Permit Fact Sheet

General Information

Permit Number	WI-0030481-11-0
Permittee Name and Address	MHC Rainbow Lake, LLC Two North Riverside Plaza, Suite 800, Chicago, IL 60606
Permitted Facility Name and Address	MHC Rainbow Lake, LLC 19990 128th St., Bristol, WI
Permit Term	January 01, 2027 to December 31, 2031
Discharge Location	Diffuse Wetland, 50 feet south and 400 feet east of the treatment facility (Lat: 42.49798° N Long: -88.004433° W)
Receiving Water	Diffuse Wetland to Mud Lake in Des Plaines River Watershed of Fox (IL) River Basin in Kenosha County
Stream Flow ($Q_{7,10}$)	0 cfs
Stream Classification	Limited Aquatic Life (LAL)
Discharge Type	Existing and Continuous
Annual Average Design Flow (MGD)	0.035 MGD
Industrial or Commercial Contributors	None
Plant Classification	Basic; A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

MHC Rainbow Lake LLC is a privately-owned domestic wastewater treatment facility (WWTF) which serves residents of approximately 300 manufactured homes in the Town of Bristol. Incoming wastewater flows by gravity to a sewage grinder and is then pumped from the influent lift station to the WWTF. Current treatment processes include an activated sludge aeration tank, final clarification and cascade aeration prior to discharge of final effluent south of the WWTF. Waste activated sludge is treated in an aerobic digester and then stored in a second tank prior to removal by a licensed and permitted contract hauler.

Substantial Compliance Determination

Enforcement During Last Permit:

A notice of noncompliance (NON) was issued on May 24, 2024 for late reporting, and May 7, 2026 for two treatment facility overflow events. The facility completed all previously required actions as part of both enforcement processes.

After a desk top review of all discharge monitoring reports, CMARs, compliance schedule items, and a site visit on June 27, 2025, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Nick Lent, Compliance Engineer on October 7, 2026.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	N/A – No influent flow meter	INFLUENT: 24-hour time composite samples shall be collected from the raw wastewater wetwell.
002	0.042 MGD (2025)	EFFLUENT: 24-hour flow proportional composite samples shall be collected adjacent to the effluent structure in the aeration steps. Grab samples shall be collected after the Parshall flume. Flow is monitored by an ultrasonic level transmitter fixed above the Parshall flume.
004	1 dry U.S Ton (2025 Permit Application)	Aerobically digested, Class B liquid sludge. Representative sludge samples shall be collected from the sludge storage tank.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
BOD5, Total		mg/L	3/Week	24-Hr Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Comp	

Changes from Previous Permit:

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

Explanation of Limits and Monitoring Requirements

Monitoring of influent flow, BOD5 and total suspended solids is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code, and in the Standard Requirements section of the permit.

2 Surface Water - Monitoring and Limitations

2.1 Sample Point Number: 002- 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	30 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	20 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	20 mg/L	3/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	
Dissolved Oxygen	Daily Min	4.0 mg/L	5/Week	Grab	
Nitrogen, Ammonia (NH3-N) Total	Daily Max	19 mg/L	2/Week	24-Hr Flow Prop Comp	Monitoring year round. Limit effective June - September.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	19 mg/L	2/Week	24-Hr Flow Prop Comp	Monitoring year round. Limit effective June - September.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	9.6 mg/L	2/Week	24-Hr Flow Prop Comp	Monitoring year round. Limit effective June - September.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit section below. Enter the result in the DMR on the last day of the month.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring only in 2030

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Total		mg/L	Weekly	24-Hr Flow Prop Comp	Monitoring only
Arsenic, Total Recoverable		ug/L	Once	Grab	Monitor only once in 2028 with a LOD of 8 µg/L or less.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring section. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.

Changes from Previous Permit

Effluent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

- **pH and Dissolved Oxygen-** Sample frequency updated.
- **Nitrogen, Ammonia –** Daily Max, Weekly Average, and Monthly Average limits added.
- **Disinfection & E. coli -** At the end of the compliance schedule, Disinfection requirements and E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 410 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply. Monitoring is not required until the limit becomes effective and the end of the compliance schedule.
- **Phosphorus, Chloride, Arsenic –** Monitoring added.

Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo dated 6/26/2026.

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

permit term. pH and Dissolved Oxygen's monitoring frequencies have been updated to align with the minimum sample frequency as stated by guidance. The minimum has been selected for this permit term given the previous permit was below this standard. Monitoring frequencies are evaluated at every permit reissuance and could be changed in future permits.

Expression of Limits- In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average whenever practicable. Minor changes have been made to Ammonia. Ammonia limits were determined by calculated P_{99} values for ammonia year-round from the facility and comparing those to the calculated limits.

Disinfection & E. coli: Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020.

Section NR 102.04(5)(a), Wis. Adm. Code, states that all surface waters shall be suitable for recreational use and meet the E. coli criteria established to protect this use. Section NR 102.04(5)(b), Wis. Adm. Code, states that exceptions to the disinfection requirement can be made if the department determines, in accordance with the procedures specified in s. NR 210.06(3), Wis. Adm. Code, that disinfection is not required to meet water quality criteria. As part of the reissuance process, the requirements for disinfection were reviewed under s. NR 210.06(3), Wis. Adm. Code.

It was determined that the permittee is required to disinfect, during the following months May – September. See WQBEL for further explanation.

Phosphorus - Water Quality Based Effluent Limits for phosphorus are not being considered at this time due to the lack of channelized flow to Mud Lake. A Total Max Daily Load is currently being developed for the Fox (IL) River Basin. TMDL will address phosphorus water quality impairments within the basin and provide waste load allocations (WLA) required to meet water quality standards. This TMDL will likely result in phosphorus limitations that must be included in WPDES permits. Phosphorus monitoring is required at this time in preparation for these future TMDL limits.

Chloride – Monitoring monthly in the year 2030 is required to ensure 11 samples are available at the next permit reissuance.

Arsenic - One sample with a limit of detection (LOD) of 8 µg/L or less is required as sampling for the 2026 permit application was a non-detect at the LOD level of 20 µg/L, which is higher than 1/5th of the calculated limit of 8 µg/L.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
004	B	Liquid	N/A – Does Not Land Apply	N/A – Does Not Land Apply	Hauled to Another Facility	1 dry U.S Ton
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? **Yes** If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
Is a priority pollutant scan required? **No, flow < 5 MGD** 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.						

3.1 Sample Point Number: 004- Digester Hauled Sludge

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Grab	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Grab	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Grab	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Grab	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Grab	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Grab	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Grab	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Grab	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Grab	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Grab	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Grab	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Grab	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Grab	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Grab	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Grab	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Grab	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Grab	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Grab	
Nitrogen, Total Kjeldahl		Percent	Annual	Grab	Monitoring required only if land application occurs under this permit.
Nitrogen, Ammonium		Percent	Annual	Grab	Monitoring required only if

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
(NH4-N) Total					land application occurs under this permit.
Phosphorus, Total		Percent	Annual	Grab	Monitoring required only if land application occurs under this permit.
Phosphorus, Water Extractable		% of Tot P	Annual	Grab	Monitoring required only if land application occurs under this permit.
Potassium, Total Recoverable		Percent	Annual	Grab	Monitoring required only if land application occurs under this permit.
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Grab	Once in 2028
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Grab	Once in 2028
Radium 226 Dry Wt		pCi/g	Annual	Grab	
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

Sludge limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

PFAS –Monitoring is required annually pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code.

Explanation of Limits and Monitoring Requirements

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

PFAS- The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of

2025. The department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" should be followed

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

4 Schedules

4.1 Disinfection and Effluent Limitations for E. coli

Required Action	Due Date
Progress Report: The permittee shall submit a progress report on development and submittal of a facility plan for upgrades to meet disinfection requirements and E. coli limits.	09/30/2027
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code for meeting disinfection requirements and complying with E. coli surface water limitations. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	04/30/2028
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to meet disinfection requirements per s. NR 210.06(1), Wis. Adm Code, achieve compliance with final E. coli limitations, and a schedule for completing construction of the upgrades by the complete construction date specified below.	03/31/2029
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	09/30/2029
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2030
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	03/31/2031
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	04/30/2031

Explanation of Schedule

A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and install disinfection treatment for meeting effluent E. coli water quality-based effluent limits and disinfection requirements pursuant s. NR 210.06, Wis. Adm. Code.

Attachments

Water Quality Based Effluent Limits dated 06/26/2026

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance

Prepared By: Marissa Fleege Wastewater Specialist **Date:** 10/13/2026

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 06/26/2026

TO: Marissa Fleege – SER

FROM: Nicole Krueger – SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for MHC Rainbow Lake, LLC
WPDES Permit No. WI-0030481-11

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 MHC Rainbow Lake, LLC in Kenosha County. This wastewater treatment facility (WWTF) discharges to a diffuse wetland draining to Mud Lake, located in the Dutch Gap Canal Watershed in the Des Plaines River Basin.

The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 002:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,2
BOD_5			30 mg/L	20 mg/L	1
TSS			30 mg/L	20 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Dissolved Oxygen		4.0 mg/L			1
Ammonia Nitrogen June – September	19 mg/L		**19 mg/L**	9.6 mg/L	3,4,5
Bacteria					6
Final Limit *E. coli*				126 #/100 mL geometric mean	
Chloride					7
Phosphorus					2
Arsenic					8
TKN, Nitrite+Nitrate, and Total Nitrogen					9

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Monitoring only for ammonia is recommended October – May.
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. MHC Rainbow Lake shall notify the Department if the single limit or the variable limits based on effluent pH are preferred. These limits apply year-round. The weekly average limit shall be 24 mg/L in this case.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \leq pH \leq 6.1$	83	$7.0 < pH \leq 7.1$	51	$8.0 < pH \leq 8.1$	11
$6.1 < pH \leq 6.2$	82	$7.1 < pH \leq 7.2$	46	$8.1 < pH \leq 8.2$	8.8

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Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.2 < pH ≤ 6.3	80	7.2 < pH ≤ 7.3	40	8.2 < pH ≤ 8.3	7.3
6.3 < pH ≤ 6.4	78	7.3 < pH ≤ 7.4	35	8.3 < pH ≤ 8.4	6.0
6.4 < pH ≤ 6.5	75	7.4 < pH ≤ 7.5	31	8.4 < pH ≤ 8.5	5.0
6.5 < pH ≤ 6.6	72	7.5 < pH ≤ 7.6	26	8.5 < pH ≤ 8.6	4.1
6.6 < pH ≤ 6.7	69	7.6 < pH ≤ 7.7	22	8.6 < pH ≤ 8.7	3.4
6.7 < pH ≤ 6.8	65	7.7 < pH ≤ 7.8	19	8.7 < pH ≤ 8.8	2.8
6.8 < pH ≤ 6.9	60	7.8 < pH ≤ 7.9	16	8.8 < pH ≤ 8.9	2.4
6.9 < pH ≤ 7.0	56	7.9 < pH ≤ 8.0	13	8.9 < pH ≤ 9.0	2.0

5. 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.
6. Bacteria limits apply during the disinfection season of May through September. A compliance schedule to meet the limits is recommended in the reissued permit. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
7. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.
8. Monitoring once with an LOD more stringent than 8 µg/L unless MHC Rainbow Lake resamples with a sensitive enough LOD prior to permit reissuance.
9. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Sections 283.37(5) and 283.55(1)(e), Wis. Stats, and ss. NR 200.065(1)(g) and NR 200.065(1)(h), Wis. Adm. Codes, provide the authority to request this monitoring during the permit term. Total Nitrogen is the sum of nitrite (NO_2), nitrate (NO_3), and total Kjeldahl nitrogen (TKN) (all expressed as N).

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

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

Attachments (2) – Narrative & Outfall Map

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Nick Lent, Wastewater Engineer – SER
Diane Figiel, Water Resources Engineer – WY/3
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
MHC Rainbow Lake, LLC

WPDES Permit No. WI-0030481-11

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

MHC Rainbow Lake LLC is a privately-owned domestic wastewater treatment facility (WWTF) which serves residents of approximately 300 manufactured homes in the Town of Bristol. Incoming wastewater flows through a grinder and is then pumped to the WWTF. Current treatment processes include fine bubble aeration of activated sludge, final clarification and cascade aeration prior to discharge of final effluent south of the WWTF. Waste activated sludge is treated in an aerobic digester and then stored in a second tank prior to removal by a licensed and permitted contract hauler.

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

Existing Permit Limitations

The current permit, expiring on March 31, 2026, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
BOD_5			30 mg/L	20 mg/L	2,3
TSS			30 mg/L	20 mg/L	2,3
pH	9.0 s.u.	6.0 s.u.			2
Dissolved Oxygen		4.0 mg/L			2,3
Ammonia Nitrogen					1
TKN, Nitrite+Nitrate, and Total Nitrogen					1

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. These limits are based on the Limited Aquatic Life (LAL) community of the immediate receiving water as described in s. NR 104.02(3)(b), Wis. Adm. Code.

Receiving Water Information

- Name: Diffuse wetland that diffuses to Mud Lake
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Limited aquatic life (LAL) "from Mobile Home STP to Mud Lake" (the facility's former name is Paramski Mobile Home Park which is specified in ch. NR 104, Wis. Adm. Code). The discharge diffuses through portions of

the wetland and historically was not considered to flow into Mud Lake. Department staff were unable to locate a channelized flow in 2000 and aerial images since then also do not show channelized flow to Mud Lake. However, downstream protection is being considered for ammonia, phosphorus and TSS. Allocations for phosphorus and TSS are being developed in the Fox (IL) TMDL because of the possibility that effluent reaches Mud Lake.

- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: Because the discharge diffuses to a wetland, the 7-Q_{10} and 7-Q_2 flow rates are zero.
  7-Q_{10} = 0 cubic feet per second (cfs)
  7-Q_2 = 0 cfs
- Hardness = 237 mg/L as $CaCO_3$. Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: Not applicable where the receiving water low flows are zero.
- Source of background concentration data: Background concentrations are not included because they do not impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: None.
- Impaired water status: The immediate receiving water is not 303(d) listed as impaired.

Effluent Information

- Design flow rate(s):
  Annual average = 0.035 million gallons per day (MGD)
  For reference, the actual average flow from 04/01/2021 – 02/28/2026 was 0.051 MGD.
- Hardness = 237 mg/L as $CaCO_3$. This value represents the geometric mean of four samples collected in October 2024 which were reported on the permit application.
- 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).
- Wastewater source: Domestic wastewater, no industrial contributors.
- Water supply: Private wells.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2, 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.

Copper Effluent Data

Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)
10/11/2024	<4	10/25/2024	<4	11/08/2024	<4
10/14/2024	<4	10/28/2024	<4	11/11/2024	<4
10/17/2024	<4	10/31/2024	<4	11/14/2024	<8
10/22/2024	<4	11/05/2024	<4		
Average = 0 µg/L					

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

Attachment #1

Chloride Effluent Data

Sample Date	Chloride mg/L
10/11/2024	73.2
10/14/2024	65.7
10/17/2024	60.2
10/22/2024	49.9
Average	62.3

The following table presents the average concentrations and loadings at Outfall 002 from 04/01/2021 – 02/28/2026 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameters with Effluent Limits

	Average Measurement
BOD_5	5.8 mg/L*
TSS	4.2 mg/L*
pH field	7.4 s.u.
Dissolved Oxygen	7.5 mg/L

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

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

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

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

Acute Limits based on 1-Q_{10}

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q_{10} receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

$$\text{Limitation} = \frac{(WQC)\,(Qs + (1-f)\,Qe) - (Qs - f\,Qe)\,(Cs)}{Qe}$$

Where:

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

Qs = average minimum 1-day flow which occurs once in 10 years (1-day Q_{10})

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

Qe = 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

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

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is the case for MHC Rainbow Lake.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT*	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day MAX. CONC.
Arsenic		340	340	68.0	<20	
Cadmium	237	77.7	77.7	15.5	<2	
Chromium	237	3655	3655	731	<3	
Copper	237	35.0	35.0	7.0	<4	
Lead	237	246	246	49.2	<20	
Nickel	237	974	974	195	4	
Zinc	237	256	256	51.2	50	
Chloride (mg/L)		757	757	151	62.3	73.2

* Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q_{10} flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic		152	152	30.4	<20
Cadmium	175	3.82	3.82	0.76	<2
Chromium	237	268	268	53.6	<3
Copper	237	21.7	21.7	4.33	<4
Lead	237	64.5	64.5	12.9	<20
Nickel	237	152	152	30.5	4
Zinc	237	256	256	51.2	50
Chloride (mg/L)		395	395	79.0	62.3

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

Monthly Average Limits based on Wildlife Criteria (WC)

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

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	880	880	176	<2
Chromium (+3)	8400000	8400000	1680000	<3
Lead	2240	2240	448	<20
Nickel	110000	110000	22000	4

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	40	40	8.0	<20

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 not required for parameters in this toxics section. Monitoring recommendations are made in the paragraphs below:

Arsenic – Considering available effluent data from the permit application and a resample in May 2026, the effluent concentration was nondetectable at <20 µg/L using the EPA 200.7 analytical method. The limit of detection of this analytical method is higher than 1/5th of the calculated limit (8.0 µg/L, based on HCC) so reasonable potential cannot be determined. All available arsenic data is summarized below:

Effluent Arsenic Data

Sample Date	Arsenic µg/L
06/17/2013	<1.0
11/18/2019	<10
10/11/2024	<20
05/18/2026	<20

The LODs for the arsenic sampling from the most recent two permit applications were not sensitive enough to determine reasonable potential. **A more sensitive approved analytical method is recommended for arsenic monitoring such that the limit of detection is less than or equal to 8.0 µg/L to better determine the need for arsenic limits per s. NR 200.027(1), Wis. Adm. Code.** One sample is recommended in the reissued permit unless the permittee resamples with a sensitive enough LOD prior to permit reissuance.

Chloride – Considering available effluent data from the permit term, the average chloride concentration is 62.3 mg/L which is below 1/5th of the most stringent calculated limit of 79 mg/L.

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

Mercury – The permit application did not require monitoring for mercury because MHC Rainbow Lake is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 12/07/2021 – 03/31/2025 was 0.38 mg/kg, with a maximum reported concentration of 1.88 mg/kg. Therefore, **no mercury monitoring is recommended at Outfall 002.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Available monitoring sample data from Rainbow Lake Manor MHP (PWS ID: 23001660) is provided in the table below:

Water Supply PFAS Data

Sample Date	Sample ID	Well #	PFOS (ng/L)	PFOA (ng/L)
06/25/2023	CB07098-03	HU154	ND	ND
09/12/2023	CB11122-03	HU154	ND	ND
		Average =	0	0

The limited data above shows the municipal water supply is below 1/5th of the applicable PFOS and PFOA criteria.

Based on the type of discharge, the lack of indirect dischargers contributing to the collection system and known levels of PFOS/PFOA in the source water, **PFOS and PFOA monitoring is not recommended.** The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

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

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic

toxicity to aquatic life. Given the fact that MHC Rainbow Lake does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time.

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

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

Where:

A = 0.633 and B = 90.0 for Limited Aquatic Life, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 768 sample results were reported from 04/06/2021 – 02/25/2026. The maximum reported value was 8.0 s.u. (Standard pH Units). The effluent pH was 7.8 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.8 s.u. The mean plus the standard deviation multiplied by a factor of 2.326, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.8 s.u. Therefore, a value of 7.8 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 7.8 s.u. into the equation above yields an ATC = 19 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method
In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the the 1-Q_{10} receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

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

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	19
1-Q_{10}	37

The 2×ATC method yields the most stringent limits for MHC Rainbow Lake.

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

Daily Maximum Ammonia Nitrogen Limits – LAL

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	83	7.0 < pH ≤ 7.1	51	8.0 < pH ≤ 8.1	11
6.1 < pH ≤ 6.2	82	7.1 < pH ≤ 7.2	46	8.1 < pH ≤ 8.2	8.8

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Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.2 < pH \leq 6.3$	80	$7.2 < pH \leq 7.3$	40	$8.2 < pH \leq 8.3$	7.3
$6.3 < pH \leq 6.4$	78	$7.3 < pH \leq 7.4$	35	$8.3 < pH \leq 8.4$	6.0
$6.4 < pH \leq 6.5$	75	$7.4 < pH \leq 7.5$	31	$8.4 < pH \leq 8.5$	5.0
$6.5 < pH \leq 6.6$	72	$7.5 < pH \leq 7.6$	26	$8.5 < pH \leq 8.6$	4.1
$6.6 < pH \leq 6.7$	69	$7.6 < pH \leq 7.7$	22	$8.6 < pH \leq 8.7$	3.4
$6.7 < pH \leq 6.8$	65	$7.7 < pH \leq 7.8$	19	$8.7 < pH \leq 8.8$	2.8
$6.8 < pH \leq 6.9$	60	$7.8 < pH \leq 7.9$	16	$8.8 < pH \leq 8.9$	2.4
$6.9 < pH \leq 7.0$	56	$7.9 < pH \leq 8.0$	13	$8.9 < pH \leq 9.0$	2.0

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)
Weekly and monthly average limits based on chronic toxicity criteria for ammonia are also calculated to determine the weekly and monthly average limits to meet the requirements of s. NR 106.07(3), Wis. Adm. Code.

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

Wetland
The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as Limited Aquatic Life is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

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

Where:

pH = the pH (s.u.) of the receiving water,
E = 1.0,
$C = 8.09 \times 10^{(0.028 \times (25 - T))}$
T = the temperature of the receiving (ºC)

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

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

Where:

pH = the pH (s.u.) of the receiving water,
E = 0.854,
C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or
$C = 1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and
T = the temperature (ºC) of the receiving water – (Early Life Stages Present), or
T = the maximum of the actual temperature (ºC) and 7 - (Early Life Stages Absent)

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q_3, if available) to derive weekly average limitations. And the

30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 ºC, 25% of the flow is used if the Temperature < 11 ºC, and 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

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

Weekly and Monthly Ammonia Nitrogen Limits – LAL

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	0.035	0.035	0.035
Background Information	7-Q_{10} (cfs)	0	0	0
	7-Q_2 (cfs)	0	0	0
	Ammonia (mg/L)	0.09	0.07	0.17
	Average Temperature (°C)	12	19	4
	Maximum Temperature (°C)	14	21	10
	pH (s.u.)	8.06	8.08	7.99
	% of Flow used	50	100	25
	Reference Weekly Flow (cfs)	0	0	0
	Reference Monthly Flow (cfs)	0	0	0
Criteria mg/L	4-day Chronic	37	24	54
	30-day Chronic	15	9.6	22
Effluent Limits mg/L	Weekly Average	37	24	54
	Monthly Average	15	9.6	22

Limits that are protective of Mud Lake are shown in the table below.

Weekly and Monthly Ammonia Nitrogen Limits – Mud Lake

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	0.035	0.035	0.035
Background Information	Ammonia (mg/L)	0.09	0.07	0.17
	Average Temperature (°C)	12	19	4
	Maximum Temperature (°C)	14	21	10
	pH (s.u.)	8.06	8.08	7.99
	Dilution factor	10	10	10
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	5.57	3.66	
	Early Life Stages Absent			8.26
	30-day Chronic			
	Early Life Stages Present	2.23	1.46	
	Early Life Stages Absent			3.30
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	60	40	
	Early Life Stages Absent			89
	Monthly Average			
	Early Life Stages Present	24	15	

Attachment #1

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
	Early Life Stages Absent			35

The calculated limits for the immediate receiving water are more stringent than the limits for Mud Lake, so ammonia decay for downstream protection is not evaluated in this memo.

Effluent Data
The following table evaluates the statistics based upon ammonia data reported from 04/01/2021 – 01/01/2026.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	April – May**	June - September	October - March
1-day P_{99}		45.5	4.86
4-day P_{99}		25.2	2.82
30-day P_{99}		11.5	1.21
Mean*	1.85	5.95	0.53
Std	5.36	10.1	1.19
Sample size	10	22	29
Range	0.06 – 17.1	0.03 – 29.1	<0.01 – 5.41

*Values lower than the limit of detection were substituted with a zero
**Less than 11 samples are available from the current permit term for April – May, so P_{99}'s could not be calculated

Reasonable Potential
The need to include ammonia limits in MHC Rainbow Lake's permit is determined by calculating 99th upper percentile (or P_{99}) values for ammonia year-round and comparing those to the calculated limits.

Based on this comparison, daily maximum, weekly average, and monthly average limits are required in June – September.

Expression of Limits
Revisions to ch. NR 106, Wis. Adm. Code, in September 2016 aligned Wisconsin's WQBELs with 40 CFR § 122.45(d), which specifies that effluent limits for continuous dischargers must be expressed as weekly and monthly averages for publicly owned treatment works and as daily maximums and monthly averages for all other dischargers, unless shown to be impracticable.

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

In this case, the single daily maximum limit of 19 mg/L is more stringent than the calculated weekly average limit of 24 mg/L for June – September. Therefore, the weekly average limit shall be set equal to the daily maximum limit of 19 mg/L.

If MHC Rainbow Lake decides to have the variable ammonia limits instead of the single daily maximum limit, the weekly average limit may be set equal to the calculated weekly average limit of 24 mg/L because it is more stringent than the least stringent variable daily maximum limit.

Conclusions and Recommendations

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

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
June – September	19	**19**	9.6

Or, if MHC Rainbow Lake requests to have variable daily maximum limits, the recommended limits are shown below.

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
June – September	Variable	24	9.6

Monitoring only is recommended October – May.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

Section NR 102.04(5), Wis. Adm. Code, states that all surface waters shall be suitable for supporting recreational use and shall meet E. coli criteria during the recreation season. Section NR 102.04(5)(b), Wis. Adm. Code, allows the Department to make exceptions when it determines, in accordance with s. NR 210.06(3), Wis. Adm. Code, that wastewater disinfection is not required to meet E. coli limits and protect the recreational use. Section NR 210.06(3), Wis. Adm. Code, tasks the Department with determining the need for disinfection using a site-specific analysis based on potential risk to human or animal health. It sets out the factors that must be considered in determining the necessity to disinfect municipal wastewater or to change the length of the disinfection season.

MHC Rainbow Lake had previously been exempted from disinfection based on the limited aquatic life/wetland classification of the receiving water. Section NR 210.06(3)(g), Wis. Adm. Code, states that disinfection decisions may be made based on the hydrologic classifications listed in s. NR 104.02(1), Wis. Adm. Code (not on the water quality classifications - i.e., limited forage fish, limited aquatic life - that are defined in s. NR 104.02(3), Wis. Adm. Code). Wetlands are surface waters of the state, are therefore designated as recreational use and disinfection should not be exempted based solely on this hydrological classification.

The Department has considered the information required by s. NR 210.06(3), Wis. Adm. Code, and has determined that the discharge cannot meet bacteria limits without disinfection. 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.

These limits are required during May through September.

Total Residual Chlorine – **If MHC Rainbow Lake decides to upgrade to use chlorination for disinfection, effluent limitations would be 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 19 µg/L would be required if MHC Rainbow Lake decides to use chlorination for disinfection.** Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required. The calculated **weekly average effluent limitation of 7.3 µg/L would also be included in the permit because it is more restrictive than the daily maximum limit.**

Sections NR 106.07(3) and NR 205.067(7), Wis. Adm. Code require WPDES permits contain weekly average and monthly average limitations for municipal dischargers whenever practicable and necessary to protect water quality. **Therefore, a weekly average and monthly average limit of 7.3 µg/L would also be required** to meet expression of limits requirements in addition to the daily max limit.

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 MHC Rainbow Lake does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04(1)(a)1, Wis. Adm. Code, and therefore no technology-based limit is required.

Annual Average Mass Total Phosphorus Loading

Month	Average Result mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
October 2024	5.93	0.858	42
November 2024	3.62	0.998	30
		Average	36

Total P (lbs/month) = Monthly average (mg/L) × total flow (MG/month) × 8.34 (lbs/gallon)
Where total flow is the sum of the actual flow (MGD) for that month

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

Water Quality-Based Effluent Limits (WQBEL)

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

Phosphorus criteria in s. NR 102.06, Wis. Adm. Code, do not apply to limited aquatic life waters as described in s. NR 102.06(6)(d), Wis. Adm. Code. These waters were not included in the USGS/WDNR stream and river studies and, therefore, the Department lacked the technical basis to determine and propose applicable criteria. At some time in the future, the Department may adopt phosphorus criteria based on new studies focusing on limited aquatic life waters. *The Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges (2020)* suggests that during the interim, WQBELs should be based on the criteria and flow conditions for the next stream segment downstream (or downstream lake or reservoir, if appropriate), because ss. 217.12 and 217.13, Wis. Adm. Code, state that the Department must set WQBELs to protect downstream waters. The discharge location of the wastewater from MHC Rainbow Lake is classified as limited aquatic life. Downstream protection for s. 217.13, Wis. Adm. Code, WQBELs are not considered at this time due to the lack of channelized flow to Mud Lake.

A TMDL is being developed at this time, so monitoring is recommended in the reissued permit.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 10/11/2024 – 12/04/2024 from the permit reissuance application.

Total Phosphorus Effluent Data

Sample Date	mg/L	Sample Date	mg/L	Sample Date	mg/L
10/11/2024	6.88	10/25/2024	5.55	11/08/2024	4.71
10/14/2024	6.0	10/28/2024	4.99	11/11/2024	4.47
10/17/2024	5.54	10/31/2024	6.09	11/14/2024	<0.34
10/22/2024	6.45	11/05/2024	5.50	12/04/2024	3.42
1-day P_{99} = 8.1 mg/L					
4-day P_{99} = 7.4 mg/L					
30-day P_{99} = 5.8 mg/L					

TMDL Under Development

A Total Maximum Daily Load (TMDL) is being developed for the Fox Illinois River Basin for phosphorus. The TMDL will address phosphorus water quality impairments within the basins and provide waste load allocations (WLA) required to meet water quality standards. This TMDL will likely result in phosphorus and TSS limitations that must be included in WPDES permits, which may be different than those calculated in this WQBEL memo. TMDL-derived phosphorus limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code.

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 Chapters NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. The daily maximum effluent temperature limitation shall be 86 °F for discharges to surface waters classified as Limited Aquatic Life according to s. NR 104.02(3)(b)1, Wis. Adm. Code, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 and described in s. NR 106.55(2), Wis. Adm. Code, which has a daily maximum effluent temperature limitation of 120 ºF. The 120° F limit applies because the hydrologic classification is listed as wetland in ch. NR 104, Wis. Adm. Code.

Reasonable Potential
Based on the available discharge temperature data from 05/01/2013 – 11/12/2019 shown below, the maximum daily effluent temperature reported was 88 °F; therefore, no reasonable potential for exceeding the daily maximum limit exists, and **no limits or monitoring are recommended**.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	46	50	-	120
FEB	46	47	-	120
MAR	47	53	-	120
APR	53	56	-	120
MAY	82	83	-	120
JUN	85	88	-	120
JUL	72	88	-	120
AUG	73	74	-	120
SEP	75	83	-	120
OCT	68	69	-	120
NOV	60	61	-	120
DEC	55	55	-	120

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

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

judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document* (2022).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.
- Chronic testing is usually not recommended where the distance between the outfall and the point where the receiving water becomes a non-variance waterbody (i.e., one that supports a cold water, warm water sport fish, or warm water forage fish community) is greater than four miles. For MHC Rainbow Lake, it is not expected that the discharge reaches a non-variance water downstream because it infiltrates before reaching Mud Lake. Therefore, there is believed to be little potential for chronic toxicity effects in Mud Lake associated with the discharge from MHC Rainbow Lake, so the need for chronic WET testing was not considered further.
- 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.

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
AMZ/IWC	Not Applicable. **0 Points**
Historical Data	0 tests used to calculate RP. **5 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**
Receiving Water Classification	LAL **0 Points**
Chemical-Specific Data	Reasonable potential for limits for ammonia based on ATC; Nickel, zinc, and chloride

	Acute
	detected. Additional Compounds of Concern: None. **0 Points**
Additives	Zero additives used. **0 Points**
Discharge Category	0 Industrial Contributors. **0 Points**
Wastewater Treatment	Secondary or Better **0 Points**
Downstream Impacts	No impacts known **0 Points**
Total Checklist Points:	**13 Points**
Recommended Monitoring Frequency (from Checklist):	None
Limit Required?	No
TRE Recommended? (from Checklist)	No

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

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

MHC Rainbow Lake Outfall Location



Legend:
- Surface Water Outfalls
- Rivers and Streams
- Intermittent Streams
- Open Water
- Rivers and Streams
- Intermittent Streams
- Open Water
- 24K Intermittent Streams
- 24K Lakes and Open Water
- 24K Streams and Rivers
- Latest Leaf Off Index
- Latest Leaf Off Imagery

Notes:
Not to scale



Map projection: NAD 1983 HARN Wisconsin TM

N

Map: 0 750 1,500 Feet
0 225 450 Meters

Service Layer Credits:
DNR Basic Feature VTL (WTM): Wisconsin Department of Natural Resources, GIS Section. Latest Leaf Off: , Output & Determinations*: WI DNR Bureau of Watershed Management, Surface Water: WIDNR, USGS, and other data

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Date Printed: 3/27/2026 3:11 PM