Permit Fact Sheet

General Information

Permit Number:	WI-0028011-10-0	
Permittee Name:	VILLAGE OF NORTH FREEDOM	
Address:	P O Box 300 103 North Maple Street	
City/State/Zip:	North Freedom WI 53951	
Discharge Location:	West bank of the Baraboo River (SW ¼ of SW ¼, Section 1, T11N R5E)	
Receiving Water:	Baraboo River (Narrows Creek/Baraboo River Watershed, LW22 – Lower Wisconsin River Basin) in Sauk County	
StreamFlow ($Q_{7,10}$):	84 cfs	
Stream Classification:	Warm Water Sport Fish (WWSF), non-public water supply	
Discharge Type:	Existing, Continuous	
Design Flow(s)	Annual Average	0.07 MGD
Significant Industrial Loading?	None	
Operator at Proper Grade?	Yes. Facility is Basic with subclasses A4 – Ponds, Lagoons and Natural Systems, SS – Sanitary Sewage Collection System.	
Approved Pretreatment Program?	N/A	

Facility Description

The Village of North Freedom operates a wastewater treatment plant that serves a population of about 600 and is a combination of commercial and domestic wastewater. Treatment consists of a two-pond stabilization treatment system. Wastewater is pumped from the main lift station to Pond #1. Wastewater flows by gravity from Pond #1 to Pond #2 and then to the effluent flow metering and sampling building prior to discharge to the Baraboo River. Ferric chloride is added before Pond #2 for phosphorus removal. Sulfuric acid can be added as necessary to adjust pH. In 2022, a new building was constructed for the chemical treatment system which houses the chemical pumps, controls, and chemical storage tanks for the ferric chloride and sulfuric acid. The facility is designed to treat an annual average flow of 70,000 gallons per day and currently receives an average of 58,000 gallons per day.

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, and a site visit on June 28, 2023, this facility has been found to be in substantial compliance with their current permit.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	0.058 MGD (2023 Average)	Influent: Representative grab samples shall be collected from the wet well at the main lift station. Flow is metered using a calibrated pump method and located at the main lift station.
001	0.04 MGD (Average December 2018 – March 2024)	Effluent: 24-hr flow proportional composite samples and grab samples shall be collected from the effluent channel prior to the Parshall flume. Flow is monitored by a Parshall flume with an ultrasonic sensor and is located after Pond 2 in the effluent building.
002	Sludge removed spring 2011	Liquid, Class B. Representative lagoon sludge composite sample collected from Pond 1 and Pond 2.

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	Measure	Flow is measured by pump run time
BOD5, Total		mg/L	Weekly	Grab	
Suspended Solids, Total		mg/L	Weekly	Grab	

Changes from Previous Permit:

Flow: The sample type was changed to 'Measure' to better represent operations.

BOD_5 and Total Suspended Solids: The sample frequency has increased to align with effluent monitoring.

Explanation of Limits and Monitoring Requirements

BOD_5 and Total Suspended Solids: Tracking of BOD_5 and Suspended Solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and in the standard requirements section of the permit.

2 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	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
BOD5, Total	Weekly Avg	45 mg/L	Weekly	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	30 mg/L	Weekly	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	60 mg/L	2/Week	24-Hr Flow Prop Comp	This is an interim limit. See Total Suspended Solids Effluent Limits & Facility Modifications schedule.
Suspended Solids, Total	Weekly Avg	45 mg/L	2/Week	24-Hr Flow Prop Comp	Final limit effective April 30, 2029. See Total Suspended Solids Effluent Limits & Facility Modifications schedule.
Suspended Solids, Total	Monthly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	Final limit effective April 30, 2029. See Total Suspended Solids Effluent Limits & Facility Modifications schedule.
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
Nitrogen, Ammonia Variable Limit		mg/L	2/Week	See Table	Look up the variable ammonia limit from the 'Variable Ammonia Limitation' table and report the variable limit in the Ammonia Variable Limit column on the eDMR.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	2/Week	24-Hr Flow Prop Comp	Report the daily maximum Ammonia result in the Nitrogen, Ammonia (NH3-N) Total column of the eDMR. See Ammonia Limitation Section.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	108 mg/L	2/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	108 mg/L	2/Week	24-Hr Flow Prop Comp	
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective May through September.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective May through September. 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	4.5 mg/L	Weekly	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	0.41 lbs/day	Weekly	Calculated	See TMDL section.
Phosphorus, Total		lbs/month	Monthly	Calculated	Calculate the Total Monthly Discharge of phosphorus and report on the last day of the month on the DMR. See TMDL section.
Phosphorus, Total		lbs/yr	Monthly	Calculated	Calculate the 12-month rolling sum of total monthly mass of phosphorus discharged and report on the last day of the month on the DMR. See TMDL section.
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.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See Whole Effluent Toxicity (WET) Testing section.

Changes from Previous Permit

Sample Type: The facility installed a 24-hour flow proportional composite sampler in 2023.

Flow: The sample frequency has changed to 'Daily' for eDMR reporting purposes.

BOD_5, Total Suspended Solids, pH and Ammonia: The sample frequency for these parameters has increased.

Total Suspended Solids: The permit includes a 45 mg/l weekly average limit and 30 mg/l monthly average limit. These limits become effective in accordance with the compliance schedule.

E. coli: E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 400 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month are effective upon permit reissuance during the month of May - September.

Total Nitrogen Monitoring (TKN, N02+N03 and Total N): Annual monitoring in rotating quarters throughout the permit term was added to the proposed permit.

Acute WET: Three acute whole effluent toxicity tests are included in the permit.

Explanation of Limits and Monitoring Requirements

Please refer to the Water Quality Based Effluent Limits Memo for the North Freedom Wastewater Treatment Facility dated July 10, 2024, and the Addendum dated November 11, 2024, prepared by Zainah Masri and used for this reissuance.

BOD_5 and pH: No changes are recommended in the categorical permit limitations for BOD_5 and pH because the water quality criteria, 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.

Total Suspended Solids (TSS): The permittee is no longer eligible for the TSS variance limit based on s. NR 210.07(2), Wis. Adm. Code, where aerated lagoons and stabilization ponds are the principal treatment process, as chemical addition is now used for phosphorus removal. The sample frequency has increased to characterize effluent quality and variability of the discharge.

Ammonia: 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 water quality based effluent limitations (WQBELs) for ammonia.

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.

A compliance schedule to install disinfection to meet the bacteria limits is not included pursuant s. NR 106.117(3)(a), Wis. Adm. Code because the facility provided calculations suggesting that the lagoon has a 180-day detention time under most conditions and no additional disinfection is necessary to comply with bacteria criteria. However, since the data provided does not show that the 180-day detention time can be met under all discharge conditions, E. coli monitoring and limits are included in the permit in order to show that the water quality criteria are indeed being met. See WQBEL and addendum for further explanation.

Phosphorus: Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. WQBELs for phosphorus are needed whenever the discharge contains phosphorus at concentrations or loadings that will cause or contribute to an exceedance of the water quality standards.

Wisconsin River Total Maximum Daily Load (TMDL): The permitted facility is included within the Wisconsin River Basin Total Maximum Daily Load (TMDL), which was approved by EPA April 26, 2019. The TMDL establishes Waste Load Allocations (WLAs) for point source dischargers and determines the maximum amounts of phosphorus that can be discharged and still protect water quality. The final effluent limits and monitoring expressed in the permit were derived from Site-Specific Criteria (SSC) for Lakes Petenwell, Castle Rock, and Wisconsin originally included in Appendix K of the TMDL report and approved by the U.S. Environmental Protection Agency on July 9, 2020. The permittee's approved SSC-based limits are consistent with the assumptions and requirements of the EPA-approved WLA in the TMDL, which is 78 lbs/yr for the permitted facility.

The approved TMDL expresses WLAs as lbs/year and lbs/day (maximum annual load divided by 365 days). As outlined in Section 4.6 of the department's *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Program*, mass limits must be given in the permit that are consistent with the TMDL WLA and the phosphorus impracticability agreement that was approved by USEPA in 2012 (see NPDES MOA Addendum dated July 12, 2012 at https://prodoasint.dnr.wi.gov/swims/downloadDocument.do?id=167886175). Continuously discharging facilities covered by the WRB TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits (averaging period of May through October and November through April) are also included. The equivalent effluent concentration of 0.367 mg/L was calculated for the facility, thus, TMDL based mass limits are expressed as a monthly average.

Facilities with WRB TMDL based effluent limits for phosphorus must report the 12-month rolling sum of total monthly discharge (lbs/yr). If reported 12-month rolling sums exceed the facility's max annual WLA, the facility's mass limits (monthly average and six-month average) may be recalculated using more appropriate CVs or monitoring frequencies when the permit is reissued to bring discharge levels into compliance with the facility's given WLA.

Total Nitrogen Monitoring (NO2+NO3, TKN and Total N): The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under §§ 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, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. 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: Whole effluent toxicity (WET) testing requirements and limits (if applicable) 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.wi.gov/topic/wastewater/wet.html)

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 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.

The department has been revisiting the sampling frequencies at every facility to evaluate whether current frequencies are appropriate or if an increase is warranted. The frequencies for BOD_5, TSS, pH, and ammonia were increased to align North Freedom with other facilities of similar size to ensure fairness and in consideration of department guidance on sampling frequencies.

Requirements in administrative code (NR 108, 205, 210, and 214 Wis. Adm. Code) and Sections 283.55, Wis. Stats., were considered, where applicable, when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. The department has determined at this time that the aforementioned changes in monitoring frequency are warranted based on the size and type of the facility.

Expression of Limits: In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code. limits in this permit are to be expressed as weekly average and monthly average limits whenever practicable.

PFOS and PFOA: NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Pursuant to s. NR 106.98(3)(b), Wis. Adm. Code, the department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, the department has determined the permittee does not need to sample for PFOS or PFOA as part of this permit reissuance. The department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
002	B	Liquid	Fecal Coliform	Injection	Land Application	Lagoon System
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.** If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						
Is a priority pollutant scan required? **No, design flow is less than 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.						

Sample Point Number: 002- LAGOON SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Once	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Once	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Once	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Once	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Once	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Once	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Once	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Once	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury Dry Wt	Ceiling	57 mg/kg	Once	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Once	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Once	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Once	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Once	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Once	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Once	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Once	Composite	
Nitrogen, Total Kjeldahl		Percent	Once	Composite	Once when land application occurs.
Nitrogen, Ammonium (NH4-N) Total		Percent	Once	Composite	Once when land application occurs.
Phosphorus, Total		Percent	Once	Composite	Once when land application occurs.
Phosphorus, Water Extractable		% of Tot P	Once	Composite	Once when land application occurs.
Potassium, Total Recoverable		Percent	Once	Composite	Once when land application occurs.
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	
PFOA + PFOS		ug/kg	Once	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Once	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

List 2 Nutrient: Monitoring has been added should land application occur and for planning purposes.

PCB: Ceiling and High Quality limits are included in the permit.

PFAS: Once monitoring is included in the permit pursuant s. NR 204.06(2)(b)9, Wis. Adm. Code.

Explanation of Limits and Monitoring Requirements

Requirements for 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) 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.

List 2 Nutrient: Monitoring for list 2 (nutrients) is highly recommended at the same time as the monitoring of List 1 (metals) in year 2 of the permit (2026). Results will assist in the determination of the acres needed for land application of sludge should it be necessary. The number of acres needed is also required for the Land Application Management Plan schedule item (see schedules for more information). List 2 nutrient sampling is required when land application occurs.

Water Extractable Phosphorus: 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.

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 ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

Change in form submittal: In prior permit reissuances when it has been noted in the application that sludge would not be removed during the permit term, the department required sampling during the second year of the permit term and the sludge characteristic report (3400-049) would be generated only during that year. Due to moving to electronic submittal of forms via Switchboard, forms 3400-049 ("Characteristics Report"), 3400-052 ("Other Methods of Disposal") and 3400-055 ("Annual Land Application") will now be generated by the department and the permittee will be required to submit all three reports each year of the permit term. This change was adopted to provide the permittee flexibility because many lagoon desludging projects can be unexpected, are delayed or staggered over multiple years. Additionally, it is used to officially report that no land application of sludge has occurred, and annual submittal of the forms is required per the standard requirements section.

4 Schedules

4.1 Total Suspended Solids Effluent Limits & Facility Modifications

This compliance schedule requires the permittee to achieve compliance by the specified date.

Required Action	Due Date
Report on Effluent Discharges: The permittee shall prepare and submit to the Department for approval an operational evaluation report. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will optimize reductions in TSS discharges from the treatment plant.	12/31/2025

Action Plan or Facility Plan Amendment: The permittee shall submit a Facility Plan or Facility Plan Amendment per s. NR 110.09, Wis. Adm. Code for treatment facility modifications for complying with the effluent limitation(s) as needed.	04/30/2026
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 achieve compliance with final *TSS* limitations and a schedule for completing construction of the upgrades by the complete construction date specified below.	03/31/2027
Initiate Actions: 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.	09/30/2027
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2028
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	03/31/2029
Achieve Compliance: Complete actions necessary to achieve compliance with the effluent limitation(s) for total suspended solids.	04/30/2029

Explanation of Schedule

The North Freedom POTW includes chemical treatment for phosphorus (Ferric Chloride), since the treatment works now includes other physical/chemical treatment processes, North Freedom is no longer eligible for the TSS variance under s. NR 210.07(2), Wis. Adm. Code. However, a review of effluent data over the permit term provides that the proposed limit is not currently achievable, a compliance schedule has been included in the permit to allow time for the limit to be achieved.

4.2 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
Land Application Management Plan Submittal: If the permittee proposes to land apply sludge, a management plan shall be submitted and approved by the Department. The management plan shall be consistent with the requirements of this permit, and s. NR 204.07, Wis. Adm. Code. At a minimum, the plan shall describe how the application rate has been calculated as well as how the sludge will be land applied and incorporated. Record keeping and tracking of site loadings shall also be described. Requests for land application site approvals shall also be included. The plan is due sixty (60) days prior to land applying.	

Explanation of Schedule

If the permittee wishes to land apply sludge from the lagoons during the permit term, they must submit a plan detailing how the sludge land application will comply with relevant code and permit requirements. The plan must be submitted at least 60 days prior to the sludge being land applied.

4.3 Desludging Management Plan

Required Action	Due Date
Desludging Management Plan Submittal: The permittee shall submit a management plan for approval if removal of the sludge will occur during this permit term. At a minimum, the plan shall address how the sludge will be sampled, removed, transported, and disposed of. No desludging may occur unless approval by the Department is obtained. Daily logs shall be kept that record where the sludge has been disposed. The plan is due sixty (60) days prior to desludging.	

Explanation of Schedule

If the lagoons are to be de-sludged during the permit term, a management plan needs to be submitted 60 days prior to desludging. At minimum, the plan should address how the sludge will be sampled, removed, transported, and disposed of. An outline is available to assist in plan development.

Special Reporting Requirements

None.

Other Comments:

None.

Attachments:

Water Quality Based Effluent Limits, dated July 10, 2024

Addendum to the Water Quality Based Effluent Limits, dated November 11, 2024

Expiration Date:

December 31, 2029

Justification Of Any Waivers From Permit Application Requirements

No waivers were requested or given from permit application requirements.

Prepared By: BetsyJo Howe, Wastewater Specialist **Date:** 11/14/2024

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: July 10, 2024

TO: BetsyJo Howe– SCR/Fitchburg

FROM: Zainah Masri – WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the North Freedom Wastewater Treatment Facility WPDES Permit No. WI-0028011-10-00

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 the North Freedom Wastewater Treatment Facility in Sauk County. This municipal wastewater treatment facility (WWTF) discharges to the Baraboo River, located in the Narrows Creek/Baraboo River Watershed in the Baraboo-Lemonweir Basin. This discharge is included in the Wisconsin River TMDL as approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
BOD_5			45 mg/L	30 mg/L	2
TSS			45 mg/L	30 mg/L	3
pH	9.0 s.u.	6.0 s.u.			2
Ammonia Nitrogen	Variable		**108 mg/L**	**108 mg/L**	2,5
Bacteria *E.coli*				126 #/100 mL geometric mean	6
Phosphorus					
Final				4.5 mg/L 0.41 lbs/day	4
TKN, Nitrate+Nitrite, and Total Nitrogen					7
Acute WET					8

Footnotes:

1. Monitoring only.
2. No changes from the current permit.
3. The North Freedom Wastewater Treatment facility is no longer eligible for the previous TSS variance limit based on s. NR 210.07 (2) where aerated lagoons and stabilization ponds are the principal treatment processes, as chemical addition is now used for phosphorus removal.
4. A Total Maximum Daily Load (TMDL) is has been developed for the Wisconsin River TMDL area. TMDL-derived 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.

5. The variable daily maximum table corresponding to various effluent pH values may be included in the permit in place of the single limit. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) are included in bold.

Effluent pH s.u.	**NH_3-N Limit mg/L**	**Effluent pH s.u.**	**NH_3-N Limit mg/L**	**Effluent pH s.u.**	**NH_3-N Limit mg/L**
6.0 < pH ≤ 6.1	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

6. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
8. Three acute whole effluent toxicity (WET) tests are recommended during the reissued permit term. 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. 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). If a satisfactory phosphorus chemical SOP is established and implemented at the facility prior to permit reissuance, then WET testing can be reduced to 2x acute tests in the reissued permit.

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

Attachments (3) – Narrative, Map and Ammonia Nitrogen Calculations

PREPARED BY: Zainah Masri, Water Resources Engineer WY/3 Zainah Masri

APPROVED BY: Diane Figiel Date: 07/10/2024

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Diane Figiel, Water Resources Engineer – WY/3
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Attachment # 1

Water Quality-Based Effluent Limitations for
North Freedom Wastewater Treatment Facility

WPDES Permit No. WI-0028011-10-0

Prepared by: Zainah Masri – WY/3

PART 1 – BACKGROUND INFORMATION

Facility Description

The Village of North Freedom operates a municipal wastewater treatment plant that serves approximately 598 people in Wisconsin of Sauk County. The facility uses a two pond stabilization treatment system with a 0.07 MGD design flow. As of 2022 ferric chloride is added to pond #1 to sequester phosphorus and sulfuric acid is added to pond #2 in order to adjust pH and ammonia concentration. Currently, the facility discharges Outfall 001 to the Baraboo River, in the Narrows Creek/Baraboo River Watershed (LW22) located in the Lower Wisconsin River Basin at SW1/4 of SW 1/4 Section 1, T11N-R5E.

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

Existing Permit Limitations

The current permit, which expired on December 31, 2023 , includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					3
BOD_5			45 mg/L	30 mg/L	1
TSS				60 mg/L	2
pH	9.0 s.u.	6.0 s.u.			
Ammonia Nitrogen Year-Round	Variable		**108 mg/L**	**108 mg/L**	4,5
Phosphorus Interim Final				 4.5 mg/L 0.41 lbs/day	 6

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. The TSS concentration limit is a variance limit under s. NR 210.07(2)
3. Monitoring Only

4. Variable Daily Maximum (Acute) Ammonia Limits

Effluent pH s.u.	NH_3-N Limit mg/L	Effluent pH s.u.	NH_3-N Limit mg/L	Effluent pH s.u.	NH_3-N Limit mg/L
6.0 < pH ≤ 6.1	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

5. Additional limits to comply with s. NR 106.7 and s. NR 205.065(7) are included in bold
6. A Total Maximum Daily Load (TMDL) is has been developed for the Wisconsin River TMDL area. There is a compliance schedule in place to meet the limits based on the Wisconsin River TMDL by September 30, 2023.

Receiving Water Information

- Name: Baraboo River
- Waterbody Identification Code (WBIC): 1285800
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values were estimated by DNR Water Resources Staff using flow estimated by USGS monitoring stations located on the Baraboo River upstream in Reedsburg and downstream in the Baraboo River.

  7-Q_{10} = 84 cfs (cubic feet per second)
  7-Q_2 = 116 cfs
  90-Q_{10} = 98.6 cfs
  Harmonic Mean Flow = 220.46 cfs

  The Harmonic Mean has been estimated based on average flow and the 7-Q_{10} using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).
- Hardness = 175 mg/L as $CaCO_3$. This value represents the geometric mean of data of WET tests from 2013 to 2017 by the City of Reedsburg.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals data from the Baraboo River at Sth 23 Bridge in Reedsburg is used for this evaluation period, 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.
- Multiple dischargers: There are several other dischargers to the Baraboo River 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: The Baraboo River in Sauk County (River Miles 0-89.79) is listed as impaired for Total Phosphorus at the outfall location.

Effluent Information

- Design flow rate(s):
  Annual average = 0.07 MGD (Million Gallons per Day)
  For reference, the actual average flow from December 2018 through March 2024 was 0.04 MGD.
- Hardness = 160 mg/L as $CaCO_3$. This value represents the geometric mean of data from the permit application collected in June 2023.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells
- Additives: Sulfuric Acid and Ferric Chloride
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.". Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
05/11/2023	<5.2	05/23/2023	<5.2	06/04/2023	<5.2
05/14/2023	<5.2	05/26/2023	<5.2	06/07/2023	<5.2
05/17/2023	<5.2	05/29/2023	<5.2	06/10/2023	<5.2
05/20/2023	<5.2	06/01/2023	<5.2		

"<" 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.

Sample Date	Chloride mg/L
06/01/2023	150
06/04/2023	150
06/07/2023	150
06/10/2023	160
Mean	153

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

Attachment # 1

Parameter Averages with Limits

	Average Measurement	Average Mass Discharged
BOD_5	21.8 mg/L*	
TSS	33.3 mg/L	
pH field	7.3 s.u.	
Phosphorus	2.4 mg/L	0.60 lbs/day
Ammonia Nitrogen	8.0 mg/L*	

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

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

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

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

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. 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 not the case for North Freedom Facility and the limits are set based on two times the acute toxicity criteria.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling for all the detected substances.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 67.20 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	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			
Arsenic		340	3.7	672.2	134.4	<7.7		
Cadmium	160	17.7		35.3	7.1	<0.41		
Chromium	160	2650	1.70	5295.8	1059	1.7		
Copper	160	24.2	3.10	42.2	8.4	<5.2		
Lead	160	168	2.20	332.4	66.5	<1.4		
Nickel	160	698		1396.5	279	2.7		
Zinc	160	182		363.1	72.6	<4.5		
Chloride (mg/L)		757	8.0	1498.0	300	153		

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 21 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	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Chlorine		7.28		1418.8	283.8		
Arsenic		152.2	3.7	28945	5789.0	<7.7	
Cadmium	175	3.82		744.5	149	<0.41	
Chromium	175	208.9	1.70	40387	8077.4	1.7	
Copper	175	16.71	3.10	2655.6	531.11	<5.2	
Lead	175	48.1	2.20	8945.7	1789.1	<1.4	
Nickel	175	83.8		16332	3266.4	2.7	
Zinc	175	196.4		38271	7654.1	<4.5	
Chloride (mg/L)		395	8.0	75430	15806.1	153	

Monthly Average Limits based on Wildlife Criteria (WC)

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

Attachment # 1

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 55.1150 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370		190181	38036.2	<0.41
Chromium (+3)	3818000		1946679542	389335908	1.7
Lead	140		71382	14276.3	<1.4
Nickel	4300		21924364	4384873	2.7

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 55.1150 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		6781.3	1356.3	<7.7

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, **no effluent limitations are required.**

Chloride – Considering available effluent data from the current permit term from date has a mean of 153 mg/L. These effluent concentrations are well below the calculated WQBELs for chloride; **therefore, no effluent limits or monitoring are needed**.

Mercury – The permit application did not require monitoring for mercury because the North Freedom Wastewater Treatment Facility 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 for October 15, 2020 was 0.23 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

PFOS and PFOA– The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. 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. Because of the lack of nondomestic contributions, **no monitoring is required during the current permit term.**

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

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

- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.

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 = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 256 sample results were reported from December 2018 to March 2024. The maximum reported value was 9.0 s.u. (Standard pH Units). The effluent pH was 9.0 s.u. or less 98% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.76 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 9.0 s.u. Therefore, a value of 9.0 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 9.0 s.u. into the equation above yields an ATC = 1.30 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 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 is shown below.

Attachment # 1

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	2.6
1-Q_{10}	14.2

The 2XATC method yields the most stringent limits for North Freedom Wastewater Treatment Facility.

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.

Daily Maximum Ammonia Nitrogen Limits – WWSF, WWFF & LFF

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	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from December 2018 to March 2024.

	Ammonia Nitrogen mg/L
1-day P_{99}	25
4-day P_{99}	15.6
30-day P_{99}	10.53
Mean	8.21
Std	4.81
Sample size	251
Range	<0.2- 27

The permit currently has daily, weekly, and monthly 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.

Expression of Limits

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

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

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

In this case, the recommended daily maximum limits vary with effluent pH, so additional limits should be set equal to the highest recommended limit. Therefore, **monthly and weekly average limits of 108 mg/L** are recommended in the permit.

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
Year Round	Variable	108	108

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 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.

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. The effluent flow (annual average design flow) to receiving water flow (100% of $Q_{7,10}$) ratio for North Freedom is 1 : 646. "Disinfection Requirements for Discharges to Surface Waters" guidance suggests that if this ratio is greater than 1 : 1,000, disinfection isn't necessary to protect the recreational use, according to s. NR 210.06(3)(e), Wis. Adm. Code. The ratio for North Freedom does not meet the criteria for exemption, and therefore, disinfection is required.

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. The permit will include a compliance schedule to meet these limits.

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.

Annual Average Mass Total Phosphorus Loading

Month	Average Phosphorus Concentration (mg/L)	Total Effluent Flow (Million Gallons)	Calculated Mass (lbs/month)
January 2022	0.99	4.35	36.03
February 2022	0.75	5.1	31.86
March 2022	1.78	11.37	169.05
April 2022	1.29	5.36	57.56
May 2022	0.68	2.75	15.61
June 2022	0.57	0.58	2.77
July 2022	0.089	0.44	0.33
August 2022	1.86	3.14	48.6
September 2022	1.11	4.85	44.5
October 2022	0.42	0.99	3.5
November 2022	1.4	0.50	5.8
December 2022	1.57	1.39	18.0
Average	36 lbs/month		

North Freedom Wastewater Treatment Facility 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 with s. NR 217.04(1)(a)1, Wis. Adm. Code, and therefore **no technology-based limit is required.**

TMDL Limits – Phosphorus

Total phosphorus (TP) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs (*May 2020). The wasteload allocations (WLA) that implement site-specific criteria for Lakes Petenwell, Castle Rock, and Wisconsin are found in Appendix K of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019 and are expressed as maximum annual loads (lbs/year) and maximum daily loads (lbs/day). The WLA that implement statewide criteria found in Appendix J of the TMDL report are no longer applicable following approval of these site-specific criteria. The daily WLAs in the WRB TMDL equals the annual WLA divided by the number of days in the year. Therefore, the daily WLA is an annual average. Since the derivation of daily WLAs from annual WLAs does not take effluent variability or monitoring frequency into consideration, maximum daily WLAs from the WRB TMDL should not be used directly as permit effluent limits.

Total Phosphorus WLA: 78 lbs/year (see Appendix K of the TMDL document)

For the reasons explained in the April 30, 2012, paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, WDNR has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL. Therefore, limits given to continuously discharging facilities covered by the WRB TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

$$\text{TP Equivalent Effluent Concentration} = \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor})$$
$$= 0.214 \text{ lbs/day} \div (0.07 \text{ MGD} * 8.34)$$
$$= 0.367 \text{ mg/L}$$

Since this value over 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no six-month average limit is required.

$$\text{TP Monthly Average Permit Limit} = \text{daily WLA} * \text{monthly average multiplier}$$
$$= 0.214 \text{ lbs/day} * 1.9$$
$$= 0.41 \text{ lbs/day}$$

The multiplier used in the monthly average calculation was used as recommended in TMDL implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 1.9. The facility can meet the permit limits based on the WLA, so the current CV is used. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as weekly; if a different monitoring frequency is used, the stated limits should be reevaluated.

The WRB TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards, for tributaries to the Wisconsin River. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from January 2023 to March 2024, when mass reporting began.

Total Phosphorus Effluent		
	Concentration mg/L	Mass Discharge lbs/day
1-day P_{99}	2.8	7.5
4-day P_{99}	1.7	4.1
30-day P_{99}	1.16	1.91
Mean	0.90	1.02
Std	0.55	1.65
Sample Size	23	20
Range	0.22 - 2.3	0 - 4.63

Conclusion:
In summary, the following limits are recommended:

- Monthly average Total Phosphorus mass limit of 0.41 lbs/day
- Monthly average Total Phosphorus Concentration limit of 4.5 mg/L

PART 5 – 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.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation.

Due to the amount of upstream flow available for dilution in the limit calculation, and water designation, the flow ratio must be Qs: Qe >20:1, the lowest calculated limitation would be 120° F according to chs. NR 106.55(6)(a), Wis. Adm. Code). The Qs:Qe ratio for North Freedom Wastewater Treatment Facility is 194:1, and thus **no effluent limits are recommended for temperature**.

PART 6 – 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 ratio of the 7-Q_{10} to the effluent flow exceeds 100:1. For the Village of North Freedom, that ratio is approximately 778:1. With this amount of dilution, there is believed to be little potential for chronic toxicity effects in the Village of North Freedom associated with the discharge from the Village of North Freedom. **Therefore, chronic WET testing is not recommended during the reissued permit term.**

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

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

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

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

Attachment # 1

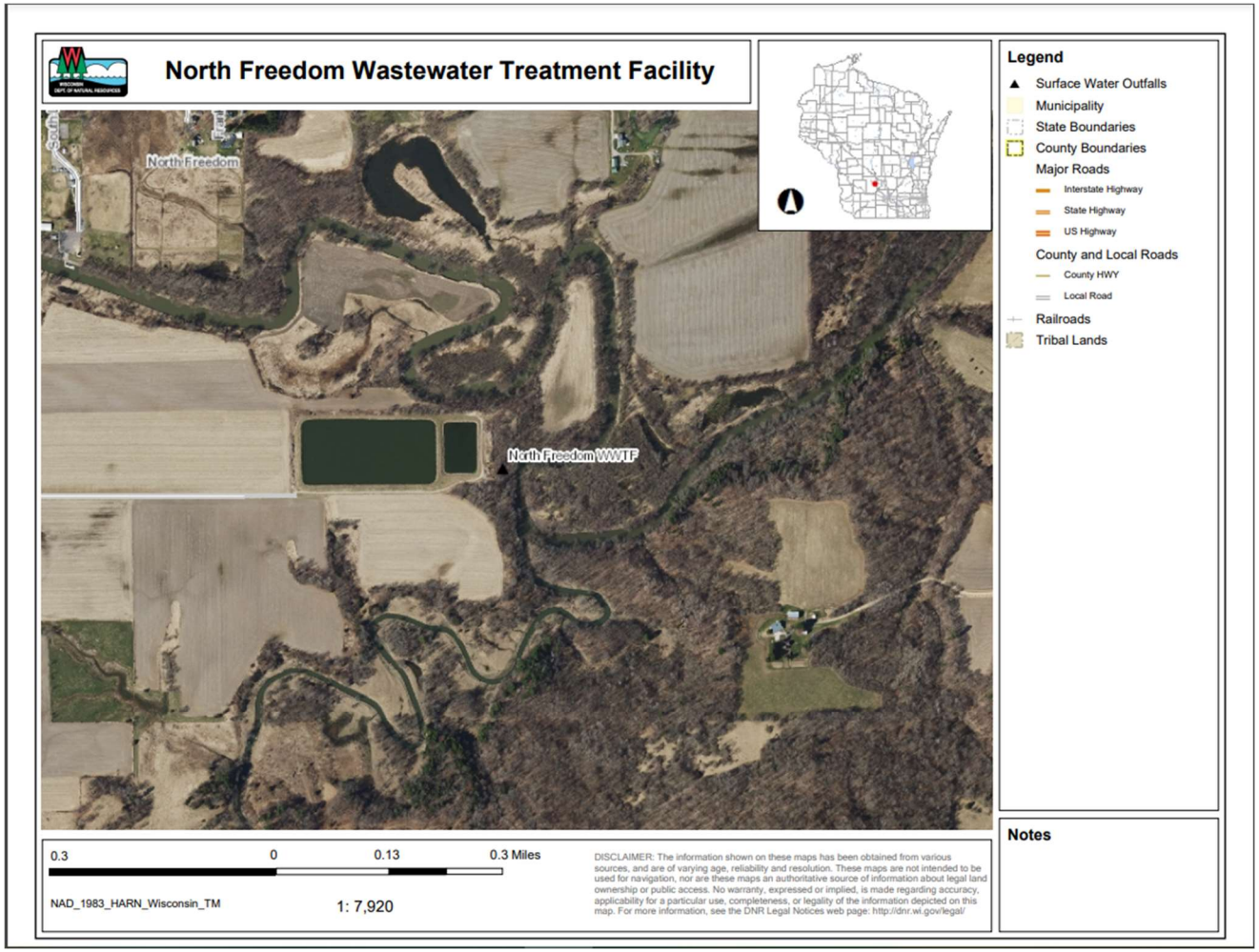
The WET checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the 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	No acute tests available within past 5 years. **5 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**
Receiving Water Classification	WWSF community. **5 Points**
Chemical-Specific Data	No reasonable potential for limits based on ATC; Ammonia nitrogen, Chromium, Nickel, Chloride detected. No additional compounds of concern. **3 Points**
Additives	2 water quality conditioner added. Permittee has proper P chemical SOPs in place: No. **17 Points**
Discharge Category	No industrial contributors **0 Points**
Wastewater Treatment	Secondary or better. **0 Points**
Downstream Impacts	No impacts known. **0 Points**
Total Checklist Points:	**30 Points**
Recommended Monitoring Frequency (from Checklist):	Three acute tests during permit term.
Limit Required?	No.
TRE Recommended? (from Checklist)	No.

After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, **3x acute 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). **If a satisfactory phosphorus chemical SOP is established and implemented at the facility prior to permit reissuance, then WET testing can be reduced to 2x acute tests in the reissued permit.**

Site Map:


North Freedom Wastewater Treatment Facility
North Freedom
North Freedom WWTF
Legend
Surface Water Outfalls
Municipality
State Boundaries
County Boundaries
Major Roads
Interstate Highway
State Highway
US Highway
County and Local Roads
County HWY
Local Road
Railroads
Tribal Lands
Notes
0.3
0
0.13
0.3 Miles
NAD_1983_HARN_Wisconsin_TM
1: 7,920
DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/

Background Ammonia Nitrogen Calculations:

		Summer June – Sept.	Winter Oct. - March	Spring April & May
Background Information	7-Q_{10} (cfs)	84.0	84	84
	7-Q_2 (cfs)	116	116	116
	Ammonia (mg/L)	0.06	0.085	0.06
	Temperature (°C)	19	4	6
	pH (s.u.)	8.08	7.9	8.09
	% of Flow used	100	25	25
	Reference Weekly Flow (cfs)	84	21	21
	Reference Monthly Flow (cfs)	98.6	24.65	24.65
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	**4.15**	6.99	**5.32**
	Early Life Stages Absent	3.56	**9.36**	5.50
	30-day Chronic			
	Early Life Stages Present	**1.66**	2.80	**2.13**
	Early Life Stages Absent	1.42	**3.74**	2.20
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	**3177.32**	1346.59	**1025.86**
	Early Life Stages Absent	2717.14	**1807.59**	1061.14
	Monthly Average			
	Early Life Stages Present	**1458.76**	620.16	**473.10**
	Early Life Stages Absent	1242.74	**836.45**	489.66

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: November 11, 2024

TO: BetsyJo Howe – SCR/Fitchburg

FROM: Zainah Masri – WY/3

SUBJECT: Addendum to the Water Quality-Based Effluent Limitations for the North Freedom Wastewater Treatment Facility
WPDES Permit No. WI-0028011-10-00

This is in response to your request for an evaluation of the need for water quality based effluent limitations for bacteria using chs. NR 102 and 210, Wis. Adm. Codes (where applicable), for the North Freedom wastewater treatment facility (WWTF). This WWTF discharges to the Baraboo River in the Narrows Creek/Baraboo Watershed the Lower Wisconsin River Basin.

The current WQBEL Evaluation dated July 10, 2024 had determined disinfection was necessary for Outfall 001 to meet the bacteria water quality standards of the Baraboo River and recommended an *E. coli* geometric mean – monthly limitation of 126#/100 mL. The facility has provided dimensional information for their two lagoons to evaluate if disinfection is not needed for Outfall 001 via a sufficient detention time in accordance with s. NR 210.06(3)(h). This evaluation will consider the updated information provided for bacteria.

This evaluation will also address the applicable total suspended solids (TSS) limits with the presence of additional treatment. **Determinations made for other parameters in the previous WQBEL Evaluation (July 10, 2024) will remain the same.**

Receiving Water Information

- Name: Baraboo River
- Classification: Warmwater Sport Fish (WWSF) community, non-public water supply.

Effluent Information

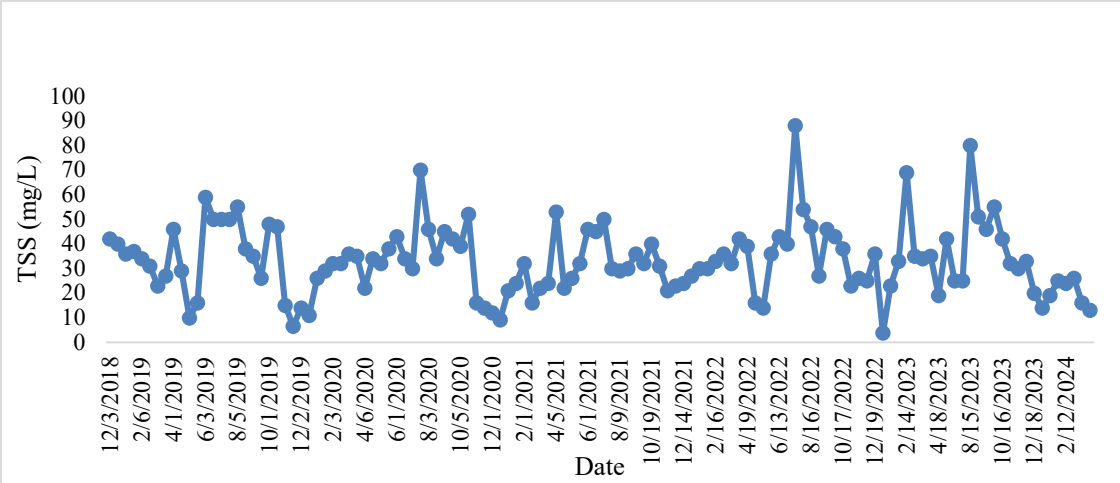
- Design flow rate(s):
  Annual average = 0.07 million gallons per day (MGD)
  For reference, the actual average flow from December 2018 to March 2024 was 0.034 MGD excluding days discharge did not occur.

Total Suspended Solids (TSS)

The TSS monthly average limit is being reduced from 60 mg/L to 30 mg/L as the North Freedom WWTF facility is no longer eligible for the previous TSS variance limit based on s. NR 210.07(2), Wis. Adm. Code, where aerated lagoons and stabilization ponds are the principal treatment processes, as chemical addition is now used for phosphorus removal.

The following graph shows the TSS effluent data from December 2018 to February 2024. Chemical addition started in spring 2022. Current effluent data shows that the permittee cannot meet the 30 mg/l monthly average limit; therefore, a compliance schedule is recommended in the permit to allow time for the permittee to meet the final limit. **The current monthly average TSS limit of 60 mg/L will serve as the interim limit during the compliance schedule.**

TSS Effluent Data



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.

It is recognized the North Freedom WWTF potentially has a detention time of at least 180 days, in which the resulting discharged effluent is thought to not pose a risk to human and animal heath, as described in s. NR 210.06(3)(h), Wis. Adm. Code.

The maximum 180-day rolling average flowrate for the facility is 0.0611 MGD (January 2019 – May 2024) including days discharge did not occur. Correspondence with the facility's consultant indicated potential unrepresentative effluent flows were recorded by the discharge's transducer probe via extreme wet weather conditions during June 2024 – July 2024 causing the Baraboo River to back up into the Parshall flume. Therefore, effluent flows during that timeframe are excluded from this evaluation. The volumetric capacity of the lagoons is approx. 11.3 MG, calculated based on dimensions provided by the facility included as attachment #1. Therefore, the estimated shortest detention time for the facility is approximately 11.3 MG / 0.061 MGD = 185 days and is greater than the 180-day minimum. This detention time would essentially be providing disinfection where additional disinfection treatment is not expected to be needed.

However, there is uncertainty about the facility consistently meeting the 180-day minimum required demonstrated by the graph provided by the facility's consultant included as attachment #1. If the June 2024 – July 2024 effluent flows are representative, then the maximum 180-day rolling average flowrate becomes 0.11 MGD, and the shortest detention time decreases to approximately 105 days.

Therefore, the limits originally given to the North Freedom Wastewater Treatment Facility in the memo dated July 10, 2024 should be retained. In addition, effluent monitoring is recommended to ensure that the discharge can meet bacteria limits during the recreation season without disinfection, according to s. NR 210.06(3)(d), Wis. Adm. Code, and as discussed in the "Disinfection Requirements for Discharges to Surface Waters" guidance. *E. coli* effluent monitoring should be included in the permit in order to ensure that the recreational use is being protected (criteria are being met) without disinfection.

Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities:
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. **Monitoring should be conducted at a minimum of weekly for the disinfection season during the permit term.**

If there are any questions or comments, please contact Zainah Masri at Zainah.Masri@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

PREPARED BY: Zainah Masri – WY/3 Zainah Masri

APPROVED BY: Diane Figiel date: 11/11/2024
Diane Figiel, Water Resources Engineer

cc: Tanner Connors, Wastewater Engineer – Fitchburg/SCR

Attachment #1

Calculations provided by the Facility:

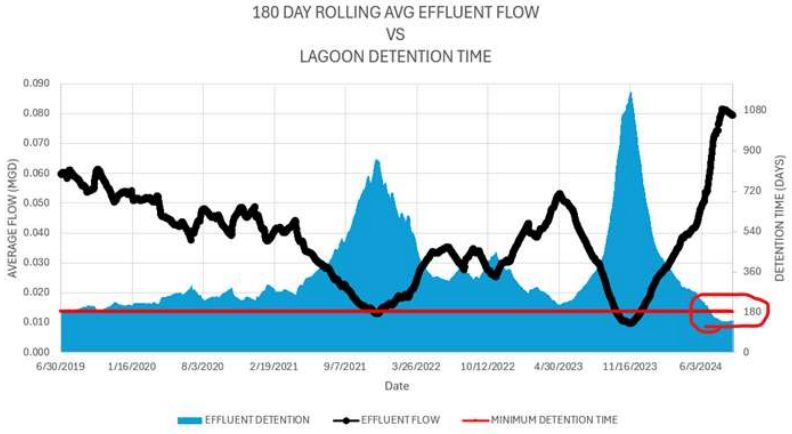
Tanner,
We completed the lagoon volume and hydraulic detention time calculations. The total volume of the two lagoons is approximately 11.3 MG. Below is a summary of the lagoon volume calculation. Let me know if you agree with this volume calculation.

LAGOON #1			LAGOON #2	
Top Water Width	385	ft	195	ft
Top Water Length	790	ft	310	ft
Top Water Elevation	880.00	ft MSL	876.00	ft MSL
Bottom Water Elevation	875.00	ft MSL	870.40	ft MSL
Depth	5.0	ft	5.6	ft
Slope	3	:1	3	:1
Total Volume	9.55	MG	1.75	MG
TOTAL VOLUME	11.30	MG		

We used the SWAMP data from September 2019 through August 2024 to calculate annual average effluent flows. The lagoon detention times were calculated based on annual average effluent flow rates for each year, as shown in the table below. The data shows that the detention time is above the 180-day detention time threshold in 2019 through 2023. In June and July of 2024, effluent flows were extremely high for four weeks due to extreme wet weather conditions. This resulted in an elevated flow rate, which caused the lagoon detention time to dip below the 180-day threshold. The data suggests that the Baraboo River may have backed up into the effluent Parshall flume which "flatlined" the flow meter at an inaccurately high flow rate for approximately two weeks. We do not believe these flow readings are reliable and not typical and this data should not be used to calculate lagoon detention time.

EFFLUENT FLOW	Average Flow (MGD)	Detention Time (Days)
2019 Average	0.057	199
2020 Average	0.043	261
2021 Average	0.023	501
2022 Average	0.034	328
2023 Average	0.028	400
2024 Average	0.070	162

The chart below compares the 180-day rolling average effluent flow to lagoon detention time. As illustrated, the lagoon detention time has been above the 180-day threshold for 97% of the days in the past 4.75 years.



Please contact me if you have any question or comments on this evaluation.

Tom Fitzwilliams
Owner
tom@clearstartwater.com