 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 from Lake Michigan and 25 industrial users.
- Additives: Ferric chloride is used for phosphorus removal. Chlorine is added for disinfection and sodium bisulfite is used for dechlorination.
- Effluent characterization: This facility is categorized as a major municipal, so the permit application required effluent sample analyses for all the “priority pollutants” except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code. The permit-required monitoring for Cd, Cr, Cu, Pb, Ni, Hg and Zn from April 2018 – November 2022 is used in this evaluation.
- 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.

Outfall 001 Toxic Substances Various Effluent Data

	Copper µg/L		Mercury ng/L
1-day P ₉₉	43.3	1-day P ₉₉	8.51
4-day P ₉₉	30.9	4-day P ₉₉	4.86
30-day P ₉₉	24.4	30-day P ₉₉	2.88
Mean	21.1	Mean	2.03
Std	7.22	Std	1.72
Sample size	56	Sample size	19
Range	13 – 47	Range	<4.20 – 6.91
	Chlorine µg/L		Cadmium
1-day P ₉₉		1-day P ₉₉	
4-day P ₉₉		4-day P ₉₉	
30-day P ₉₉		30-day P ₉₉	
Mean	0.11	Mean	0
Std	31.1	Std	

Attachment #1

Sample size	1705	Sample size	56
Range	<0.007 – 99	Range	<0.2 – <0.3
	Chromium µg/L		Lead µg/L
1-day P ₉₉	21.1	1-day P ₉₉	
4-day P ₉₉	12.0	4-day P ₉₉	
30-day P ₉₉	7.25	30-day P ₉₉	
Mean	5.20	Mean	0.54
Std	4.22	Std	1.57
Sample size	56	Sample size	56
Range	<5.5 – 24	Range	<0.85 – 7.3
	Nickel µg/L		Zinc µg/L
1-day P ₉₉	64.7	1-day P ₉₉	125
4-day P ₉₉	37.5	4-day P ₉₉	74.5
30-day P ₉₉	23.7	30-day P ₉₉	49.3
Mean	17.6	Mean	37.8
Std	12.8	Std	24.2
Sample size	56	Sample size	56
Range	7.8 – 100	Range	15 – 147

“<” 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.

Chloride Effluent Data

Sample Date	Chloride mg/L
07/07/2022	200
07/11/2022	160
07/12/2022	170
07/17/2022	160
Average	173

The following table presents the average concentrations and loadings at Outfall 001 from 04/01/2018 – 11/30/2022 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Averages of Parameters with Limits

	Average Measurement
BOD ₅	22.2 mg/L *
TSS	5.52 mg/L*
pH field	7.3 s.u.
Phosphorus	0.61 mg/L
Ammonia nitrogen	7.86 mg/L
Fecal coliform	169 #/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 P₉₉) 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)

Daily Maximum Limit Calculation Method

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. In accordance with s. NR 106.06(3)(b), limitations based on acute toxicity are either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation below, whichever is more restrictive.

$$\text{Limitation} = \frac{(\text{WQC}) (\text{Q}_s + (1-f) \text{Q}_e) - (\text{Q}_s - f \text{Q}_e) (\text{C}_s)}{\text{Q}_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)
if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

Q_e = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C_s = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

In this case, limits set equal to two times the acute criteria are more restrictive and this method is used to calculate the daily maximum limits shown in the table below.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L) and mercury (ng/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.
Chlorine		19.0		38.1	7.61	0.11		
Arsenic		340	1.00	680	136	<0.85		
Cadmium	252	12.6	0.01	25.2	5.0	<0.3		
Chromium	252	3844	0.49	7687			21.1	24
Copper	252	37.1	0.44	74.2			43.3	47

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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.
Lead	252	261	0.05	522	104	0.54		
Mercury		830	0.40	1660			8.51	6.91
Nickel	252	1025	0.00	2051			64.7	100
Zinc	252	270	0.39	540			125	147
Chloride (mg/L)		757	0.00	1514	303	173		

* 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.

** Limits are calculated based on 2 X ATC because they are more stringent than limits based on a 10:1 dilution.

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
Chlorine		7.28		80.08	16.02	0.11	
Arsenic		148	1.00	1618	324	<0.85	
Cadmium	128	2.99	0.01	32.8	6.6	<0.3	
Chromium	128	106	0.49	1156			12.0
Copper	128	12.8	0.44	136			30.9
Lead	128	35.6	0.05	391	78.1	0.54	
Mercury		440	0.40	440			4.86
Nickel	128	64.3	0.00	708			37.5
Zinc	128	149	0.39	1639			74.5
Chloride (mg/L)		395	0.00	4345	869	173	

* 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)

10:1 dilution

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P ₉₉
Mercury (ng/L)	1.3	0.40	1.3			2.88

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.	30-day P ₉₉
Cadmium	4.4	0.01	48	9.7	<0.3	
Chromium (+3)	100	0.49	1095			7.25
Lead	10	0.05	109	21.9	0.54	

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SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P ₉₉
Mercury	1.5	0.40	1.5			2.88
Nickel	100	0.00	1100			23.7
Antimony	5.6		62	12.3	0.41	

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.
Arsenic	0.2	1.0	0.2	0.04	<0.85
Chloroform	53		583	117	2.8
Dichlorobromomethane	53		583	117	0.30

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 chlorine and mercury.

Total Residual Chlorine – Because chlorine is added as a disinfectant, effluent limitations are recommended to assure proper operation of the de-chlorination system. Section NR 210.06(2)(b), Wis. Adm. Code, states, “When chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L.” Because the WQBELs are more restrictive, they are recommended instead. **Specifically, a daily maximum limit of 38 µg/L is required. The weekly and monthly average limits of 38 µg/L are recommended to continue as well to meet the expression of limits requirements.**

Mercury – The WQBEL for total recoverable mercury is set equal to the most stringent criterion of 1.3 ng/L, according to s. NR 106.06(6), Wis. Adm. Code, because the background concentration in the receiving water and similar inland streams is known to exceed 1.3 ng/L.

A review of data from 04/03/2018 – 10/05/2022 indicates the 30-day P₉₉ is 2.9 ng/L, which is above the wildlife criterion of 1.3 ng/L. Therefore, **a mercury effluent limit is required for Manitowoc WWTF.** See the Mixing Zone Phase-Out Exception for Mercury section for further requirements.

Arsenic – The sample that was collected for the permit reissuance application had a limit of detection (LOD) of 2.6 µg/L which is greater than the most stringent calculated limit of 0.2 µg/L based on the human cancer criteria. The previous permit reissuance application had one data point that was reported as <1.0 µg/L. Because the LODs are greater than the most stringent calculated limit, reasonable potential can’t be determined at this time. **Monitoring for one year is recommended in the reissued permit.** The

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arsenic test shall be sensitive enough so that the LOD is below 0.2 µg/L and reasonable potential can be determined.

Sample Date	Arsenic µg/L
03/03/2010	<2.4
06/19/2016	<1.0
07/12/2022	<0.85

Section NR 106.06(6), Wis. Adm. Code, allows a facility to demonstrate that a pollutant present in intake water, which is passed through the facility and discharged does not cause, have the reasonable potential to cause, or contribute to the excursion of water quality criteria in the receiving water. The demonstration has five conditions, all of which must be met:

1. The permittee withdraws 100 percent of its intake water containing the substance from the same body of water into which the discharge is made;
2. The permittee does not contribute any additional mass of the substance to the wastewater;
3. The permittee does not alter the substance chemically or physically in a manner that would cause adverse water quality impacts to occur that would not occur if the pollutants were left in-stream;
4. The permittee does not increase the concentration at the edge of the mixing zone, or at the point of discharge if a mixing zone is not allowed, as compared to the concentration in the intake water, unless the increased concentration does not cause or contribute to an excursion above an applicable water quality standard; and
5. The timing and location of the discharge would not cause adverse water quality impacts to occur that would not occur if the identified intake pollutant were left instream.

To demonstrate that Manitowoc does not contribute additional mass of arsenic at the point of discharge, monitoring arsenic from the untreated drinking water intake (water supply from Lake Michigan) should also be included in the reissued permit so the conditions above can be met.

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Previous monitoring produced a PFOS result of 4.61 ng/L and a PFOA result of 17.5 ng/L. These results are greater than one fifth of the respective criteria for each substance. Based on the effluent flow rate, the types of indirect dischargers contributing to the collection system, and the available PFOS/PFOA monitoring data, **PFOS and PFOA monitoring is recommended at a monthly frequency.**

**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:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- 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:

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

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 1705 sample results were reported from 04/02/2018 – 11/30/2022. The maximum reported value was 7.8 s.u. (Standard pH Units). The effluent pH was 7.6 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.6 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 7.6 s.u. Therefore, a value of 7.6 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 7.6 s.u. into the equation above yields an ATC = 11.4 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 either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation in s. NR 106.32(2)(e), Wis. Adm. Code.

In this case, limits calculated set equal to two times the acute criteria are more restrictive. This method is used to calculate the daily maximum limit of **23 mg/L**.

The current permit has variable daily maximum effluent limits based on effluent pH. Presented below is a table of daily maximum limitations corresponding to various effluent pH values updated using the 1-Q₁₀.

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

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Section NR 106.33(2), Wis. Adm. Code, was updated effective September 1, 2016. As a result, seasonal 20 and 40 mg/L thresholds for including ammonia limits in municipal discharge permits are no longer applicable under current rules. As such, the table has been expanded from the table in the current permit to include ammonia nitrogen limits throughout the pH range.

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

Weekly and monthly average limits are not included in the current permit but are being evaluated here due to changes to ch. NR 106, Wis. Adm. Code. **The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change** because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in Attachment #3.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 04/01/2018 – 11/29/2022, with those results being compared to the calculated limits to determine the need to include ammonia limits in Manitowoc’s permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen mg/L	April - September	October - March
1-day P ₉₉	26.2	26.8
4-day P ₉₉	15.5	16.1
30-day P ₉₉	10.0	10.6
Mean	7.58	8.19
Std	5.14	5.20
Sample size	387	332
Range	0.1 – 26	0.29 – 29

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits.

The permit currently has daily maximum, weekly average, and monthly average limits year-round. 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.

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.

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
April – September	Variable	39	30
October – March	Variable	39	34

**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 Manitowoc’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 year-round. No changes are recommended to the current recreational period and the required disinfection season.

The current permit requires Manitowoc to disinfect year-round for protection of the public water supply, because the drinking water intake for the city of Manitowoc is located near the outfall. Because the *E. coli* limits listed in NR 210.06(2)(a)1, Wis. Adm. Code, are set for protection of recreational uses and not drinking water supply, these *E. coli* limits do not necessarily need to be applied year-round. However, either *E. coli* or fecal coliform bacteria limits are needed year-round in order to ensure that there is no reduction from the current level of disinfection needed to protect the public drinking water source.

In accordance with s. NR 210.06(2)(a)2, Wis. Adm. Code, outside of the recreational season, bacteria limits may either be set equal to the previous fecal coliform limits or the listed *E. coli* limits. Therefore, the facility can select one of the two possible sets of permit limits:

- *E. coli* limits as listed above during the recreation period of May through September and a fecal coliform limit of 400 counts/100 mL as a monthly geometric mean in November through April. Any fecal coliform weekly geometric mean limit which was included in the previous permit for expression of limits purposes does not need to be included in the reissued permit.
- *E. coli* limits as listed above apply year-round.

Effluent Data

Manitowoc has monitored effluent *E. coli* from 05/07/2018 – 09/26/2022 and a total of 109 results are available. A geometric mean of 126 counts/100 mL was exceeded in 1 out of 25 months, with a maximum

monthly geometric mean of 297 counts/100 mL. Effluent data has exceeded 410 counts/100 mL 7 times (which is 6.4% of the total sample results). The maximum reported value was 2800 counts/100 mL. **Based on this effluent data it appears that the facility can meet 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 Manitowoc currently has a limit of 0.9 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

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 Manitowoc, 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.

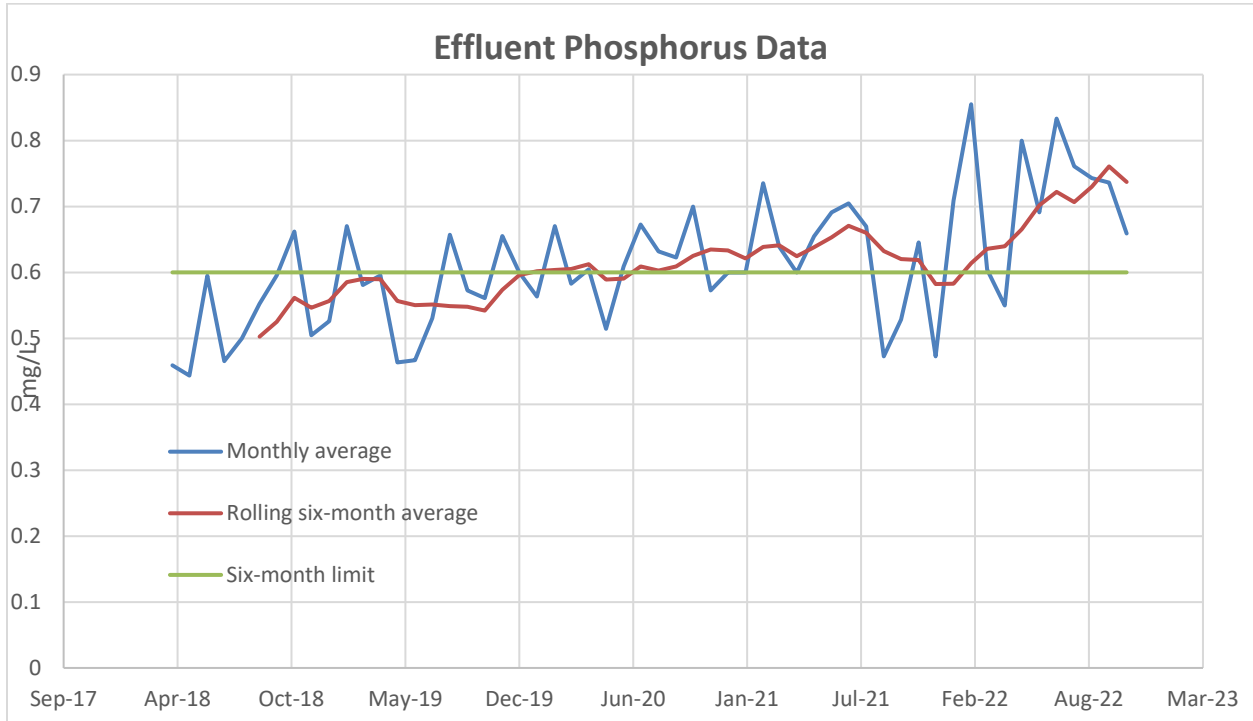
Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 04/01/2018 – 11/30/2022.

Total Phosphorus Effluent Data

	Phosphorus mg/L
1-day P ₉₉	1.18
4-day P ₉₉	0.87
30-day P ₉₉	0.70
Mean	0.61
Std	0.19
Sample size	1219
Range	0.2 – 3.5

Below is a graph of six-month rolling average and monthly average phosphorus data from the current permit term compared to the six-month limit of 0.6 mg/L.



Manitowoc’s effluent data demonstrates that the facility is not able to meet 0.6 mg/L as a six-month average on a consistent basis. Therefore, the WQBEL of 0.6 as a six-month average is not recommended to be included in the reissued permit. **The current monthly average limit of 0.9 mg/L is recommended to continue in the reissued permit.**

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 10:1 dilution for the lake discharge, the lowest calculated limitation is 120° F (s. NR 106.55(7)(b), Wis. Adm. Code).

The table below summarizes the maximum temperatures reported during monitoring from 07/03/2011 – 12/27/2011.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN			NA	120
FEB			NA	120
MAR			NA	120
APR			NA	120
MAY			NA	120
JUN			NA	120
JUL	67	69	NA	120
AUG	71	71	NA	120
SEP	71	71	NA	120
OCT	68	69	NA	120
NOV	62	64	NA	120
DEC	57	58	NA	120

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 LC₅₀ (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 IC₂₅ (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 for chronic WET was 9% during the last permit term and remains the same for this term. The

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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. Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005. Data before July 1, 2005 was excluded in this evaluation.

WET Data History

Date Test Initiated	Acute Results LC ₅₀ %				Chronic Results IC ₂₅ %					Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Algae (IC ₅₀ %)	Pass or Fail?	Use in RP?	
09/13/2005	>100	>100	Pass	Yes	51.6	57.9		Pass	Yes	
11/29/2005	>100	>100	Pass	Yes						
03/14/2006	60.2	>100	Fail	Yes	37.4	49.6		Pass	Yes	
05/02/2006	>100	>100	Pass	Yes	42.1	49.7	>100	Pass	Yes	
05/08/2006	>100	17.7	Fail	Yes						
05/23/2006	53.6	>100	Fail	Yes						
06/21/2006	>100	>100	Pass	Yes						
07/25/2006	>100	>100	Pass	Yes	42.8	58.3		Pass	Yes	
02/28/2007	>100	>100	Pass	Yes						
05/22/2007	>100	>100	Pass	Yes						
07/24/2007	70.7	>100	Fail	Yes						
08/29/2007	>100	>100	Pass	Yes						
09/19/2007	>100	>100	Pass	Yes						
10/18/2007	70.7	>100	Fail	Yes	47	>100		Pass	Yes	
12/12/2007	>100	>100	Pass	Yes						
01/09/2008	>100	>100	Pass	Yes						
03/05/2008	>100	>100	Pass	Yes						
05/14/2008	>100	>100	Pass	Yes						
09/09/2008	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
11/12/2008	>100	>100	Pass	Yes						
03/18/2009	>100	>100	Pass	Yes						
06/09/2009	>100	>100	Pass	Yes	39.2	38.7		Pass	Yes	

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Date Test Initiated	Acute Results LC ₅₀ %				Chronic Results IC ₂₅ %					Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Algae (IC ₅₀ %)	Pass or Fail?	Use in RP?	
08/19/2009	>100	>100	Pass	Yes						
10/21/2009	>100	>100	Pass	Yes						
02/09/2010	73.5	>100	Fail	Yes	45.6	52.3		Pass	Yes	
03/31/2010	77.1	>100	Fail	Yes						
11/17/2010	>100	>100	Pass	Yes						
02/23/2011	>100	>100	Pass	Yes						
05/25/2011	>100	>100	Pass	Yes						
09/14/2011	>100	>100	Pass	Yes						
11/16/2011	>100	>100	Pass	Yes						
02/22/2012	>100	>100	Pass	Yes						
06/06/2012	>100	>100	Pass	Yes						
09/11/2012	>100	>100	Pass	Yes	36.2	44.6		Pass	Yes	
11/14/2012	>100	>100	Pass	Yes						
02/13/2013	>100	>100	Pass	Yes						
05/22/2013	79.4	>100	Fail	Yes						
07/24/2013	>100	>100	Pass	Yes						
11/12/2013	>100	>100	Pass	Yes	45.4	>100	>100	Pass	Yes	Split
03/26/2014	>100	>100	Pass	Yes						
06/25/2014	>100	>100	Pass	Yes						
09/09/2014	>100	>100	Pass	Yes	40.3	70.6		Pass	Yes	
11/12/2014	70.7	>100	Fail	Yes						
01/07/2015	>100	>100	Pass	Yes						
02/11/2015	>100	>100	Pass	Yes						
06/02/2015	>100	>100	Pass	Yes	40.8	38.6		Pass	Yes	
08/26/2015	>100	>100	Pass	Yes						
12/16/2015	28.65	>100	Fail	Yes						
01/06/2016	>100	>100	Pass	Yes						
02/23/2016	>100	>100	Pass	Yes	38.9	60.9		Pass	Yes	
06/15/2016	>100	>100	Pass	Yes						
08/17/2016	>100	>100	Pass	Yes						
12/07/2016	>100	>100	Pass	Yes						
03/01/2017	>100	>100	Pass	Yes						
06/14/2017	>100	>100	Pass	Yes						
09/26/2017	>100	>100	Pass	Yes	43	50.3		Pass	Yes	
12/20/2017	>100	>100	Pass	Yes						
03/28/2018	>100	>100	Pass	Yes						
06/27/2018	>100	>100	Pass	Yes						
09/27/2018	>100	>100	Pass	Yes	79.7	>100		Pass	Yes	
11/14/2018	34.4	>100	Fail	Yes						
01/09/2019	>100	>100	Pass	Yes						
02/06/2019	>100	>100	Pass	Yes						
03/06/2019	>100	>100	Pass	Yes						
06/18/2019	>100	>100	Pass	Yes	40.6	52.4		Pass	Yes	

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Date Test Initiated	Acute Results LC ₅₀ %				Chronic Results IC ₂₅ %					Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Algae (IC ₅₀ %)	Pass or Fail?	Use in RP?	
08/28/2019	>100	>100	Pass	Yes						
11/06/2019	>100	>100	Pass	Yes						
01/07/2020	>100	>100	Pass	Yes	34.6	72.8		Pass	Yes	
06/01/2020	>100	>100	Pass	Yes						
08/26/2020	>100	>100	Pass	Yes						
10/21/2020	>100	>100	Pass	Yes						
03/17/2021	>100	>100	Pass	Yes						
06/16/2021	>100	>100	Pass	Yes						
09/01/2021	>100	>100	Pass	Yes						
11/09/2021	>100	>100	Pass	Yes	>100	67.4		Pass	Yes	
01/19/2022	>100	>100	Pass	Yes						
06/15/2022	>100	>100	Pass	Yes						
08/16/2022	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
11/02/2022	>100	>100	Pass							

Footnotes:

1. *Split Samples*. Tests were conducted concurrently on the same effluent samples by two different labs, as a check on lab performance or sampling procedures. Split samples cannot be double counted.
- 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.**

$$\text{Acute Reasonable Potential} = [(TUa \text{ effluent}) (B)(AMZ)]$$

$$\text{Chronic Reasonable Potential} = [(TUc \text{ effluent}) (B)(IWC)]$$

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 LC₅₀, IC₂₅ or IC₅₀ ≥ 100%).

$$\text{Acute Reasonable Potential} = [(TUa \text{ effluent}) (B)]$$

Acute WET Limit Parameters

TUa (maximum) 100/LC ₅₀	B (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)
100/17.7= 5.65	1.7 Based on 11 detects

$$[(TUa \text{ effluent}) (B)] = 9.6 > 1.0$$

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Reasonable potential is shown for an acute WET limit using the procedures in s. NR 106.08(6) and representative data from 09/13/2005 – 06/15/2022.

$$\text{Chronic Reasonable Potential} = [(TU_c \text{ effluent}) (B)(IWC)]$$

Chronic WET Limit Parameters

TU_c (maximum) 100/IC ₂₅	B (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/34.6 = 2.89	1.4 Based on 17 detects	9.1%

$$[(TU_c \text{ effluent}) (B)(IWC)] = 0.36 < 1.0$$

Therefore, no reasonable potential is shown for a chronic WET limit using the procedures in s. NR 106.08(6) and representative data from 09/13/2005 – 06/15/2022.

Expression of WET limits

Acute WET limit = **1.0 TU_a (daily maximum)**

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 = 9.1%. 0 Points
Historical Data	78 tests used to calculate RP. 11 tests failed. 0 Points	19 tests used to calculate RP. No tests failed. 0 Points
Effluent Variability	There is a history of WET failures. 5 Points	Same as Acute. 5 Points
Receiving Water Classification	Coldwater community. 5 Points	Same as Acute. 5 Points
Chemical-Specific Data	Reasonable potential for limits for no substances based on ATC; Ammonia nitrogen limit carried over from the current	Reasonable potential limits for no substances based on CTC; Ammonia nitrogen limit carried over from the current

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	Acute	Chronic
	permit. Chlorine, chromium, copper, lead, mercury, nickel, zinc, chloride, and ammonia detected. Additional Compounds of Concern: Antimony, phenol, dichlorobromomethane, chloroform, toluene, and Delta-BHC. 5 Points	permit. Chlorine, chromium, copper, lead, mercury, nickel, zinc, chloride, and ammonia detected. Additional Compounds of Concern: Antimony, phenol, dichlorobromomethane, chloroform, toluene, and Delta-BHC. 5 Points
Additives	1 Biocide and 2 Water Quality Conditioners added. Permittee has proper P chemical SOPs in place: No. 20 Points	All additives used more than once per 4 days. 20 Points
Discharge Category	25 Industrial Contributors. 15 Points	Same as Acute. 15 Points
Wastewater Treatment	Secondary treatment or better. 0 Points	Same as Acute. 0 Points
Downstream Impacts	No impacts known 0 Points	Same as Acute. 0 Points
Total Checklist Points:	50 Points	50 Points
Recommended Monitoring Frequency (from Checklist):	2x yearly	2x yearly
Limit Required?	Yes Limit = 1.0 TU _a	No
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above, 2x yearly acute and chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).
- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, an acute WET limit is required. The acute WET limit shall be expressed as 1.0 TU_a as a daily maximum in the effluent limits table of the permit.
- A minimum of annual acute monitoring is required because an acute WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.
- A minimum of annual acute and chronic monitoring is recommended because Manitowoc WWTF is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.

If Manitowoc submits an approvable SOP for ferric chloride, 15 points would be removed from the acute

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and chronic checklists. **This would result in the recommendation of annual acute and chronic WET testing.**

**Mixing Zone Phase-Out Exception for Mercury
For Manitowoc WWTF**

Manitowoc WWTF has requested a continued exception to the mixing zone phase out when calculating effluent limitations for mercury beyond November 15, 2010, under the exception for technical and economic considerations to the mixing zone phase-out for bioaccumulating chemicals of concern (BCC's) at 40 CFR, Part 132, Appendix F, Procedure 3 C. 6. In consideration of the requirements contained at the above reference, the Wisconsin Department of Natural Resources (WDNR) determines that:

- Manitowoc WWTF is in compliance with and shall continue to comply with all applicable requirements of Clean Water Act sections 118, 301, 302, 303, 304, 306, 307, 401, and 402, including existing categorical effluent limits and WQBELs.
- Manitowoc WWTF will accept a permit compliance schedule requiring the development and implementation of a Mercury Pollution Minimization Plan (PMP) meeting the requirements of s. 106.145(7), Wis. Adm. Code. WDNR believes the finding at s. 106.145(1)(a), Wis. Adm. Code, sufficiently demonstrates that controls beyond a PMP would result in unreasonable economic effects because controls to remove mercury using wastewater treatment technology are not feasible or cost-effective.
- Manitowoc WWTF discharges directly to Lake Michigan.
- The discharger has reduced and will continue to reduce, to the maximum extent possible, its discharge of the BCC for which the mixing zone is requested. The mixing zone shall be no larger than necessary to account for the technical constraints and economic effects identified pursuant to this exception. Therefore, the mixing zone shall be set at 1.8:1 based on the 30-day P₉₉ of discharge 2.88 mg/L, the criterion of 1.3 ng/L, and a background concentration of 0.40 mg/L at the facility design flow of 15.5 MGD.
- The limit shall be set at 6.9 ng/L as a daily maximum, with quarterly monitoring. This is the maximum result reported during the previous permit term.
- The water quality criteria are met at the edge of the mixing zone.
- There is currently no applicable TMDL for mercury in Lake Michigan and available data indicate the concentration of mercury in Lake Michigan meets all applicable water quality criteria.
- Other actions in Wisconsin to reduce releases of mercury include rules to control emissions from utility boilers and proposed mercury product legislation.
- This mixing zone and resulting WQBELs meet the requirements at 40 CFR, Part 132, Appendix F, Procedure 3 D., including that the actions will not jeopardize the continued existence of endangered or threatened species. The requirements for authorizing the exception and the circumstances under which it is being granted are essentially the same as those for granting a variance to water quality standards. WDNR has analyzed the potential impacts to endangered and threatened species as part of its variance process. The analysis concluded that approval of mercury variances, with more stringent permit requirements for PMPs, is unlikely to adversely

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affect bald eagles or other listed species that occur within the State of Wisconsin.

Therefore, WDNR grants a mixing zone extension for effluent discharges from the wastewater treatment facility operated by Manitowoc WWTF due to technical and economic considerations.

The granting of this exception to Manitowoc WWTF shall apply only to the 5-year permit term of the proposed WPDES permit. The permittee will need to make a similar request and DNR will need to make a similar determination for a further continuation of a mixing zone, if those actions become appropriate for the next permit term.

2011 Ammonia Limits Calculations

Weekly average and monthly average limits for Ammonia Nitrogen are based on chronic toxicity criteria. The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified for a Coldwater fishery is calculated by the following equation.

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

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 (°C) of the receiving water

The 4-Day criterion is simply equal to the 30-Day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation to derive weekly average limitations, and the 30-day criteria are used to derive monthly average limitations. A ten-to-one dilution is used for the mass balance, as for other toxic substances.

For pH the value of 7.9 will be used for both spring and summer conditions, while 7.8 will be used for winter conditions, for calculating limits. These pH values had been obtained from intake data for the Manitowoc Waterworks and the Manitowoc Public Utilities cooling water. This data is consistent with raw water intake pH data from the Two Rivers Waterworks, which also draws its supply from Lake Michigan, and the same values had been used in calculating ammonia limits for the Sheboygan WWTF. The background temperature values and ambient ammonia concentrations that are used have been selected based on current guidance and professional judgment. These values are shown in the table below, along with the criteria and resulting effluent limitations.

Ammonia Nitrogen Limitations Based on Chronic Toxicity		June - September	October - March	April & May
BACKGROUND INFORMATION:	Ammonia conc. (mg/L)	0.05	0.1	0.1
	Temperature (° C)	12	<7	7
	pH (standard units)	7.9	7.8	7.9
CRITERIA (in mg/L):	4-day Chronic	6.99	7.96	6.99
	30-day Chronic	2.80	3.18	2.80
EFFLUENT LIMITS (in mg/L):	Weekly Average	76	86	76
	Monthly Average	30	34	30

The final step in this evaluation is the determination of the need for these limitations in accordance with the procedures in s. NR 106.05. The effluent monitoring data for the three-year period of May 2008 through April 2011 will be used in this determination. Monitoring has been performed three times per week, for a total of 458 sample results. The maximum reported concentration was 26 mg/L, and the 1-Day P99 of all of the data equals 26.24 mg/L. Since both are greater than the calculated daily maximum limit of 23 mg/L, only a daily maximum limit is needed from November to April. The data was then

Attachment #3

grouped into subsets corresponding to the months shown in the table immediately above. The 4-Day P99 from the data equals 15.73 mg/L, and the 30-day P99 equals 10.44 mg/L. These upper ninety ninth percentile concentrations are each less than the weekly and monthly average limitations shown above, so limits are not needed based on chronic toxicity.

A daily limit for ammonia nitrogen of 23 mg/L is recommended from November to April, and monitoring throughout the entire year should continue in order to assure that the Manitowoc WWTF continues “to be operated in a manner that optimizes the removal of ammonia within the design capabilities of the wastewater treatment plant” as specified in s. NR 106.33(1), Wis. Adm. Code.

Temperature limits for receiving waters without unidirectional flow
(calculation using default ambient temperature data)

Facility: Manitoowoc WWTF

Outfall(s): 001

Date Prepared: 1/10/2023

Design Flow (Qe): 15.5 MGD

Lake Type: Lake Michigan waters - Sout

Discharge Type: Great Lakes shore discharge

Temp Dates **Flow Dates**

Start: 07/03/11 04/01/18

End: 12/27/11 11/30/22

Maximum area of mixing zone allowed (coefficient "A"): 3,125,000 ft²

Month	Water Quality Criteria			Representative Highest Effluent Flow Rate (Qe)		B			Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)	7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)	B	e ^{-a} (for SL-WQBEL)	e ^{-a} (for A-WQBEL)	Weekly Average (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	35	43	69	8.38	10.64	0.405	0.006	0.017			NA	120
FEB	34	46	69	6.90	7.22	0.405	0.002	0.003			NA	120
MAR	37	52	70	11.25	15.99	0.405	0.021	0.067			NA	120
APR	43	59	70	10.31	12.95	0.405	0.015	0.035			NA	120
MAY	48	65	72	17.04	30.16	0.405	0.079	0.238			NA	120
JUN	54	70	73	11.99	14.88	0.405	0.027	0.055			NA	120
JUL	59	71	74	15.26	29.99	0.405	0.059	0.237	67	69	NA	120
AUG	63	70	76	12.29	17.76	0.555	0.015	0.055	71	71	NA	120
SEP	60	64	74	10.82	14.20	0.555	0.008	0.026	71	71	NA	120
OCT	53	57	73	13.36	19.76	0.405	0.039	0.112	68	69	NA	120
NOV	45	49	71	9.98	13.50	0.405	0.013	0.041	62	64	NA	120
DEC	38	44	70	10.90	12.36	0.405	0.019	0.030	57	58	NA	120

