

Permit Fact Sheet

General Information

Permit Number:	WI-0029017-11-0											
Permittee Name:	Village of Rib Lake											
Address:	PO Box 205 741 Mc Comb Avenue											
City/State/Zip:	Rib Lake WI 54470											
Discharge Location:	1501 State Road, Rib Lake, Wisconsin. East bank of Silver Creek 1/8 mile downstream of State Street Bridge (SW¼ - SE¼ of Section 27: T33N-R2E)											
Receiving Water:	Sheep Ranch Creek within the Upper Rib Watershed in the Upper Wisconsin River Drainage Basin in Taylor County.											
StreamFlow (Q _{7,10}):	Monthly Low Flows (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.39	0.37	0.44	1.0	0.60	0.42	0.29	0.26	0.28	0.41	0.57	0.45
Stream Classification:	Currently listed as Limited Forage Fish (LFF) community in NR 104, Wis. Adm. Code. Non-public water supply and within the ceded territory.											
Wild Rice Impacts: <i>(no specific wild rice standards exist at this time)</i>	No impacts identified at this location. No wild rice waters inventoried near the outfall. (Evaluation completed March 2017)											
Discharge Type:	Existing continuous discharger											
Design Flow(s)	Annual Average											0.2 MGD
Significant Industrial Loading?	No											
Operator at Proper Grade?	Yes											
Approved Pretreatment Program?	N/A											

Facility Description

The Village of Rib Lake owns and operates a domestic wastewater treatment system. The plant designed to treat 200,000 gallons per day, currently treats an average of 97,000 gallons per day. The treatment system consists of an activated sludge plant with extended aeration and sequential anoxic and aerobic zones. The process is trademarked SEQUOX Biological Nutrient Removal Process using Aero-mod technology. The system provides fine screening, a selector tank with diffused air mixing, and two identical parallel treatment trains sharing common concrete walls. Each parallel treatment train contains the following process equipment: aeration tank with three separate stages/basins, a clarifier tank, an aerobic sludge digestion tank with coarse bubble diffusers, return activated sludge (RAS) and waste activated sludge (WAS) pumps, and a chemical feed system utilizing aluminum sulfate (alum) for phosphorus reduction. Excess digested sludge is stored in a sludge storage tank adjacent to the package plant until it is land-applied on WDNR-approved agricultural sites or transported to the Medford Wastewater Treatment Facility for further treatment.

Substantial Compliance Determination

Enforcement During Last Permit:

There have been a several minor violations of effluent limits, missed samples, and late reporting. However, the facility has taken the necessary steps to correct their actions and nothing further is required.

After a desk top review of all discharge monitoring reports, CMARs, and application reports, compliance schedule items, and a site visit by Arthur Ryzak, WDNR, on 06/14/22, the Village of Rib Lake 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	INFLUENT Flow is not a required parameter.	Representative samples shall be collected in the influent wet well ahead of the main lift pumps.
001	EFFLUENT An average of 0.097 MGD (June 2019 through June 2024)	Representative samples shall be collected using the effluent sampler attached to the tap off the discharge pipe located in the control building.
002	SLUDGE An average of 222 dry US tons (per application)	Representative samples shall be collected from the sludge holding tank that are composited for analysis.

1 Influent – Monitoring Requirements

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 Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

Changes from Previous Permit:

Influent limitations and monitoring requirements were re-evaluated for the proposed permit term and no changes were required in this permit section. Sampling requirements and frequencies are the same as the previous permit.

Explanation of Limits and Monitoring Requirements

The parameters are standard for minor municipalities, as are monitoring and frequency requirements for municipal wastewater treatment plant. Tracking of BOD5, and Suspended Solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code.

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	
BOD5, Total	Daily Max	30 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	15 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Daily Max	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	3/Week	Grab	
pH Field	Daily Min	6.0 su	3/Week	Grab	
Dissolved Oxygen	Daily Min	4.0 mg/L	Weekly	Grab	
E. coli	Monthly Avg	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 discussion below. Enter the result in the DMR on the last day of the month.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	7.7 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective November through April.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	6.6 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective May through October.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	17 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective November through April.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	12 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective May through October.

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	3/Week	24-Hr Flow Prop Comp	Enter the daily ammonia result on the eDMR and compare to the Nitrogen, Ammonia Variable Limit column to determine compliance.
Nitrogen, Ammonia Variable Limit		mg/L	3/Week	See Table	Using the daily pH result look up the applicable ammonia limit in the Ammonia Limitation section and report the variable limit on the eDMR.
Phosphorus, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	1.1 lbs/month	Monthly	Calculated	Calculate the Total Monthly Discharge of phosphorus and report on the last day of the month on the DMR. See the Total Maximum Daily Load (TMDL) Limitations discussion below.
Phosphorus, Total		lbs/yr	Monthly	Calculated	Beginning January 2026, 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 the Total Maximum Daily Load (TMDL) Limitations discussion below.
Temperature Maximum		deg F	3/Week	Measure	Monitoring is required October and November 2025.
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	Monthly monitoring occurs April 2025 through December 2026.
Copper, Total Recoverable		ug/L	Quarterly	24-Hr Flow Prop Comp	Quarterly monitoring begins January 2027.

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Hardness, Total as CaCO ₃		ug/L	Monthly	24-Hr Flow Prop Comp	Monthly monitoring occurs April 2025 through December 2026.
Hardness, Total as CaCO ₃		ug/L	Quarterly	24-Hr Flow Prop Comp	Quarterly monitoring begins January 2027.
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	Monitoring is required during the 2027 calendar year.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring is required during the 2027 calendar year.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Nitrogen Series Monitoring section for testing schedule.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Nitrogen Series Monitoring section for testing schedule.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Total Nitrogen = Total Nitrogen Kjeldahl (mg/L) + Nitrite + Nitrate Nitrogen (mg/L). See the Nitrogen Series Monitoring section for testing schedule.
Acute WET		TU _a	See Listed Qtr(s)	24-Hr Flow Prop Comp	Two tests are required during the permit term. See the Whole Effluent Toxicity (WET) testing section for monitoring schedule.
Chronic WET		TU _c	See Listed Qtr(s)	24-Hr Flow Prop Comp	Three tests are required during the permit term. See the Whole Effluent Toxicity (WET) testing section for monitoring schedule.

Changes from Previous Permit

Effluent limitations and monitoring requirements were re-evaluated for the proposed 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.

- **Flow** sampling frequency changed from “continuous” to ‘daily’ to better represent practices at the facility.

- An **E. coli** schedule to comply with the limits has been included. At the end of the schedule seasonal limits are required. Monitoring is not required until the limit becomes effective.
- **Ammonia** - A variable daily maximum limit based on pH levels has been added to the permit.
- A monthly average **phosphorus** limit based on the Wisconsin River TMDL assessment has been added to the permit.
- **Temperature** monitoring October and November 2025 has been included in preparation for the next permit issuance.
- **Zinc** and **chloride** monitoring during the 2027 calendar year has been included in preparation for the next permit issuance.
- **Copper** and **hardness** monitoring and a copper schedule to comply with limits have been included. Monthly monitoring is required during the first two years of the permit term and quarterly monitoring is required the remaining three years.
- Annual monitoring for the **Nitrogen Series** (nitrate +nitrite, total Kjeldahl nitrogen and total nitrogen) has been added to the permit.
- Two **acute Wet** tests and three **chronic WET** test are required during the permit term.

Explanation of Limits and Monitoring Requirements

More information on categorical and water quality based limits (WQBEL) is found in the “Water Quality-Based Effluent Limitations for the Village of Rib Lake (WI-0029017)” memo dated September 25, 2024.

BOD₅ and Total Suspended Solids (TSS) - Categorical limits for BOD₅ and TSS are required per s. NR 210.05, Wis. Adm. Code and NR 104.02(3) Wis. Adm. Code

pH - Categorical limits for pH are required per ch. NR 210 (Subchapter II).

Dissolved Oxygen - Categorical limits for Dissolved Oxygen in a Limited Forage Fish (intermediate) are found in NR 104.02(3)(a) and 210.05(2) Wis. Adm. Code.

Disinfection and 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. Monitoring and limits become effective at the end of the schedule.

Ammonia – Daily maximum limits - Using current acute and chronic ammonia toxicity criteria found in Tables 2C and 4B of NR 105 Wis. Adm. Code and limit calculating procedures (Subchapter IV of 106, Wis. Adm. Code ammonia limitations were calculated for the facility. Based on a reasonable potential analysis it was found ammonia limits are needed to ensure toxic conditions in the receiving water do not occur. Daily maximum limits expressed as a single limit or as a variable limit based on effluent pH were calculated. Expression as a variable limit was chosen. Sample results for pH shall be used to calculate the daily variable limit. Total ammonia (NH₃-N) sampling shall occur on the same day pH levels are monitored. The applicable variable limit shall be recorded on the Electronic Discharge Monitoring Report (eDMR) in the Ammonia Variable Limit column. Report the effluent ammonia sample result in the ‘Nitrogen, Ammonia (NH₃-N) Total’ column. Compare the variable daily maximum ammonia limit to the reported ammonia result, record the number of exceedances in the box to the right of the ‘Limit in Effect’ ‘Daily Max’ row in the ‘Summary’ tables at the end of the eDMR.

Variable Limits Table
Daily maximum ammonia limits based on Effluent pH

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	93	7.0 < pH ≤ 7.1	56	8.0 < pH ≤ 8.1	12
6.1 < pH ≤ 6.2	91	7.1 < pH ≤ 7.2	51	8.1 < pH ≤ 8.2	9.8
6.2 < pH ≤ 6.3	89	7.2 < pH ≤ 7.3	45	8.2 < pH ≤ 8.3	8.1
6.3 < pH ≤ 6.4	86	7.3 < pH ≤ 7.4	39	8.3 < pH ≤ 8.4	6.6
6.4 < pH ≤ 6.5	84	7.4 < pH ≤ 7.5	34	8.4 < pH ≤ 8.5	5.5
6.5 < pH ≤ 6.6	80	7.5 < pH ≤ 7.6	29	8.5 < pH ≤ 8.6	4.5
6.6 < pH ≤ 6.7	76	7.6 < pH ≤ 7.7	25	8.6 < pH ≤ 8.7	3.8
6.7 < pH ≤ 6.8	72	7.7 < pH ≤ 7.8	21	8.7 < pH ≤ 8.8	3.1
6.8 < pH ≤ 6.9	67	7.8 < pH ≤ 7.9	17	8.8 < pH ≤ 8.9	2.6
6.9 < pH ≤ 7.0	62	7.9 < pH ≤ 8.0	14	8.9 < pH ≤ 9.0	2.3

Ammonia – Weekly and Monthly Average Limits - The current Weekly Average and Monthly Average limits were also reviewed. There is not a reasonable potential for the Weekly or Monthly Average limits to be exceeded but based on anti-backsliding requirements (NR 207, Wis. Adm. Code) the limitations are required this permit term.

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

In the case of the Village of Rib Lake:

- A TBEL of 1.0 mg/L is needed if a facility discharges more than the threshold of 150 pounds per month (s. NR 217.04(1)(a)1 Wis. Adm. Code). The current facility limit memo determined that the facility discharges less than the threshold; therefore, a TBEL is not applicable this permit term.
- Based on the size and classification of the stream and instream background phosphorus data are used to calculate the stream criteria-based WQBELs. But in the case of Rib Lake, the *Wisconsin River Basin TMDL was developed to be protective of the immediate receiving water therefore can be used to measure compliance* and the stream criteria-based WQBEL is not required this permit term. See the next bullet for more information.
- The facility lies within the boundaries of the Wisconsin River total maximum daily load (TMDL) area. The TMDL was developed to address phosphorus water quality impairments. The Wisconsin River TMDL for total phosphorus was approved by the U.S. Environmental Protection Agency on April 26, 2019. Additional site-specific criteria (SSC) for Lakes Petenwell, Castle Rock, and Wisconsin and the related Waste Load Allocation (WLA) included in Appendix K of the TMDL report were approved by the U.S. Environmental Protection Agency on July 9, 2020. More information about the TMDL can be found at <https://dnr.wisconsin.gov/topic/TMDLs/TMDLReports.html>. Based on current criteria, the approved TMDL WLA for Total Phosphorus is 223 lbs per year, which equates to a 1.1 lbs/day monthly average.

Calculation and reporting of the total mass of phosphorus discharged over the past 12 months is required to track progress in meeting the overall TMDL requirements. The 12-month rolling sum equals the sum of the most recent 12 consecutive months of total monthly discharges.

Calculations needed to determine compliance with the WLA are:

- **Total Monthly Discharge (lbs/month)** = monthly average concentration (mg/L) x total flow for the month (MG/month) x 8.34.
- **12-Month Rolling Sum of Total Monthly Discharge (lbs/year)** = the sum of the most recent 12 consecutive months of total monthly discharges. This value should be reported on the eDMR on the last day of each month. Recording will begin after 12-months (January 2026).

Temperature - Using the administrative rules for thermal discharges detailed in NR 102 Subchapter II Water Quality Standards for Temperature, and NR 106 Subchapter V Effluent Limitations for Temperature, effluent thermal limits were calculated. The calculated thermal limits for the Sheep Ranch Creek vary over the year. Based on a reasonable potential analysis limits are not required this permit term. Monitoring during October and November 2025 is required in preparation for the next permit reissuance.

Copper and Hardness - Limits are calculated using the methods outlined in NR 106 Wis. Adm. Code. Based on a reasonable potential analysis copper limits of 7.8 ug/L as both weekly average and monthly average limits as well as weekly average mass limits of 0.013 lbs/day (chronic) and 0.02 lbs/day (wet weather) are needed this permit term. A schedule has been included to give the permittee time to come into compliance with the limits. Monthly monitoring is required the first two years of the permit term and quarterly for the remaining three years.

Zinc and Chloride – Limits are calculated using the methods outlined in NR 106 Wis. Adm. Code. Based on a reasonable potential analysis limits are not needed this permit term, but monthly monitoring during the 2027 calendar year will be used to determine if limits are needed for the next permit reissuance.

Nitrogen Series - (nitrate +nitrite, total Kjeldahl nitrogen and total nitrogen) – In 2011, the Upper Mississippi River Basin Association (UMRBA) completed the report “Upper Mississippi River Nutrient Monitoring, Occurrence, and Local Impacts: A Clean Water Act Perspective”. Among the many recommendations of this report was that the states should expand their NPDES discharge monitoring requirements to include both phosphorus and nitrogen as they have important impacts on the mainstem upper Mississippi River as well as in the Gulf of Mexico. Consequently, the department developed the “Guidance for Total Nitrogen Monitoring in WPDES Permits” document dated October 2019, where annual effluent monitoring for total nitrogen (total nitrogen = total Kjeldahl + (nitrite+nitrate)) is required for municipal and industrial facilities discharging to surface waters. Section 283.55(1)(e) Wis. Stats. 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 s. NR 200.065 (1)(h) Wis. Adm. Code allows for this monitoring to be collected during the permit term. The schedule for this facility is as follows:

- July – September 2025
- October – December 2026
- January – March 2027
- April – June 2028
- July – September 2029

Testing shall continue after the permit expiration date (until the permit is reissued) in accordance with the requirements for 2026. For example, the next test would be required July - September 2030.

WET Testing - 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>).

Based on historical WET test data and reasonable potential factor (RPF) calculations WET tests are required this permit term, but limits are not needed. A WET Checklist was prepared to determine the number of WET tests that are needed. As toxicity potential increases, more points accumulate, and more monitoring is required to assure toxicity is not occurring over the short (acute) and long (chronic) term. Based on the total points accumulated and Chapter 1.3 of the WET Guidance Document 2 Acute WET Tests and 3 Chronic WET Tests are required this permit term during the following quarters:

- April – June 2026 (Acute and Chronic)
- October – December 2027 (Chronic)
- July – September 2028 (Acute and Chronic)

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.

Sampling Frequencies - The “Monitoring Frequencies for Individual Wastewater Permits” guidance document (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 determined at this time that the facility meets the guidance and no changes in the monitoring frequency is required this permit term.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)
002	B	Liquid	Fecal Coliform	Incorporation	Land Apply	222 dry tons (information from application)
				pH adjustment	Haul to another facility	
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, the most recent set of results (2020) were below the level of detection.						
Is a priority pollutant scan required? No						

Sample Point Number: 002- Aerobic Sludge

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations

Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Per Application	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Per Application	Composite	
Phosphorus, Total		Percent	Per Application	Composite	
Phosphorus, Water Extractable		% of Tot P	Per Application	Composite	
Potassium, Total Recoverable		Percent	Per Application	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Monitoring is required once in 2026.
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

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
					Permit Sections for more information.

Changes from Previous Permit:

Sludge limitations and monitoring requirements were re-evaluated for the proposed 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.

- The sampling frequency for **List 2 (nutrients)** was changed from “annual” to “per application” so that monitoring is not required during years sludge is transported to the Medford WWTF.
- **PFAS** monitoring is required once during the permit term.

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). Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k).

List 2 (nutrients) – The permittee disposes of sludge by land application or transferring to another permitted wastewater treatment facility. Monitoring for nutrients (Total Kjeldahl Nitrogen, Total Ammonium Nitrogen, Total Phosphorus, Water Extractable Phosphorus and Total Recoverable Potassium) is required prior to land application at a frequency of no more than annual. List 1 (metals), PCBs and PFAS is required at the frequency stated in the table above.

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.

4 Schedules

4.1 Water Quality Based Effluent Limits (WQBELs) for Copper

The permittee shall comply with the WQBELs for copper as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Sampling Standard Operating Procedure (SOP): Submit an SOP plan for approval describing the standard sampling protocols and actions required to obtain representative copper data.	03/31/2025
Operational Evaluation Report (OER): The permittee shall prepare and submit to the Department for approval an OER. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will	03/31/2026

optimize reductions in copper discharges from the treatment plant. The report shall provide a plan and schedule for implementation of the measures, improvements, and modifications. The report shall state whether the operational improvements are expected to result in compliance with the copper limit.	
<p>Compliance Alternatives Plan: If the OER and additional data concludes the limit can't be achieved the permittee shall submit a compliance alternatives plan. If upgrading of the permittee's wastewater treatment is necessary to meet final copper WQBELs, the submittal shall include a final engineering design report addressing the treatment plant upgrades, and a facility plan if required pursuant to NR 110, Wis. Adm. Code.</p> <p>If the OER and additional data concludes the limit can be met with operational improvements the permit will be modified so the limit will not become effective, and the permittee will not be required to comply with the remaining milestones identified in the schedule below.</p> <p>If the OER and additional data concludes that a variance will be pursued, the Plan shall provide information regarding the basis for the variance.</p>	03/31/2027
<p>Final Plans and Specifications: Submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final copper WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below.</p>	12/31/2027
<p>Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades.</p> <p>Or as part of the application for the next reissuance, or prior to filing the application, the permittee shall submit an application for a variance.</p>	12/31/2028
<p>Achieve Compliance: The permittee shall complete construction of wastewater treatment system upgrades and achieve compliance with final copper WQBELs.</p>	12/31/2029

4.2 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.	09/30/2025
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.	04/30/2026
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.	03/31/2027
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	09/30/2027

plant upgrades in accordance with the approved plans and specifications.	
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: The permittee shall achieve compliance with final E. coli limitations.	04/30/2029

Explanation of Schedules

Water Quality Based Effluent Limits (WQBELs) for Copper - A compliance schedule is included in the permit to provide time for the permittee to come into compliance with the copper limits (7.8 ug/L weekly average and monthly average as well as weekly average mass limits of 0.013 lbs/day (chronic) and 0.02 lbs/day (wet weather)).

Disinfection and Effluent Limitations for E. coli - 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:

Wastewater Flow Diagram – updated October 2024

“Water Quality-Based Effluent Limitations for the Village of Rib Lake (WI-0029017)” memo dated September 25, 2024

Expiration Date:

December 31, 2029

Justification Of Any Waivers From Permit Application Requirements

N/A

Prepared By: Sheri A. Snowbank **Wastewater Specialist**

Date: September 11, 2024

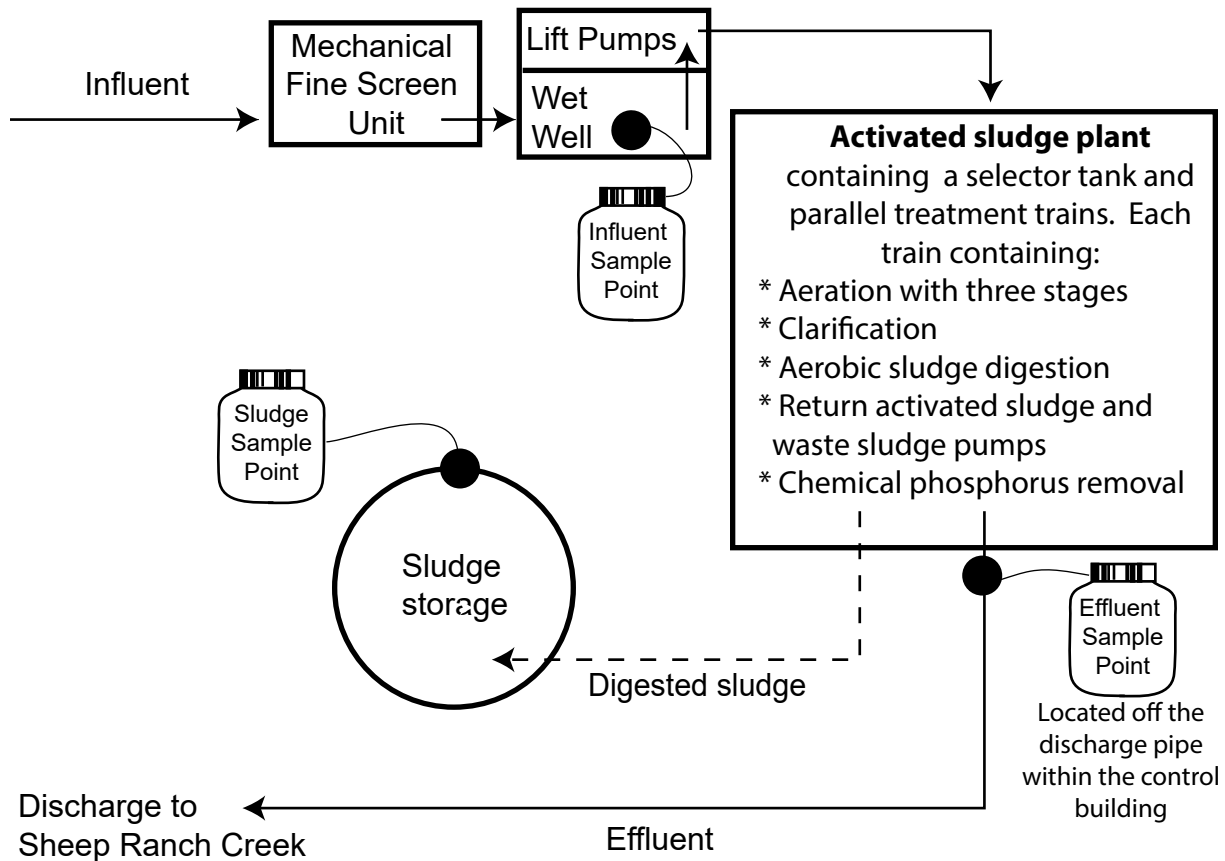
Date updated based on Factcheck comments: October 30, 2024 (The Wastewater Flow Diagram was recreated and updated WQBEL memo and draft permit documents were based on USGS flow data submitted to the department.)

Date updated based on public notice comments:

Notice of reissuance was published in the Star News, PO Box 180, Medford WI 54451-0180.

Village of Rib Lake Wastewater Treatment Plan

The Rib Lake Wastewater treatment facility is designed to treat 200,000 gallons per day. The treatment system consists of an activated sludge plant. The system provides fine screening, a selector tank with diffused air mixing, and two identical parallel treatment trains. Each parallel treatment train contains the following process equipment: aeration tank with three separate stages/basins, a clarifier tank, an aerobic sludge digestion tank with coarse bubble diffusers, return activated sludge (RAS) and waste activated sludge (WAS) pumps, and a chemical feed system for phosphorus reduction. Excess digested sludge is stored in a sludge storage tank until it is land-applied on WDNR-approved agricultural sites or transported to the Medford Wastewater Treatment Facility for further treatment. The diagram below shows the treatment units and sampling locations.



Flow: 0.200 MGD
 BOD: 156 pounds/day
 Suspended Solids: 183 pounds/day
 Construction year: 2019

● represents sample locations
 NOT TO SCALE

CORRESPONDENCE/MEMORANDUM

DATE: September 25, 2024

TO: Sheri Snowbank – NOR/Spooner Service Center

FROM: Michael Polkinghorn – NOR/Rhineland Service Center *Michael Polkinghorn*

SUBJECT: Water Quality-Based Effluent Limitations for the Village of Rib Lake
 WPDES Permit No. WI-0029017-11-0

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 Village of Rib Lake in Taylor County. This municipal wastewater treatment facility (WWTF) discharges to Sheep Ranch Creek, located in the Upper Rib Watershed in the Upper Wisconsin River Basin. This discharge is included in the Wisconsin River Basin 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	30 mg/L			15 mg/L	1, 2
TSS	30 mg/L			20 mg/L	1, 2
pH	9.0 s.u.	6.0 s.u.			1, 2
Dissolved Oxygen		4.0 mg/L			1, 2
<i>E. coli</i> May – September				126 #/100 mL geometric mean	3
Ammonia Nitrogen May – October November – April	12 mg/L or Variable		12 mg/L 17 mg/L	6.6 mg/L 7.7 mg/L	4
Phosphorus				1.1 lbs/day	5
Copper (Total Recoverable)			7.8 µg/L 0.013 lbs/day 0.020 lbs/day	7.8 µg/L	6, 7
Zinc (Total Recoverable)					8
Chloride					9
TKN, Nitrate+Nitrite, and Total Nitrogen					10
Temperature					11
Acute WET					12, 14
Chronic WET					13, 14

Footnotes:

1. No changes from the current permit.

2. These limits are based on the Limited Forage Fish (LFF) community of the immediate receiving water as described in s. NR 104.02(3)(a), Wis. Adm. Code.
3. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL. The permit will include a compliance schedule to meet these limits.
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 of 12 mg/L. These limits apply year-round.

Daily Maximum Ammonia Nitrogen Limits

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	93	7.0 < pH ≤ 7.1	56	8.0 < pH ≤ 8.1	12
6.1 < pH ≤ 6.2	91	7.1 < pH ≤ 7.2	51	8.1 < pH ≤ 8.2	9.8
6.2 < pH ≤ 6.3	89	7.2 < pH ≤ 7.3	45	8.2 < pH ≤ 8.3	8.1
6.3 < pH ≤ 6.4	86	7.3 < pH ≤ 7.4	39	8.3 < pH ≤ 8.4	6.6
6.4 < pH ≤ 6.5	84	7.4 < pH ≤ 7.5	34	8.4 < pH ≤ 8.5	5.5
6.5 < pH ≤ 6.6	80	7.5 < pH ≤ 7.6	29	8.5 < pH ≤ 8.6	4.5
6.6 < pH ≤ 6.7	76	7.6 < pH ≤ 7.7	25	8.6 < pH ≤ 8.7	3.8
6.7 < pH ≤ 6.8	72	7.7 < pH ≤ 7.8	21	8.7 < pH ≤ 8.8	3.1
6.8 < pH ≤ 6.9	67	7.8 < pH ≤ 7.9	17	8.8 < pH ≤ 8.9	2.6
6.9 < pH ≤ 7.0	62	7.9 < pH ≤ 8.0	14	8.9 < pH ≤ 9.0	2.3

5. The phosphorus mass limit is based on the WRB TMDL to address phosphorus water quality impairments within the TMDL area and will be effective upon permit reissuance.
6. 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.
7. These are the WQBELs for copper. Additional effluent monitoring is recommended and during any scheduled chronic WET test during the reissued permit term to support effluent toxicity. The wet weather mass limit of 0.020 lbs/day would apply when the dry weather mass limit of 0.013 lbs/day is exceeded and demonstrated during a wet weather event. A variance limit may be included in the permit in place of the WQBELs if a copper variance application is submitted by the Village of Rib Lake and approved by EPA.
8. Monthly zinc monitoring for 1 year is recommended during the reissued permit term to determine the need for zinc limits at the next permit issuance.
9. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.
10. 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 (NO₃), nitrite (NO₂), and total Kjeldahl nitrogen (TKN) (all expressed as N).
11. Weekly monitoring during October and November for 1 year is recommended during the reissued permit term.
12. Two 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.
13. Three chronic WET tests are recommended during the reissued permit term. The Instream Waste Concentration (IWC) to assess chronic test results is 86%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic

testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Sheep Ranch Creek upstream of the confluence of Outfall 001.

14. 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).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Michael Polkinghorn at (715) 360-3379 or Michael.Polkinghorn@wisconsin.gov and Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (4) – Narrative, discharge area map, weekly/monthly average ammonia nitrogen limits, & thermal table.

PREPARED BY: Michael A. Polkinghorn – Water Resources Engineer

E-cc: Arthur Ryzak, Wastewater Engineer – NOR/Ladysmith Service Center
Michelle BalkLudwig, Regional Wastewater Supervisor – NOR/Spooner Service Center
Diane Figiel, Water Resources Engineer – WY/3
Nathaniel Willis, Wastewater Engineer – WY/3

**Water Quality-Based Effluent Limitations for
Village of Rib Lake**

WPDES Permit No. WI-0029017-11-0

Prepared by: Michael A. Polkinghorn

PART 1 – BACKGROUND INFORMATION

Facility Description

The Village of Rib Lake operates an AeroMod® activated sludge package plant. The current WWTF provides fine screening, a selector tank with diffused air mixing, and two identical parallel treatment trains sharing common concrete walls. Each parallel treatment train contains the following process equipment: aeration tank with three separate stages/basins, a clarifier tank, an aerobic sludge digestion tank with coarse bubble diffusers, RAS and WAS pumps, and a new chemical feed system for phosphorus reduction. The current chemical feed system doses aluminum sulfate (alum) to the anoxic zone and can also dose alum in the aeration basins and in the raw wastewater wet well. Currently, multiple point chemical addition is not practiced at the WWTF due to the sufficient performance of single point addition to the anoxic zone. Digested sludge is stored in a sludge storage tank adjacent to the package plant. Effluent is discharged on a continuous basis via Outfall 001 to the east bank of Sheep Ranch Creek, approx. 0.13 mi downstream of the State St. Bridge.

Attachment #2 is a discharge area map of Outfall 001.

The Village of Rib Lake contacted USGS to provide updated annual and monthly low flows for Sheep Ranch Creek. This is in response to the previous QBEL Evaluation dated April 2024 for the 11th issuance of their permit where limit and monitoring recommendations were made based on previous low flow information for Sheep Ranch Creek. This evaluation will consider the updated information provided for all applicable parameters. **Determinations made for parameters in this reevaluation will supersede those made in the previous QBEL Evaluation (April 2024).**

Existing Permit Limitations

The current permit, expired on 09/30/2023, 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			15 mg/L	2, 3
TSS	30 mg/L			20 mg/L	2, 3
pH	9.0 s.u.	6.0 s.u.			2, 3
Dissolved Oxygen		4.0 mg/L			2, 3
Ammonia Nitrogen					
May – October			12 mg/L	6.6 mg/L	
November – April			17 mg/L	7.7 mg/L	

Attachment #1

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Phosphorus					4
Interim 1				1.6 mg/L	
Interim 2				1.0 mg/L	
Copper (Total Recoverable)					1
Zinc (Total Recoverable)					1
Temperature					1
Chronic WET					

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 Forage Fish (LFF) community of the immediate receiving water as described in s. NR 104.02(3)(a), Wis. Adm. Code.
4. These interim limits were required under the individual phosphorus variance approved by EPA for the current permit term. Interim limit 1 was effective in the current permit until 09/30/2020. Interim limit 2 is effective in the current permit starting 10/01/2020.
5. One chronic whole effluent toxicity (WET) test was required during quarter 3 (July – September) 2022. The IWC for chronic WET testing was 86%.

Receiving Water Information

- Name: Sheep Ranch Creek
- Waterbody Identification Code (WBIC): 1467900
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code:
 - Sheep Ranch Creek: Limited Forage Fish (LFF) community as described in Table 8 Row 18 of s. NR 104.10(2), Wis. Adm. Code, from Outfall 001 downstream to the first town road. Non-public water supply.
 - The modeled natural community of Sheep Ranch Creek is “Cool-Warm Headwater” at Outfall 001. This classification will be used for WET-based decisions only.
 - Big Rib River is classified as a Warm Water Sport Fish (WWSF) community, non-public water supply, and is approx. 0.6 mi downstream of Outfall 001. A review of historic limit evaluations show the calculated WQBELs based on Sheep Ranch Creek are also protective of the Big Rib River’s water quality standards. Therefore, only WQBELs based on the protection of Sheep Ranch Creek will be reevaluated at this time.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are from Sheep Ranch Creek near Hwy 102 at Rib Lake, WI (USGS station ID #05395504, Lat. 45.3115, Long. -90.2144, drainage area = 7.84 mi²). These statistics were computed by relating discharge measurements collected on Sheep Ranch Cr. to low-flow statistics from the long term continuously recording gaging stations on the Prairie River near Merrill (05394500) and the Spirit River near Spirit Falls (05393500):
 - Annual 7-Q₁₀ = 0.24 cubic feet per second (cfs)
 - Annual 7-Q₂ = 0.41 cfs

Attachment #1

Annual 1-Q₁₀ = 0.22 cfs

Harmonic Mean Flow = 1.38 cfs using a drainage area of 7.84 mi²

The Harmonic Mean has been estimated based on average flow and the 7-Q₁₀ 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).

Monthly Low Flows

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q₁₀ (cfs)	0.39	0.37	0.44	1.0	0.60	0.42	0.29	0.26	0.28	0.41	0.57	0.45
7-Q₂ (cfs)	0.64	0.61	0.75	1.9	1.1	0.78	0.54	0.51	0.67	0.88	1.0	0.78
1-Q₁₀ (cfs)	0.37	0.35	0.41	0.84	0.50	0.36	0.26	0.24	0.26	0.35	0.52	0.41

- Hardness = 61 mg/L as CaCO₃. This value represents the geometric mean of data (n = 5, August 2003 – August 2022) from chronic WET testing.
- % 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 Black River near Medford, WI in Taylor County is used for this evaluation because there is no data available for the Sheep Ranch Creek. The Black River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later in this evaluation.
- Multiple dischargers: None.
- Impaired water status: There are no known impairments to Sheep Ranch Creek. Approx. 0.6 mi downstream of Outfall 001, the Big Rib River is on the Clean Water Act Section 303(d) list for a phosphorous impairment. Outfall 001 is included in the WRB TMDL which addresses phosphorus water quality impairments within the TMDL area.

Effluent Information

- Design Flow Rate(s):
 - Annual average = 0.200 MGD
 - Peak Daily = 0.404 MGD
 - Peak weekly = 0.301 MGD
 - Peak Monthly = 0.256 MGD

For reference, the actual average flow from October 2018 – January 2024 was 0.0972 MGD. Only the annual average and peak weekly design flows are used in this evaluation and the remaining design flows are included for information purposes.

- Hardness = 190 mg/L as CaCO₃. This value represents the geometric mean of data (n = 4, March 2023 – April 2023) from 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).
- Water source: Domestic wastewater with no industrial contributors. Water supply from Rib Lake Waterworks.
- Total Phosphorus Wasteload Allocation: 223 lbs/yr, 0.611 lbs/day (*Appendix K of Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin, April 2019, page 24*).

Attachment #1

- Additives: Aluminum sulfate is used for chemical phosphorus treatment.
- 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 chloride and hardness. The current permit required monitoring for copper, zinc, and temperature.
- 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.
- Additional effluent chloride data (n = 4, March 2017) is utilized to better determine the need for chloride limits during the reissued permit term.

Copper, Chloride, & Zinc Effluent Data

Sample Date	Copper (µg/L)	Chloride (mg/L)	Zinc (µg/L)
02/15/2021	11		59
03/04/2021	34		<20
04/15/2021	3.86		<20
05/06/2021	7.94		<20
06/01/2021	5.36		20
07/07/2021	10		<20
08/12/2021	5.68		<20
09/01/2021	4.66		20
11/03/2021	12		20
12/02/2021	7.84		<20
01/03/2022	14		20
03/22/2017		64	
03/25/2017		61	
03/28/2017		83	
03/31/2017		35	
03/20/2023		97	
03/24/2023		110	
03/28/2023		87	
04/01/2023		94	
Mean*		79	13
1-day P ₉₉	42		
4-day P ₉₉	24		

“<” 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.

The following table presents the average concentrations and loadings at Outfall 001 from October 2018 – January 2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameter Averages with Limits	
	Average Measurement*
BOD ₅	6.9 mg/L

Attachment #1

TSS	7.7 mg/L
pH field	7.4 s.u.
Dissolved Oxygen	8.6 mg/L
Ammonia Nitrogen	1.3 mg/L
Phosphorus	0.66 mg/L

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

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

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

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

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-Q₁₀ 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.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

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

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

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

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

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

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ 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 the Village of Rib Lake and the limits are set based on the 1-Q₁₀ method.

Attachment #1

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 = 0.22 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), 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.
Arsenic		340		581.4	116.3	<1.1		<1.1
Cadmium	190	21.5		36.8	7.4	<0.19		<0.19
Chromium	190	3,047		5,213	1,043	<1.1		<1.1
Copper	190	28.4	1.68	47.4			42	34
Lead	190	199	0.332	339.4	67.9	<4.3		<4.3
Nickel	190	807		1,380	276	<1.2		<1.2
Zinc	190	211	5.11	357.0	71.4	14		59
Chloride (mg/L)		757	9.0	1,289	258	79		110

* Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q₁₀ 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 = 0.06 cfs (¼ of the 7-Q₁₀), 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
Arsenic		152.2		182	36.3	<1.1	
Cadmium	61	1.68		2.01	0.4	<0.19	
Chromium	61	88.55		106	21.1	<1.1	
Copper	61	6.81	1.68	7.80			24
Lead	61	17.47	0.332	20.8	4.2	<4.3	
Nickel	61	34.53		41	8.2	<1.2	
Zinc	61	78.53	5.11	93	18.6	14	
Chloride (mg/L)		395	9.0	470	94.0	79	

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 = 0.34 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		782	156.3	<0.19
Chromium	3,818,000		8,065,897	1,613,179	<1.1
Lead	140	0.332	295	59.1	<4.3

Attachment #1

Nickel	43,000		90,842	18,168	<1.2
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Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0.34 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		28.1	5.62	<1.1

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.

Evaluation of Dissolved-Based Metal Limits

Dissolved-based limits may be evaluated for the Village of Rib Lake pursuant to chs. NR 105 and 106, Wis. Adm. Code. Typically, the first approach in evaluating the need for the dissolved-based limits is to look at the variability of the metals data already provided to the department.

It should be noted that the permittee has not formally requested the evaluation of dissolved-based limits, which normally triggers the consideration of such according to s. NR 106.06(7)(b), Wis. Adm. Code. Since this request has not been submitted, the dissolved-based limits are provided for informational purposes with an explanation of the additional data which the permittee would need to submit to demonstrate that the dissolved-based recommendations belong in the permit.

Information required for the calculation of dissolved-based limits includes the conversion factors from ss. NR 105.05 (5) (for acute criteria) or NR 105.06 (8) (for chronic criteria), Wis. Adm. Code. Background data is also required to translate the dissolved criteria into a site-specific number (the “translator”) from which a total recoverable limit may be calculated based on the fraction of the discharged metal which would be dissolved in the receiving water. To perform this translation the following background data is required:

$$\text{Translator} = \frac{M_{tr}}{M_d}$$

Where:

M_d : Dissolved metals concentration in the receiving water (µg/L)

M_{Tr} : Total Recoverable metals concentration in the receiving water (µg/L)

Site-specific data of paired background total recoverable/dissolved copper samples is currently not available. Nearby sites where paired sampling is available are shown below:

Date	Location	SWIMS ID	Total Recoverable Copper (µg/L)	Dissolved Copper (µg/L)	Translator
NA	Big Rib River at Goodrich, WI	553034	0.795	0.765 Geomean	1.04 1.04

Multiplying the translator, the conversion factor from ch. NR 105, Wis. Adm. Code, and the applicable

criterion will give an indication of the amount of “relief” potentially available to the recommended permit limits if the dissolved fraction is considered from the available data:

$$\text{Translated Criteria} = \text{NR 105 Criterion} * \text{Conversion Factor} * \text{Translator}$$

$$\text{Copper (CTC)} = 6.81 \mu\text{g/L} * 0.960 * 1.04 = 6.79 \mu\text{g/L}$$

Because the dissolved-based copper CTC is less than the total recoverable CTC, the calculated weekly average copper WQBEL remains at 7.8 $\mu\text{g/L}$. The Village of Rib Lake can collect on-site information to support either the estimated dissolved-based criteria or some alternate criteria. **Additional effluent monitoring is recommended and during any scheduled chronic WET test during the reissued permit term to support the dissolved-based limits and effluent toxicity.**

Conclusions and Recommendations

Based on a comparison of the effluent data and calculated effluent limitations, **effluent limitations are needed for copper**. Limits and/or monitoring recommendations are made in the paragraphs below:

Chloride – Considering available effluent data from March 2017 – April 2023, the mean effluent concentration is 79 mg/L. This effluent concentration is below the calculated chloride WQBELs; therefore, **chloride limits are not recommended during the reissued permit term. 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.**

Copper – Considering available effluent data from the current permit term (February 2021 – January 2022), the 1-day P_{99} and 4-day P_{99} concentrations are 42 and 24 $\mu\text{g/L}$, respectively. The 4-day P_{99} concentration exceeds the calculated weekly copper WQBEL; **therefore, the weekly average limit of 7.8 $\mu\text{g/L}$ is recommended during the reissued permit term. The monthly average limit of 7.8 $\mu\text{g/L}$ is required to satisfy the expression of limits requirements as described in s. NR 106.07, Wis. Adm. Code.**

The chronic mass limitation of 0.013 lbs/day is based on the concentration limit and the annual average design flow rate of 0.200 MGD ($7.8 \mu\text{g/L} * 0.200 \text{ MGD} * 8.34/1000$) in accordance with s. NR 106.07(2)(c), Wis. Adm. Code. **The chronic wet weather mass limitation of 0.020 lbs/day** is based on the concentration limit and the peak weekly design flow rate of 0.301 MGD ($7.6 \mu\text{g/L} * 0.301 \text{ MGD} * 8.34/1000$) in accordance with s. NR 106.07(9), Wis. Adm. Code.

Previous limit evaluations have utilized a mixed hardness value instead of that of the receiving water in calculation of weekly average WQBELs for toxic substances. Three conditions must be satisfied to justify using a mixed hardness; the effluent flow must contribute significantly to the receiving water flow, the effluent hardness must be significantly higher than the receiving water hardness, and the Langelier Index must be negative using the procedure in Appendix B of the Department guidance document, *Calculating Water Quality-Based Effluent Limitations for Surface Water Discharges*, (August 2020). The mixed hardness is not used in this evaluation because there is insufficient effluent and receiving water information to determine the Langelier Index. The mixed hardness value is 134 mg/L calculated by flow weighting the effluent hardness and receiving water hardness values. If this value were used in the calculation of copper limits, the CTC would be 13.27 $\mu\text{g/L}$, and the associated weekly average copper WQBEL would be 15.52 $\mu\text{g/L}$. Reasonable potential for the weekly average copper WQBEL would still be demonstrated in this case. The use of a mixed hardness in limit calculations can be pursued if effluent

and receiving water parameters such as alkalinity, total dissolved solids, pH and hardness data is collected.

Copper sampling is recommended during any scheduled chronic WET test during the reissued permit term as addressed in Part 6 of this evaluation. A variance limit may be included in the permit in place of the WQBELs if a copper variance application is submitted and approved by EPA.

Mercury – The permit application did not require monitoring for mercury because the Village of Rib 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 (n = 5, November 2018 – September 2022) was 1.4 mg/kg, with a maximum reported concentration of 5.56 mg/kg. **Therefore, mercury monitoring is not recommended during the reissued permit term.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the type of discharge, the effluent flow rate, the lack of indirect dischargers contributing to the collection system and known nondetectable levels of PFOS/PFOA in the source water, **PFOS and PFOA monitoring is not recommended during the reissued permit term.** 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.

Zinc – Considering available effluent data from February 2021 – January 2022, the mean effluent and maximum concentrations are 13 and 59 µg/L respectively. This effluent concentration is below the calculated zinc WQBELs; therefore, **zinc limits are not recommended during the reissued permit term. Monthly zinc monitoring for 1 year is recommended during the reissued permit term to determine the need for zinc limits at the next permit issuance.**

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 weekly average and monthly average limits year round. These limits are re-evaluated at this time due to the following changes:

- The maximum expected effluent pH has changed.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

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

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

Where:

Attachment #1

A = 0.411 and B = 58.4 for a LFF community, and
 pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 837 sample results were reported from October 2018 – January 2024. The maximum reported value was 8.2 s.u. (Standard pH Units). The effluent pH was 8.0 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.1 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 8.1 s.u. Therefore, a value of 8.1 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.1 s.u. into the equation above yields an ATC = 7.1 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are either set equal to two times the nitrogen limits or the mass balance approach using the 1-Q₁₀ 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-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

Method	Limit (mg/L)
2×ATC	14
1-Q ₁₀	12

The 1-Q₁₀ method yields the most stringent limits for the Village of Rib 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 – LFF Community

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	93	7.0 < pH ≤ 7.1	56	8.0 < pH ≤ 8.1	12
6.1 < pH ≤ 6.2	91	7.1 < pH ≤ 7.2	51	8.1 < pH ≤ 8.2	9.8
6.2 < pH ≤ 6.3	89	7.2 < pH ≤ 7.3	45	8.2 < pH ≤ 8.3	8.1
6.3 < pH ≤ 6.4	86	7.3 < pH ≤ 7.4	39	8.3 < pH ≤ 8.4	6.6
6.4 < pH ≤ 6.5	84	7.4 < pH ≤ 7.5	34	8.4 < pH ≤ 8.5	5.5
6.5 < pH ≤ 6.6	80	7.5 < pH ≤ 7.6	29	8.5 < pH ≤ 8.6	4.5
6.6 < pH ≤ 6.7	76	7.6 < pH ≤ 7.7	25	8.6 < pH ≤ 8.7	3.8
6.7 < pH ≤ 6.8	72	7.7 < pH ≤ 7.8	21	8.7 < pH ≤ 8.8	3.1
6.8 < pH ≤ 6.9	67	7.8 < pH ≤ 7.9	17	8.8 < pH ≤ 8.9	2.6
6.9 < pH ≤ 7.0	62	7.9 < pH ≤ 8.0	14	8.9 < pH ≤ 9.0	2.3

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

At the time of the January 2006 limit evaluation, the fish and aquatic life classification of Sheep Ranch Creek was proposed to be changed from the current LFF community classification to a WWSF community classification as part of the proposed changes to ch. NR 104, Wis. Adm. Code. The January 2006 limit evaluation calculated the weekly and monthly average ammonia nitrogen limits based on a WWSF community for the immediate receiving water where the Village of Rib Lake’s effluent ammonia nitrogen data demonstrated the need for both sets of limits in the permit year round. These limits are more stringent than the equivalent limits calculated for Sheep Ranch Creek with a LFF community classification (previous low flows) and considering downstream impacts with the Big Rib River with a WWSF classification with additional assimilative capacity and ammonia decay.

The Village of Rib Lake contacted USGS to provide updated annual and monthly low flows for Sheep Ranch Creek and an initial review of these flows show all except the annual 7-Q₂ low flow have increased. Therefore, the weekly and monthly average ammonia nitrogen WQBELs that would be calculated will be less stringent than both the current limits and limits based on the Big Rib River. Therefore, the current limits would still be the most stringent of the three limit sets. The calculations from the January 2006 limit evaluation are included as attachment #3.

If the Village of Rib Lake would like to request an increase to the existing permit limits an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. This evaluation is on a parameter by parameter basis and includes consideration of operations, maintenance and temporary upsets. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limits must be continued in the reissued permit. A review of the effluent ammonia nitrogen data from the current permit term shows the facility can currently meet the existing weekly and monthly average ammonia nitrogen limits. Therefore, no changes are recommended in any of the permit limits for ammonia.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from October 2018 – January 2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Village of Rib Lake permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen Effluent Data

Statistics (mg/L)	May – October	November – April
1-day P ₉₉	9.4	13
4-day P ₉₉	5.6	7.5
30-day P ₉₉	2.4	3.3
Mean *	0.98	1.6
Std	2.4	3.07
Sample size	405	427
Range	<0.04 - 20	<0.04 - 21

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

Based on this comparison, daily maximum limits are recommended year round during the reissued permit term. The Village of Rib Lake shall notify the Department if the single limit of 12 mg/L or

the variable limits based on effluent pH are preferred. The permit currently has weekly average and monthly average limits year round. **Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:**

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

Conclusions and Recommendations

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

Season	Daily Maximum (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)
May – October	12 mg/L or Variable	12 mg/L	6.6 mg/L
November – April	12 mg/L or Variable	17 mg/L	7.7 mg/L

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.

The Village of Rib Lake had previously been exempted from disinfection based on the Limited Aquatic Life or Limited Forage Fish community 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). The hydrologic classification for Sheep Ranch Creek is listed in ch. NR 104, Wis. Adm. Code, as continuous. Continuous streams have a higher likelihood of providing opportunities for full contact recreational activities. Therefore, 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. The permit will include a compliance schedule to meet these limits.

PART 5 – PHOSPHORUS

TMDL Limits

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 WLAs 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.

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:

$$\begin{aligned} \text{TP Equivalent Effluent Concentration} &= \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor}) \\ &= 0.611 \text{ lbs/day} \div (0.200 \text{ MGD} * 8.34) \\ &= 0.366 \text{ mg/L} \end{aligned}$$

Since this value is greater than 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no 6-month average limit is required.

$$\begin{aligned} \text{TP Monthly Average Permit Limit} &= \text{daily WLA} * \text{monthly average multiplier} \\ &= 0.611 \text{ lbs/day} * 1.72 \\ &= 1.1 \text{ lbs/day} \end{aligned}$$

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 0.9. The facility is able to 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 3x/wk; 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 lists the statistics for effluent phosphorus concentrations from October 2018 – January 2024. In the cases where reporting the mass discharge is not required in the current permit, the mass is calculated using the reported phosphorus concentration and the effluent flow rate for that day.

Phosphorus Effluent Data

Statistics	Conc. (mg/L)	Mass Discharge (lbs/day)
1-day P ₉₉	2.62	2.15
4-day P ₉₉	1.49	1.19
30-day P ₉₉	0.91	0.69
Mean	0.66	0.48
Std	0.52	0.43
Sample Size	835	835
Range	0.04 – 4.03	0.036 – 3.92

The 2023 Phosphorus Variance Annual Report from the Village of Rib Lake indicates the current alum feed system allows the facility to meet the proposed TMDL limit and the facility has chosen not to reapply for the individual phosphorus variance for the reissued permit term. A review of the calculated monthly average mass phosphorus loadings (n = 64, October 2018 – January 2024) shows the facility would have been 95% compliant with the TMDL limit or only 3 monthly averages would have exceeded the TMDL limit. **Therefore, the monthly average limit of 1.1 lbs/day is recommended to be effective upon permit reissuance.**

The current permit has the effective monthly average limit of 1.0 mg/L which served as an interim limit for the individual phosphorus variance since 10/01/2020 during the current permit term. The TMDL limit is equivalent to the concentration of 0.630 mg/L at the facility design flow of 0.200 MGD. **Therefore, this limit may be removed during the reissued permit term.**

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.

The daily maximum mass phosphorus value calculated for Outfall 001 was 3.92 lbs/day. Assuming the facility discharges at this loading daily for 1 month, the total monthly loading would be approx. 118 lbs/month. This loading as an annual average is less than the 150 lbs/month threshold for municipal facilities. **Therefore, a technology-based limit is not recommended during the reissued permit term.**

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

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. These values were based off actual flow reported from October 2018 – January 2024.

The table below summarizes the maximum temperatures reported during monitoring from October 2018 – January 2024. The complete thermal limit calculation table is included as attachment #4.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	46	47	63	96
FEB	43	44	61	92
MAR	43	44	60	86
APR	46	48	67	89
MAY	54	55	74	90
JUN	61	63	82	89
JUL	69	72	85	89
AUG	69	71	82	90
SEP	67	68	74	87
OCT	65	65	65	88
NOV	56	58	59	97
DEC	50	51	63	93

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
 - (a) The highest recorded representative daily maximum effluent temperature
 - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
 - (a) The highest weekly average effluent temperature for the month.
 - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. **Based on this analysis, temperature limits are not recommended during the reissued permit term. Weekly monitoring during October and November for 1 year is recommended during the reissued permit term.**

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

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

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC₅₀ (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 84% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100$$

Attachment #1

Where:

Q_e = annual average flow = 0.200 MGD = 0.309 cfs

f = fraction of the Q_e withdrawn from the receiving water = 0

Q_s = ¼ of the 7- Q_{10} of “Cool-Warm Headwater” natural community = 0.24 cfs ÷ 4 = 0.06 cfs

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

WET Data History

Date Test Initiated	Acute Results LC ₅₀ %				Chronic Results IC ₂₅ %					Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Algae (IC ₅₀)	Pass or Fail?	Use in RP?	
08/12/2003	>100	>100	Pass	Yes	>100	>100	>100	Pass	No	1
06/12/2007					>100	>100		Pass	Yes	
09/16/2008					>100	>100		Pass	Yes	
08/07/2014					>100	>100		Pass	Yes	
08/30/2022					>100	>100		Pass	Yes	

Footnotes:

1. *Data Not Representative.* Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005. It may be appropriate to exclude data collected before July 1, 2005, unless 1) it shows repeated toxicity that was never resolved or 2) older data is all that is available, and no significant changes have occurred which obviously make it unrepresentative.
- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.

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

Attachment #1

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

According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC₅₀, IC₂₅ or IC₅₀ ≥ 100%).

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

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

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

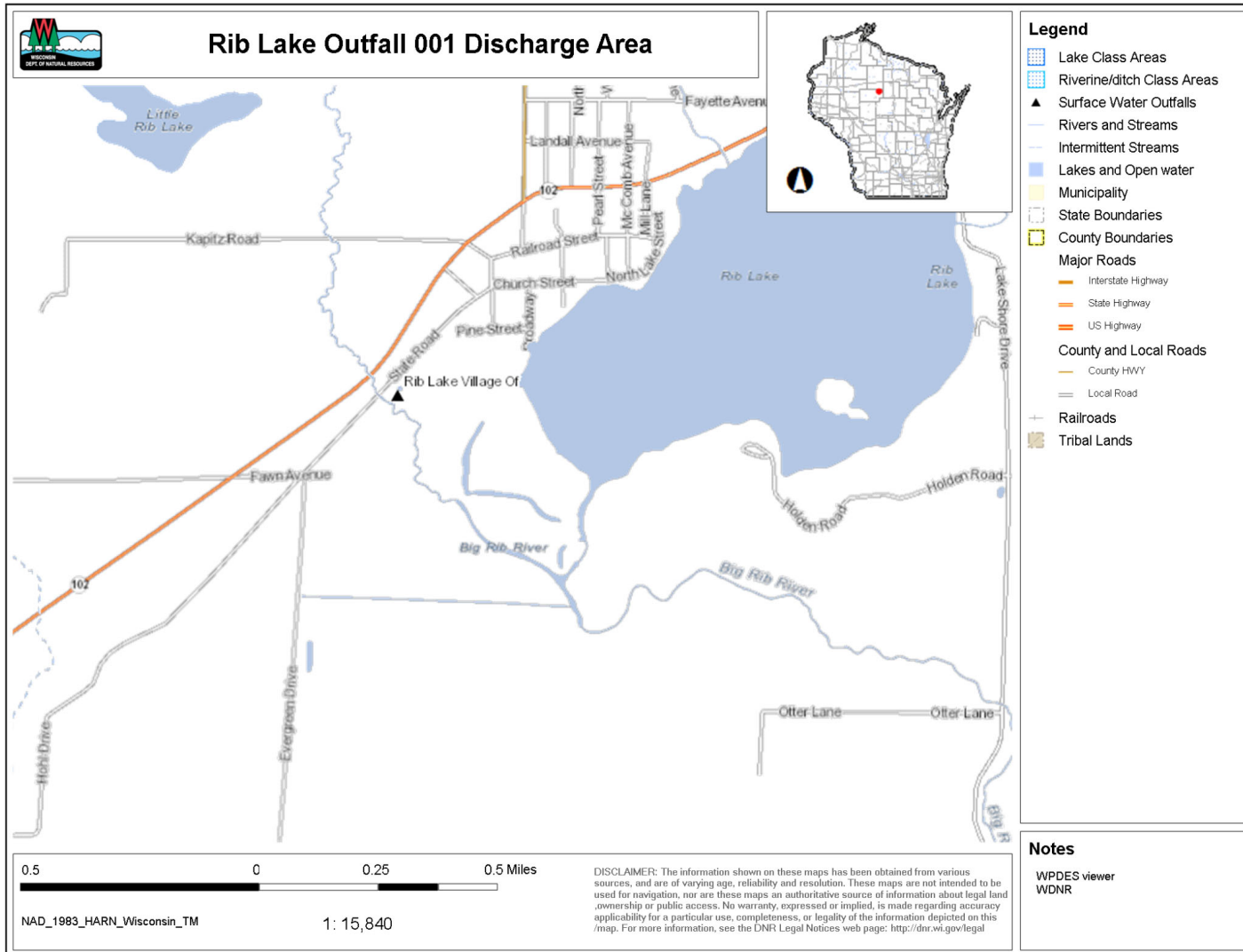
WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not applicable. 0 Points	IWC = 84%. 15 Points
Historical Data	One test used to calculate RP. No tests failed. No acute tests performed within last 5 years. 5 Points	Four tests used to calculate RP. No tests failed. 0 Points
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. 0 Points	Same as acute. 0 Points
Receiving Water Classification	Less than 4 mi to non-variance water. 5 Points	Same as acute. 5 Points
Chemical-Specific Data	Reasonable potential for limits for ammonia nitrogen based on ATC; chloride, copper, and zinc detected. Additional Compounds of Concern: No. 8 Points	Reasonable potential for limits for copper based on CTC; ammonia nitrogen limit carried over from the current permit. Chloride and zinc detected. Additional Compounds of Concern: No. 8 Points
Additives	No biocides and one water quality conditioner added. Permittee has proper P chemical SOPs in place: Yes. 1 Point	All additives used more than once per 4 days. 1 Point
Discharge Category	No industrial contributors. 0 Points	Same as acute. 0 Points
Wastewater Treatment	Secondary or better. 0 Points	Same as acute. 0 Points

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	Acute	Chronic
Downstream Impacts	No impacts known. 0 Points	Same as acute. 0 Points
Total Checklist Points:	19 Points	29 Points
Recommended Monitoring Frequency (from Checklist):	Two acute tests recommended.	Three chronic tests recommended.
Limit Required?	No.	No.
TRE Recommended? (from Checklist)	No.	No.

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, **2x acute and 3x chronic WET tests are recommended in the reissued permit.** Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).



Weekly & Monthly Ammonia Nitrogen Limits – January 2006 Limit Evaluation

Sheep Ranch Creek (WWSF Community)		Summer	Winter
Effluent Flow	Q _e (MGD)	0.2	0.2
Background Information	7-Q ₁₀ (cfs)	0.2	0.2
	7-Q ₂ (cfs)	0.46	0.46
	Ammonia (mg/L)	0.04	0.21
	Temperature (°C)	22	7
	pH (s.u.)	7.39	7.02
	% of Flow used	100	25
	Reference Weekly Flow (cfs)	0.2	0.05
	Reference Monthly Flow (cfs)	0.391	0.09775
Criteria mg/L	4-day Chronic		
	Early Life Stages Present	7.36	14.66
	Early Life Stages Absent		
	30-day Chronic		
	Early Life Stages Present	2.94	5.86
	Early Life Stages Absent		
Effluent Limitations mg/L	Weekly Average		
	Early Life Stages Present	12.09	16.99
	Early Life Stages Absent		
	Monthly Average		
	Early Life Stages Present	6.61	7.65
	Early Life Stages Absent		

Temperature Limits for Receiving Waters with Unidirectional Flow

(calculation using default ambient temperature data)

Facility:	Village of Rib Lake	7-Q₁₀:	0.24 cfs	Temp Dates		Flow Dates	
Outfall(s):	001	Dilution:	25%	Start:	10/01/18	End:	10/01/18
Date Prepared:	3/15/2024	f:	0	Start:	10/01/18	End:	10/01/18
Design Flow (Q_e):	0.200 MGD	Stream type:	Limited forage fish community				
Storm Sewer Dist.	0 ft	Q_s:Q_e ratio:	0.2 :1				
		Calculation Needed?	YES				

Month	Water Quality Criteria			Receiving Water Flow Rate (Q _s) (cfs)	Representative Highest Effluent Flow Rate (Q _e)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	T _a (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Q _{esl}) (MGD)	Daily Maximum Flow Rate (Q _{ea}) (MGD)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)		(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	37	54	78	0.39	0.118	0.142	0	46	47	63	96
FEB	39	54	79	0.37	0.134	0.188	0	43	44	61	92
MAR	43	57	80	0.44	0.326	0.457	0	43	44	60	86
APR	50	63	81	1	0.495	0.656	0	46	48	67	89
MAY	59	70	84	0.60	0.245	0.392	0	54	55	74	90
JUN	64	77	85	0.42	0.191	0.391	0	61	63	82	89
JUL	69	81	86	0.29	0.150	0.232	0	69	72	85	89
AUG	68	79	86	0.26	0.160	0.207	0	69	71	82	90
SEP	63	73	85	0.28	0.333	0.486	0	67	68	74	87
OCT	55	63	83	0.41	0.244	0.381	0	65	65	65	88
NOV	46	54	80	0.57	0.147	0.186	0	56	58	59	97
DEC	40	54	79	0.45	0.115	0.202	0	50	51	63	93