

Permit Fact Sheet

General Information

Permit Number:	WI-0020478-11-0	
Permittee Name:	CITY OF SUN PRAIRIE	
Address:	300 East Main Street	
City/State/Zip:	Sun Prairie WI 53590	
Discharge Location:	North bank of Koshkonong Creek, ¼ mile upstream of Bailey Road bridge. SE ¼ of SW ¼, Section 18, T8N, R11E.	
Receiving Water:	Koshkonong Creek (Upper Koshkonong Creek Watershed, LR12 – Lower Rock River Basin) in Dane County	
StreamFlow (Q _{7,10}):	0.02 cfs	
Stream Classification:	Limited Aquatic Life	
Discharge Type:	Existing, Continuous	
Design Flow(s)	Daily Maximum	10.26 MGD
	Weekly Maximum	8.73 MGD
	Monthly Maximum	7.53 MGD
	Annual Average	4.62 MGD
Significant Industrial Loading?	Hallman/Lindsay Paints; Imperial Blades; Devon’s Chocolates	
Operator at Proper Grade?	Yes. Facility is Advanced with subclasses A1 – Suspended Growth Processes, B – Solids Separation, C – Biological Solids/Sludges, P – Total Phosphorus, D – Disinfection, L – Laboratory, SS – Sanitary Sewage Collection System.	
Approved Pretreatment Program?	N/A	

Facility Description

The City of Sun Prairie operates a wastewater treatment facility providing tertiary level treatment to a combination of domestic, commercial, and industrial wastewater. The POTW serves the community of Sun Prairie and receives industrial discharge from Hallman Paints, Imperial Blades, and Devon’s Chocolates. Treatment consists of activated sludge treatment with biological phosphorus removal (chemical backup), step screen, vortex grit removal, primary and secondary clarifiers, influent and intermediate pump stations, gravity belt press, and sludge storage. Sludge is gravity thickened, anaerobically digested, dewatered and stored on-site prior to land application on DNR approved sites.

The facility completed an upgrade in 2022 that included facility-wide rehabilitations, upgrades, and expansions for increased capacity, a new sidestream pump station, and replacement of granular filter with disc filtration. The annual average design flow increased from 4.4 MGD to 4.62 MGD.

Substantial Compliance Determination

After a site visit on May 20, 2022, and a desk top review of all discharge monitoring reports, CMARs, land app reports, and compliance schedule items on April 18, 2024, this facility has been found to be in substantial compliance with their current permit.

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
701	3.60 MGD (Average October 2018 – March 2024)	Influent: 24-hr flow proportional composite samples collected after the fine screen and prior to grit removal. Ultrasonic flow meter located at the Parshall flume prior to grit removal.
001	3.62 MGD (Average October 2018 – December 2023)	Effluent: 24-hr flow proportional composite effluent samples shall be collected upstream of UV disinfection and grab samples prior to the step aerator, prior to discharge to Koshkonong Creek. Ultrasonic flow meter located at the Parshall flume downstream of the UV tank.
004	None reported. Outfall was not actively in use during the previous permit term.	Anaerobically digested, Liquid, Class B; Representative sludge samples of the anaerobic digester contents shall be collected when the outfall is in use. INACTIVE: DEPARTMENT APPROVAL REQUIRED TO ACTIVATE OUTFALL 004 MUST BE RECEIVED PRIOR TO USE.
006	677 U.S. tons (2023 Permit Application)	Anaerobically digested, Belt Pressed, Cake, Class B. Representative sludge samples shall be collected from the sludge storage building.
101	N/A Not Required	In-Plant Monitoring: Collect the mercury field blank using standard sample handling procedures.

1 Influent – Monitoring Requirements

Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Quarterly	24-Hr Flow Prop Comp	See 'Mercury Monitoring' section.

Changes from Previous Permit:

No changes from previous permit.

Explanation of Limits and Monitoring Requirements

BOD₅ and Total Suspended Solids: Tracking of BOD₅ and Suspended Solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and in the standard requirements section of the permit.

2 Inplant - Monitoring and Limitations

Sample Point Number: 101- GEN PLANT (Hg blank)

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

Changes from Previous Permit:

No changes from previous permit.

Explanation of Limits and Monitoring Requirements

A mercury field blank shall be collected using the clean hands/dirty hands sample collection technique for every day that mercury influent and effluent samples are collected.

3 Surface Water - Monitoring and Limitations

Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	
BOD ₅ , Total	Weekly Avg	5.0 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective May through October
BOD ₅ , Total	Weekly Avg	10 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective November through April
BOD ₅ , Total	Monthly Avg	5.0 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective May through October
BOD ₅ , Total	Monthly Avg	10 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective November through April
Suspended Solids, Total	Monthly Avg	10 mg/L	5/Week	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Suspended Solids, Total	Weekly Avg	330 lbs/day	5/Week	Calculated	Limit effective January, March, May, October, and December
Suspended Solids, Total	Weekly Avg	366 lbs/day	5/Week	Calculated	Limit effective February
Suspended Solids, Total	Weekly Avg	342 lbs/day	5/Week	Calculated	Limit effective April, June, and November
Suspended Solids, Total	Weekly Avg	301 lbs/day	5/Week	Calculated	Limit effective July
Suspended Solids, Total	Weekly Avg	252 lbs/day	5/Week	Calculated	Limit effective August
Suspended Solids, Total	Weekly Avg	253 lbs/day	5/Week	Calculated	Limit effective September
Suspended Solids, Total	Monthly Avg	250 lbs/day	5/Week	Calculated	Limit effective January, March, May, October, and December
Suspended Solids, Total	Monthly Avg	277 lbs/day	5/Week	Calculated	Limit effective February
Suspended Solids, Total	Monthly Avg	259 lbs/day	5/Week	Calculated	Limit effective April, June, and November
Suspended Solids, Total	Monthly Avg	228 lbs/day	5/Week	Calculated	Limit effective July
Suspended Solids, Total	Monthly Avg	191 lbs/day	5/Week	Calculated	Limit effective August and September
Dissolved Oxygen	Daily Min	7.0 mg/L	5/Week	Grab	
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	2/Week	Grab	Limit effective May through September
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Limit effective May through September
Nitrogen, Ammonia Variable Limit		mg/L	5/Week	24-Hr Flow Prop Comp	Look up the variable ammonia limit from the 'Variable Ammonia Limitation' table and report the variable limit in the Ammonia Variable Limit

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
					column on the eDMR.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	5/Week	24-Hr Flow Prop Comp	Report the daily maximum Ammonia result in the Nitrogen, Ammonia (NH3-N) Total column of the eDMR. See Ammonia Limitation Section.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	6.6 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective April
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	2.8 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective May through September
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	11 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective October through March
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	2.8 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective April
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	1.1 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective May through September
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	4.5 mg/L	5/Week	24-Hr Flow Prop Comp	Limit effective October through March
Chloride	Weekly Avg	400 mg/L	4/Month	24-Hr Flow Prop Comp	
Chloride	Monthly Avg	400 mg/L	4/Month	24-Hr Flow Prop Comp	
Chloride, Variable Limit		lbs/day	4/Month	See Table	Look up the chloride mass from the 'Variable Chloride Mass' table and report the variable limit in the Chloride Variable Limit column on the eDMR.
Chloride	Weekly Avg - Variable	lbs/day	4/Month	Calculated	Report the weekly average mass Chloride result in the Chloride column of the eDMR. See 'Chloride Mass Limit - Non-Wet Weather and Alternative Wet Weather Mass Limit' section.
Phosphorus, Total	Monthly Avg	0.225 mg/L	5/Week	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Total	6-Month Avg	0.075 mg/L	5/Week	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	21.2 lbs/day	5/Week	Calculated	Limit effective January
Phosphorus, Total	Monthly Avg	27 lbs/day	5/Week	Calculated	Limit effective February
Phosphorus, Total	Monthly Avg	23 lbs/day	5/Week	Calculated	Limit effective March
Phosphorus, Total	Monthly Avg	20.8 lbs/day	5/Week	Calculated	Limit effective April
Phosphorus, Total	Monthly Avg	18.4 lbs/day	5/Week	Calculated	Limit effective May
Phosphorus, Total	Monthly Avg	16.4 lbs/day	5/Week	Calculated	Limit effective June
Phosphorus, Total	Monthly Avg	12.8 lbs/day	5/Week	Calculated	Limit effective July
Phosphorus, Total	Monthly Avg	11.7 lbs/day	5/Week	Calculated	Limit effective August
Phosphorus, Total	Monthly Avg	13.7 lbs/day	5/Week	Calculated	Limit effective September
Phosphorus, Total	Monthly Avg	14.5 lbs/day	5/Week	Calculated	Limit effective October
Phosphorus, Total	Monthly Avg	17.3 lbs/day	5/Week	Calculated	Limit effective November
Phosphorus, Total	Monthly Avg	18.2 lbs/day	5/Week	Calculated	Limit effective December
Mercury, Total Recoverable		ng/L	Quarterly	Grab	
Temperature Maximum		deg F	Daily	Continuous	Monitoring only in 2028.
PFOS		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
PFOA		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	Quarterly	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annually in rotating quarters. See 'WET Monitoring' section for sample dates and WET requirements.
Chronic WET	Monthly Avg	1.0 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annually in rotating quarters. See 'WET Monitoring' section for sample dates and WET requirements.

Changes from Previous Permit

E. coli: Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits. See additional explanation of limits under “Explanation of Limits and Monitoring Requirements” below.

Chloride: A monthly average concentration limit and an alternative wet weather mass limit has been included in the permit.

Temperature: The monitoring year for this parameter has been updated to 2028. The monitoring frequency has been changed to daily to reflect the existing temperature meter at the plant.

PFOS and PFOA: Monitoring once every two months is included in the permit in accordance with s. NR 106.98(2)(b), Wis. Adm. Code.

Chronic WET: The monthly average limit has been updated with the new instream waste concentration (IWC) of 100%.

Explanation of Limits and Monitoring Requirements

Please refer to the Water Quality Based Effluent Limits memo for the Sun Prairie Wastewater Treatment Facility prepared by Sarah Luck, dated March 11, 2024, and used for reissuance.

BOD₅, Total Suspended Solids, pH, and DO: No changes are recommended in the categorical permit limitations for BOD₅, total suspended solids, pH, and dissolved oxygen. Because the water quality criteria and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.

TMDL: A total maximum daily load (TMDL) was developed for the Rock River Basin to determine the maximum amounts of phosphorus and sediment that can be discharged to protect and improve water quality. The Rock River Basin’s TMDL was approved by the Environmental Protection Agency (EPA) in September 2011. These final effluent limits were derived from and comply with the applicable water quality criterion and is consistent with the assumptions and requirements of the EPA-approved WLA for the Rock River. The entire report can be found at: http://dnr.wi.gov/topic/TMDLs/RockRiver/Final_Rock_River_TMDL_Report_with_Tables.pdf. The proposed permit includes limitations and requirements necessary to implement the recommendations of the TMDL. For specific limits see below.

- **Suspended Solids, Total:** These limits are in addition to the concentration limit for suspended solids. The approved total suspended solids TMDL limits for this permittee are included in the following table, expressed as weekly average and monthly average effluent limits, and were already effective during the previous permit term:

Total Suspended Solids (TSS) Effluent Limits

Month	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)
Jan	250	330
Feb	277	366
March	250	330
April	259	342
May	250	330
June	259	342
July	228	301
Aug	191	252
Sept	191	253
Oct	250	330
Nov	259	342
Dec	250	330

- Phosphorus:** Waste load allocations specified in TMDLs are expressed as WQBELs (water quality based effluent limits). The waste load allocated-derived WQBELs are consistent with the assumptions and requirements of the approved Rock River TMDL. The approved total phosphorus TMDL limits for this permittee are included in the following table, expressed as monthly average effluent limits, and were already effective during the previous permit term:

Total Phosphorus (TP) Effluent Limits

Month	Monthly Ave Total P Effluent Limit (lbs/day)
Jan	21.2
Feb	27.0
March	23.0
April	20.8
May	18.4
June	16.4
July	12.8
Aug	11.7
Sept	13.7
Oct	14.5
Nov	17.3
Dec	18.2

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. The new rule requires that WPDES permits for

facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period, and establish effluent limitations for E. coli established in s. NR 210.06 (2), Wis. Adm. Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to E. coli to protect recreation in ch. NR 102, Wis. Adm. Code.; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code.; revised permit requirements for publicly and privately owned sewage treatment works in ch. NR 210, Wis. Adm. Code.; and, updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code.

E. coli monitoring is required at the permit effective date. E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 410 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply.

Ammonia: Current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Tables 2C and 4B of ch. NR 105, Wis. Adm. Code. Subchapter IV of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for ammonia.

Chloride: Acute and chronic chloride toxicity criteria for the protection of aquatic life are included in Tables 1 and 5 of ch. NR 105, Wis. Adm. Code. Subchapter VII of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for chloride. If the permittee's effluent data shows that a calculated WQBEL for chloride cannot be met, then the permit will include a chloride effluent limitation. The permittee's effluent data exceeds the calculated limitation based on chronic toxicity (395 mg/L) therefore implementation of Source Reduction Measures shall continue. The weekly average limit of 400 mg/L and weekly average limit of 14,500 lbs/day are already in effect. An additional monthly average limit is required to comply with the federal regulation 40 CFR 122.45(d) and ss. NR 106.07(4) and NR 205.065(7), Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average limits. An alternative wet weather mass limit is included in accordance with s. NR 106.07(9), Wis. Adm. Code.

Phosphorus: Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. All phosphorus limits are already in effect.

Mercury: Requirements for mercury are included in s. NR 106.145 Wis. Adm. Code. (See <http://dnr.wi.gov/topic/Mercury/>)

Thermal: Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. Thermal discharges must meet the Public Health criterion of 120 degrees F and the Fish & Aquatic Life criteria which are established to protect aquatic communities from lethal and sub-lethal thermal effects.

PFOS and PFOA: NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for major municipal dischargers with an average flow rate greater than 1 MGD but less than 5 MGD, at a minimum sample effluent once every two-months for PFOS and PFOA pursuant s. NR 106.98(2)(b), Wis. Adm. Code.

A sample frequency of 1/2 months means one sample is taken during any two-month period. Examples of 1/2 month sample would be every other month (Jan, March, May, etc.) or back-to-back months with a break in between (February & March, May & June, Aug & Sept, etc.). DMR Short Forms will be generated for the following time periods: January-February, March-April, May-June, July-August, September-October, and November-December. At a minimum one sample result will be present on each form.

The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

Total Nitrogen Monitoring (NO₂+NO₃, TKN and Total N): The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under §§ 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from

the point source, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. Quarterly effluent monitoring for Total Nitrogen is included in the permit because of the potential for higher nitrogen loading resulting from higher flows (major facilities), higher concentrations, or both. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the “Guidance for Total Nitrogen Monitoring in Wastewater Permits” dated October 1, 2019.

Whole Effluent Toxicity: Whole effluent toxicity (WET) testing requirements and limits (if applicable) are determined in accordance with ss. NR 106.08 and NR 106.09 Wis. Adm. Code, as revised August 2016. (See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at <http://dnr.wi.gov/topic/wastewater/wet.html>. Annual acute and chronic WET tests in rotating quarters are scheduled during the permit term.

Monitoring Frequencies: The [Monitoring Frequencies for Individual Wastewater Permits](#) guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. No changes were made to sampling frequency after this evaluation.

4 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)
004	B	Liquid	Anaerobic Digestion	Volatile Solids Reduction	Land Application	20
006	B	Cake	Anaerobic Digestion	Volatile Solids Reduction	Land Application	677
Does sludge management demonstrate compliance? Yes.						
Is additional sludge storage required? No.						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No.						
If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						
Is a priority pollutant scan required? No, design flow is less than 5 MGD.						
Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

Sample Point Number: 004- SLUDGE and 006- SLUDGE (Belt Pressed)

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	January - December 2025
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	January - December 2025
Solids, Total		Percent	Quarterly	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Quarterly	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Quarterly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Quarterly	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Quarterly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Quarterly	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Quarterly	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Quarterly	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Quarterly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Quarterly	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	
Nitrogen, Ammonium (NH ₄ -N) Total		Percent	Quarterly	Composite	
Phosphorus, Total		Percent	Quarterly	Composite	
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
PFOA + PFOS		µg/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

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

Outfall 004 has been added to the permit. This outfall is used during digester cleanouts and it is anticipated use will occur during this 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) Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) Wis. Adm. Code, for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k) Wis. Adm. Code. Radium requirements are addressed in s. NR 204.07(3)(n) Wis. Adm. Code.

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA 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.

5 Schedules

5.1 Chloride Source Reduction Measures

The permittee shall comply with the WQBELs for Chloride and perform the following actions.

Required Action	Due Date
Final Chloride Report: Submit a report summarizing the chloride source reduction measures implemented during the current permit term and the success in maintaining effluent quality at or below the current concentrations. The report shall include an analysis of trends in weekly, monthly, and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data covering the current permit term. The report shall include an analysis of how	06/30/2029

effluent chloride varies with time and with significant loadings of chloride.

Explanation of Schedule

The schedule requires that annual reports shall indicate which source reduction measures have been implemented during each calendar year, and an analysis of chloride concentration and mass discharge data based on chloride sampling and flow data.

5.2 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
<p>Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code.</p> <p>This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.</p>	06/30/2025
<p>Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan.</p> <p>This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.</p> <p>The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan.</p> <p>If the department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for department approval no later than 90 days after written notification was sent from the department. The department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued.</p> <p>If, however, the department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.</p>	06/30/2026

Explanation of Schedule

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

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

Special Reporting Requirements

None.

Other Comments:

None.

Attachments:

Water Quality Based Effluent Limits, dated March 11, 2024.

Expiration Date:

June 30, 2029

Justification Of Any Waivers From Permit Application Requirements

No waivers were requested or given from permit application requirements.

Prepared By: BetsyJo Howe, Wastewater Specialist

Date: 4/3/2024

Updated (based on fact check): Editorial changes for clarity. 5/6/2024

Updated (based on public notice):

CORRESPONDENCE/MEMORANDUM

DATE: March 11, 2024

TO: BetsyJo Howe – SCR/Fitchburg

FROM: Sarah Luck – SCR/Fitchburg

SUBJECT: Water Quality-Based Effluent Limitations for Sun Prairie Wastewater Treatment Facility
WPDES Permit No. WI-0020478-11-0

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 Sun Prairie Wastewater Treatment Facility in Dane County. This municipal wastewater treatment facility (WWTF) discharges to Koshkonong Creek, located in the Upper Koshkonong Creek Watershed in the Lower Rock River Basin. This discharge is included in the Rock River TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD ₅ May - October November - April			5.0 mg/L 10 mg/L	5.0 mg/L 10 mg/L		2,3
TSS				10 mg/L		4
Dissolved Oxygen		7.0 mg/L				2
pH	9.0 s.u.	6.0 s.u.				2
Bacteria <i>E. coli</i>				126 #/100 mL geometric mean		5
Ammonia Nitrogen April May – September October – March	Variable Variable Variable		6.6 mg/L 2.8 mg/L 11 mg/L	2.8 mg/L 1.1 mg/L 4.5 mg/L		2,6
Phosphorus				0.225 mg/L	0.075 mg/L	4,7
Chloride Concentration Limit Mass Limit Wet Weather Mass Limit			400 mg/L 14,500 lbs/day 28,800 lbs/day	400 mg/L		3,8
Mercury						2
PFOS and PFOA						9
Temperature						10
TKN, Nitrate+Nitrite, and Total Nitrogen						11
Acute WET						12,14

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Chronic WET				1.0 TU _c		13,14

Footnotes:

1. Monitoring only.
2. No changes from the current permit.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are included in bold.
4. Additional phosphorus and TSS mass limitations are required in accordance with the wasteload allocations specified in the Rock River TMDL.

Month	Monthly Ave Total P Effluent Limit (lbs/day)	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)
Jan	21.2	250	330
Feb	27.0	277	366
March	23.0	250	330
April	20.8	259	342
May	18.4	250	330
June	16.4	259	342
July	12.8	228	301
Aug	11.7	191	252
Sept	13.7	191	253
Oct	14.5	250	330
Nov	17.3	259	342
Dec	18.2	250	330

5. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
6. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values shall be used in place of a single daily maximum limit.


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	63	7.0 < pH ≤ 7.1	38	8.0 < pH ≤ 8.1	8.2
6.1 < pH ≤ 6.2	62	7.1 < pH ≤ 7.2	34	8.1 < pH ≤ 8.2	6.7
6.2 < pH ≤ 6.3	61	7.2 < pH ≤ 7.3	31	8.2 < pH ≤ 8.3	5.5
6.3 < pH ≤ 6.4	59	7.3 < pH ≤ 7.4	27	8.3 < pH ≤ 8.4	4.6
6.4 < pH ≤ 6.5	57	7.4 < pH ≤ 7.5	24	8.4 < pH ≤ 8.5	3.7
6.5 < pH ≤ 6.6	55	7.5 < pH ≤ 7.6	20	8.5 < pH ≤ 8.6	3.1
6.6 < pH ≤ 6.7	53	7.6 < pH ≤ 7.7	17	8.6 < pH ≤ 8.7	2.6
6.7 < pH ≤ 6.8	50	7.7 < pH ≤ 7.8	15	8.7 < pH ≤ 8.8	2.2
6.8 < pH ≤ 6.9	46	7.8 < pH ≤ 7.9	11	8.8 < pH ≤ 8.9	1.9
6.9 < pH ≤ 7.0	43	7.9 < pH ≤ 8.0	10	8.9 < pH ≤ 9.0	1.6

7. All phosphorus limits are in effect.
8. These are the WQBELs for chloride. The wet weather mass limit applies when the dry weather mass limit is exceeded and the facility demonstrates to the Department the exceedance occurred during a wet weather event. Source reduction measures should also continue.
9. PFOS and PFOA monitoring is recommended at a once every two months frequency.
10. Monitoring for temperature for one year is recommend.

11. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major permittees. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (TKN) (all expressed as N).
12. Annual acute WET tests are required since Sun Prairie is a major municipal discharger.
13. Annual chronic WET tests are required since Sun Prairie is a major municipal discharger and since there is a chronic WET limit. The Instream Waste Concentration (IWC) to assess chronic test results is 100%. 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 Koshkonong Creek.
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 Sarah Luck (Sarah.Luck@wisconsin.gov) or Diane Figiel (Diane.Figiel@wisconsin.gov).

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

PREPARED BY:  Date: March 11, 2024
Sarah Luck
Water Resources Engineer

E-cc: Ashley Brechlin, Wastewater Engineer – SCR/Fitchburg
Tom Bauman, Regional Wastewater Supervisor – SCR/Fitchburg
Diane Figiel, Water Resources Engineer – WY/3
Kari Fleming, Environmental Toxicologist – WY/3
Nate Willis, Wastewater Engineer – WY/3

**Water Quality-Based Effluent Limitations for
Sun Prairie Wastewater Treatment Facility**

WPDES Permit No. WI-0020478-11-0

PART 1 – BACKGROUND INFORMATION

Facility Description

The Sun Prairie Wastewater Treatment Facility provides treatment to a combination of domestic, commercial, and industrial (Hallman Paints and Imperial Blades) wastewater. Treatment consists of activated sludge treatment with biological phosphorus removal (chemical backup), step screen, vortex grit removal, primary and secondary clarifiers, influent and intermediate pump stations, gravity belt press, and sludge storage. Sludge is gravity thickened, anaerobically digested, dewatered, and stored on-site prior to land application on DNR approved sites.

The facility underwent an upgrade that was completed in 2022 that included facility-wide rehabilitations, upgrades, and expansions for increased capacity, a new sidestream pump station, and replacement of granular filter with disc filtration. The annual average design flow increased from 4.4 MGD to 4.62 MGD.

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

Existing Permit Limitations

The current permit, which expired September 30, 2023, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnote
Flow Rate						1
BOD ₅ May - October November - April			5.0 mg/L 10 mg/L	5.0 mg/L 10 mg/L		2,3
TSS				10 mg/L		2,4
Dissolved Oxygen		7.0 mg/L				2
pH	9.0 s.u.	6.0 s.u.				2
Fecal Coliform May - September			780#/100 mL geometric mean	400#/100 mL geometric mean		3
Ammonia Nitrogen April May – September October – March	Variable Variable Variable		6.6 mg/L 2.8 mg/L 11 mg/L	2.8 mg/L 1.1 mg/L 4.5 mg/L		5
Chloride			400 mg/L 14,500 lbs/day			6

Attachment #1

Phosphorous Interim Limit Final Limit				1.0 mg/L 0.225 mg/L	0.075 mg/L	4
Temperature						1
Mercury						1
WET Acute Chronic				1.2 TUc		7

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Since the water quality criteria (WQC) and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) are included in bold.
4. Additional phosphorus and TSS mass limitations are required in accordance with the wasteload allocations specified in the Rock River TMDL. A compliance schedule is included in the permit to meet the final phosphorus WQBELs by October 1, 2022.

Month	Monthly Ave Total P Effluent Limit (lbs/day)	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)
Jan	21.2	250	330
Feb	27.0	277	366
March	23.0	250	330
April	20.8	259	342
May	18.4	250	330
June	16.4	259	342
July	12.8	228	301
Aug	11.7	191	252
Sept	13.7	191	253
Oct	14.5	250	330
Nov	17.3	259	342
Dec	18.2	250	330

5. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values was included in the permit.

Effluent pH s.u.	NH ₃ -N Limit mg/L	Effluent pH s.u.	NH ₃ -N Limit mg/L	Effluent pH s.u.	NH ₃ -N Limit mg/L
6.0 < pH ≤ 6.1	63	7.0 < pH ≤ 7.1	38	8.0 < pH ≤ 8.1	8.2
6.1 < pH ≤ 6.2	62	7.1 < pH ≤ 7.2	34	8.1 < pH ≤ 8.2	6.7
6.2 < pH ≤ 6.3	61	7.2 < pH ≤ 7.3	31	8.2 < pH ≤ 8.3	5.5
6.3 < pH ≤ 6.4	59	7.3 < pH ≤ 7.4	27	8.3 < pH ≤ 8.4	4.6
6.4 < pH ≤ 6.5	57	7.4 < pH ≤ 7.5	24	8.4 < pH ≤ 8.5	3.7
6.5 < pH ≤ 6.6	55	7.5 < pH ≤ 7.6	20	8.5 < pH ≤ 8.6	3.1
6.6 < pH ≤ 6.7	53	7.6 < pH ≤ 7.7	17	8.6 < pH ≤ 8.7	2.6

Attachment #1

Effluent pH s.u.	NH ₃ -N Limit mg/L	Effluent pH s.u.	NH ₃ -N Limit mg/L	Effluent pH s.u.	NH ₃ -N Limit mg/L
6.7 < pH ≤ 6.8	50	7.7 < pH ≤ 7.8	15	8.7 < pH ≤ 8.8	2.2
6.8 < pH ≤ 6.9	46	7.8 < pH ≤ 7.9	11	8.8 < pH ≤ 8.9	1.9
6.9 < pH ≤ 7.0	43	7.9 < pH ≤ 8.0	10	8.9 < pH ≤ 9.0	1.6

6. Final chloride limits went into effect September 1, 2023.
7. Annual acute and annual chronic WET testing. The IWC for chronic WET was 85%.

Receiving Water Information

- Name: Koshkonong Creek
- Waterbody Identification Code (WBIC): 808800
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Limited aquatic life upstream from first bridge above Sun Prairie STP (as listed in ch. NR 104, Wis. Adm. Code).
- Flow: The following 7-Q₁₀ and 7-Q₂ values are from USGS for Station LR31, where Outfall 001 is located. The Harmonic Mean has been estimated as recommended in *State of Wisconsin Water Quality Rules Implementation Plan* (Publ. WT-511-98)
 - 7-Q₁₀ = 0.02 cfs (cubic feet per second)
 - 7-Q₂ = 0.06 cfs
 - 90-Q₁₀ = 0.051 cfs
 - Harmonic Mean Flow = 0.25 cfs
- Downstream Flow: Approximately 2.5 miles downstream the following 7-Q₁₀ and 7-Q₂ values are from USGS for Station LR1A, where Koshkonong Creek changes stream classification from a limited aquatic life system to a warm water sport fishery.
 - 7-Q₁₀ = 1.2 cfs (cubic feet per second)
 - 7-Q₂ = 2.3 cfs
 - 90-Q₁₀ = 1.96 cfs
 - Harmonic Mean Flow = 2.94 cfs
- Hardness = 349 mg/L as CaCO₃. This value represents the geometric mean of data (n=10) from WET testing conducted from October 2018 through April 2023.
- % 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 Koshkonong Creek is used for this evaluation. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are several other dischargers to Koshkonong Creek; however, they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: The entire length of Koshkonong Creek was listed as impaired for phosphorus in April 2012.

Effluent Information

- Flow rates:
 - Design annual average = 4.62 MGD (Million Gallons per Day)
 - Peak daily = 10.26 MGD
 - Peak weekly = 8.73 MGD

Attachment #1

Peak monthly = 7.53 MGD

For reference, the actual average flow from October 2018 through December 2023 was 3.62 MGD.

- Hardness = 376 mg/L as CaCO₃. This value represents the geometric mean of data (n=4) from January and February 2023 reported on the permit application.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic, commercial, and industrial (Hallman Paints, Imperial Blades, and Devon's Chocolates) wastewater with water supply from wells.
- Additives: Ferric sulfate (phosphorus removal)
- Effluent characterization: This facility is categorized as a major municipal, so the permit application required effluent sample analyses for all the “priority pollutants” except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code. The permit-required monitoring for mercury is used in this evaluation.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Copper Effluent Data

Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)
1/19/2023	4.65	2/4/2023	5.43	2/20/2023	3.32
1/23/2023	5.14	2/8/2023	4.75	2/24/2023	3.71
1/27/2023	4.39	2/12/2023	4.86	2/28/2023	3.36
1/31/2023	4.42	2/16/2023	3.83		
1-day P ₉₉ = 6.26 µg/L					
4-day P ₉₉ = 5.24 µg/L					

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

Chloride Effluent Data

	(mg/L)	(lbs/day)
1-day P ₉₉	459	14,987
4-day P ₉₉	398	12,460
30-day P ₉₉	363	11,028
Mean	343	10,265
Std	44.4	1,744.6
Sample size	252	252
Range	229 - 490	6,256 – 17,240

Mercury Effluent Data

	(ng/L)
1-day P ₉₉	2.2
4-day P ₉₉	1.4
30-day P ₉₉	0.83
Mean	0.60
Std	0.45

Attachment #1

	(ng/L)
Sample size	21 (3 ND)
Range	<0.16 - 2.3

“<” means that the pollutant was not detected (ND) 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 through December 2023 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	Average Mass Discharged
BOD ₅	2 mg/L*	
TSS	2 mg/L*	55.4 lbs/day*
pH field	7.6 s.u.	
Phosphorus	0.05 mg/L*	1.51 lbs/day
Ammonia Nitrogen	0.17 mg/L*	
Chloride	343 mg/L	

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

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

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

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or 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)

Attachment #1

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.

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, chloride (mg/L), and mercury (ng/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0.02 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	10.00	340.5	68.1	<0.151		
Cadmium	376	131.9	0.20	132.1	26.4	<0.148		
Chromium	301	4446	3.00	4455.8	891	<2.26		
Copper	376	54.1	3.00	54.3			6.26	5.43
Lead	356	365	3.00	365.5	73.1	<0.155		
Mercury (ng/L)		830	0.20	831.9			2.2	2.3
Nickel	268	1080	20.00	1082.7	217	2.81		
Zinc	333	345	20.00	345.4	69.1	32.9		
Chloride (mg/L)		757	67.48	758.5			459	490

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

** 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 = 0.005 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	10	152	30.5	<0.151	
Cadmium	175	3.82	0.20	3.82	0.8	<0.148	
Chromium	301	325.75	3	326	65.2	<2.26	
Copper	349	30.18	3	30.2			5.24
Lead	349	93.77	3	93.8	18.8	<0.155	

Attachment #1

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P ₉₉
Mercury (ng/L)		440	0.20	440			1.4
Nickel	268	169.08	20	169	33.8	2.81	
Zinc	333	344.68	20	345	69.0	32.9	
Chloride (mg/L)		395	67.48	395			398

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

Monthly Average Limits based on Wildlife Criteria (WC)

RECEIVING WATER FLOW = 0.01 cfs (¼ of the 90-Q₁₀), as specified in s. NR 106.06(4), Wis. Adm. Code

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	30-day P ₉₉
Mercury (ng/L)	1.3	0.20	1.3		0.83

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0.06 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.	30-day P ₉₉
Cadmium	880	0.20	888	177.5	<0.148	
Chromium (+3)	8400000	3	8472247	1694449	<2.26	
Lead	2240	3	2259	451.8	<0.155	
Mercury (ng/L)	336	0.20	338.9			0.83
Nickel	110000	20	110946	22189	2.81	
Benzene	4000		4034	806.9	0.29	
Toluene	280000		282408	56482	0.32	

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0.06 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	40	10	40.3	8.05	<0.151
Benzene	1300		1311	262.2	0.29

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

Conclusions and Recommendations

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

Chloride – Considering available effluent data from the current permit term (October 2018 through December 2023), the 1-day P₉₉ chloride concentration is 459 mg/L, and the 4-day P₉₉ of effluent data is 398 mg/L. Since the 4-day P₉₉ exceeds the calculated limitation based on chronic toxicity (395 mg/L), **weekly average concentration and mass effluent limits are needed** in accordance with s. NR 106.05(4)(b), Wis. Adm. Code. The chronic mass limitation of 15,200 lbs/day is based on the concentration limit and the design annual average flow rate of 4.62 MGD ($395 \text{ mg/L} \times 4.62 \text{ MGD} \times 8.34$) in accordance with s. NR 106.07(2)(c), Wis. Adm. Code. However, a chloride mass limit of 14,500 lbs/day, based on the previous design flow rate of 4.4 MGD, went into effect September 1, 2023 and therefore the limit cannot be relaxed without a demonstration of need in accordance with ch. NR, 207, Wis. Adm. Code.

An alternative wet weather mass limit of 28,800 lbs/day ($395 \text{ mg/L} \times 8.73 \text{ MGD} \times 8.34$) **should also be included** in accordance with s. NR 106.07(9), Wis. Adm. Code. The peak weekly design flow was used to calculate the wet weather mass limit. The wet weather mass limit applies when the dry weather mass limit is exceeded and the facility demonstrates to the Department the exceedance occurred during a wet weather event.

A monthly average concentration limit of 400 mg/L should be included in the permit for expression of limit requirements per s. NR 106.07(4), Wis. Adm. Code, as follows:

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

Mercury – The WQBEL for total recoverable mercury is set equal to the most stringent criterion of 1.3 ng/L, according to s. NR 106.06(6), Wis. Adm. Code, because the background concentration in the receiving water and similar inland streams is known to exceed 1.3 ng/L. The current permit requires quarterly monitoring of the influent and effluent for total recoverable mercury. A total of 21 effluent sampling results are available from October 2018 through December 2023 for total recoverable mercury. The average concentration was 0.60 ng/L, and the maximum was 2.3 ng/L. Since the 30-day P₉₉ of available data (0.83 ng/L) is less than the most stringent WQBEL of 1.3 ng/L, **no WQBEL for mercury is required for permit reissuance. Quarterly mercury monitoring is recommended to continue, consistent with other major municipal dischargers.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Previous monitoring produced a PFOS result of 0.697 ng/L and a PFOA result of 12.7 ng/L. These results are less than one fifth of the respective criteria for each substance. However, based on the effluent flow rate (greater than 1 MGD), **PFOS and PFOA monitoring is recommended at a frequency of once every two months.**

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

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105,

Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average, and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- The maximum expected effluent pH has changed.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

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

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

Where:

- A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
- A = 0.633 and B = 90.0 for Limited Aquatic Life, and
- pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1918 sample results were reported from October 2018 through December 2023. The maximum reported value was 8.20 s.u. (Standard pH Units). The effluent pH was 8.11 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 8.15 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 8.13 s.u. Therefore, a value of 8.11 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 8.11 s.u. into the equation above yields an ATC = 10.5 mg/L.

Ammonia Decay

The Department must establish limits to protect downstream uses, according to s. NR 106.32(1)(b), Wis. Adm. Code. Ammonia decay may be considered when determining limits at the outfall to protect the downstream classification, according to s. NR 106.32(4)(c), Wis. Adm. Code. Where the calculated limits are more restrictive based on downstream uses, ammonia decay can be considered to determine if these more restrictive limits are needed or if the ammonia will decay before it reaches the point of the classification change.

Ammonia decay rates are dependent on temperature with in-stream nitrification essentially non-existent in the winter. In-stream decay is expected so a first order decay model should be used. Based on the available literature, a decay rate of 0.25 day⁻¹ at 20°C has been suggested as a default rate. A temperature correction factor of θ = 1.08 is (k_t = k₂₀ θ^(T-20)). The ammonia nitrogen decay equation is provided below.

$$N_{Limit} = \left(\frac{N_{down}}{EXP(-k_t T)} \right)$$

- Where: N_{Limit} = Ammonia limit needed to protect downstream use (mg/L)
- N_{down} = Ammonia limit calculated based on downstream classification and flow (mg/L)
- k_t = Ammonia decay rate at background stream temperature (day⁻¹)
- T = Travel time from outfall to downstream use (day)

Attachment #1

The velocity of receiving water is assumed to be 5 miles per day, and the distance from the point of discharge to the classification change is approximately 2.5 miles for a travel time of 0.5 days. This equation shows that at the location where the classification change, 94% of the ammonia is remaining (average for year-round).

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code, daily maximum ammonia limitations are calculated using the 1-Q₁₀ receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	2×ATC	1-Q ₁₀
LAL	21	11
Warmwater	14	7.7
Warmwater (decay consideration)	NA - 1-Q ₁₀ is more restrictive	8.2

The 1-Q₁₀ method, accounting for downstream decay at the classification change, yields the most stringent limits for Sun Prairie Wastewater Treatment Facility.

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

Daily Maximum Ammonia Nitrogen Limits – WWSF (after decay)

Effluent pH s.u.	NH ₃ -N Limit mg/L	Effluent pH s.u.	NH ₃ -N Limit mg/L	Effluent pH s.u.	NH ₃ -N Limit mg/L
6.0 < pH ≤ 6.1	63	7.0 < pH ≤ 7.1	38	8.0 < pH ≤ 8.1	8.2
6.1 < pH ≤ 6.2	62	7.1 < pH ≤ 7.2	34	8.1 < pH ≤ 8.2	6.7
6.2 < pH ≤ 6.3	61	7.2 < pH ≤ 7.3	31	8.2 < pH ≤ 8.3	5.5
6.3 < pH ≤ 6.4	59	7.3 < pH ≤ 7.4	27	8.3 < pH ≤ 8.4	4.6
6.4 < pH ≤ 6.5	57	7.4 < pH ≤ 7.5	24	8.4 < pH ≤ 8.5	3.7
6.5 < pH ≤ 6.6	55	7.5 < pH ≤ 7.6	20	8.5 < pH ≤ 8.6	3.1
6.6 < pH ≤ 6.7	53	7.6 < pH ≤ 7.7	17	8.6 < pH ≤ 8.7	2.6
6.7 < pH ≤ 6.8	50	7.7 < pH ≤ 7.8	15	8.7 < pH ≤ 8.8	2.2
6.8 < pH ≤ 6.9	46	7.8 < pH ≤ 7.9	11	8.8 < pH ≤ 8.9	1.9
6.9 < pH ≤ 7.0	43	7.9 < pH ≤ 8.0	10	8.9 < pH ≤ 9.0	1.6

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

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in Attachment #3.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from October 2018 through December 2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Sun Prairie Wastewater Treatment Facility 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

Ammonia Nitrogen mg/L	April	May - September	October - March
1-day P ₉₉	0.73	1.86	1.97
4-day P ₉₉	0.40	1.06	1.15
30-day P ₉₉	0.17	0.44	0.48
Mean *	0.06	0.18	0.17
Std	0.26	0.54	0.60
Sample size	106 (67 ND)	554 (211 ND)	715 (259 ND)
Range	<0.039 - 1.011	<0.039 - 3.80	<0.039 - 6.34

**“<” 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 (ND) result.

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits. However, since the permit currently has daily maximum, weekly average, and monthly average limits year-round, **the limits must be retained regardless of reasonable potential**, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

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

Conclusions and Recommendations

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

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
April	Variable	6.6 mg/L	2.8 mg/L
May – September	Variable	2.8 mg/L	1.1 mg/L
October – March	Variable	11 mg/L	4.5 mg/L

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

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

Attachment #1

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

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

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season.

Effluent Data

Sun Prairie Wastewater Treatment Facility has monitored effluent *E. coli* from July 2022 through September 2023 and a total of 71 results are available. A geometric mean of 126 counts/100 mL was not exceeded, and the maximum monthly geometric mean was 39.7 counts/100 mL. Effluent data did not exceed 410 counts/100 mL; the maximum reported value was 224.7 counts/100 mL (except for a value of 2419.6 reported on 9/26/2022 which was excluded since it was believed to have been a input error). Based on this effluent data, it appears **that the facility can meet new *E. coli* limits and a compliance schedule is not needed** in the reissued permit.

PART 5 – PHOSPHORUS

Technology Based Effluent Limit (TBEL)

Sun Prairie Wastewater Treatment Facility currently has a limit of 1.0 mg/L. **The TBEL limit of 1.0 mg/L is now removed since more stringent WQBELs are now in effect.**

Water Quality Based Limit

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

TMDL Limits

The Department has developed a TMDL for the Upper and Lower Rock River Basins. The US EPA approved the Rock River TMDL on September 28, 2011. The document, along with the referenced appendices, can be found at: <https://dnr.wisconsin.gov/topic/TMDLs/RockRiver/index.html>.

The monthly average total phosphorus effluent limits in pounds per day (lbs/day) are calculated based on the monthly phosphorus wasteload allocation (WLA) given in pounds per month as suggested in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* dated April 15, 2013. The WLA for this facility is found in the *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin* report dated July 2011. The equivalent concentration limits are 0.30 mg/L to 0.70 mg/L at the design flow of 4.62 MGD. **Monthly average mass effluent limits in accordance with the following table are recommended for this**

discharge.

Total Phosphorus Effluent Limitations

Month	Monthly Total P WLA ¹ (lbs/month)	Days Per Month	Monthly Ave Total P Effluent Limit ² (lbs/day)
Jan	657.41	31	21.2
Feb	756.33	28	27.0
March	713.38	31	23.0
April	622.64	30	20.8
May	570.96	31	18.4
June	491.93	30	16.4
July	395.99	31	12.8
Aug	363.26	31	11.7
Sept	411.01	30	13.7
Oct	449.22	31	14.5
Nov	519.53	30	17.3
Dec	562.82	31	18.2

Footnotes:

1- Appendix P. Monthly Total Phosphorus Allocations by Wastewater Treatment Facility (p. 147)

2- Monthly Average Total P effluent limit (lbs/day) = monthly Total P WLA (lbs/month) ÷ days per month

The TMDL-derived limits should be expressed in a manner consistent with the wasteload allocation and assumptions of the TMDL.

Point of Discharge Limits

Section NR 217.16, Wis. Adm. Code, states that the Department may include a TMDL-derived water quality based effluent limit (WQBEL) for phosphorus in addition to, or in lieu of, a s. NR 217.13, Wis. Adm. Code, WQBEL in a WPDES permit. Since the receiving water is not a direct impaired segment covered under an approved TMDL, both TMDL-based limits and s. NR 217.13, Wis. Adm. Code, WQBELs are required.

As a limited aquatic life water, Koshkonong Creek does not have an applicable phosphorus criterion at Outfall 001. However, a phosphorus criterion of 0.075 mg/L applies for Koshkonong Creek 2.5 miles below the discharge, where the water body is classified as a warmwater sport fishery. Section NR 217.13, Wis. Adm. Code, limits are required to protect the downstream water of Koshkonong Creek, since it was not listed as impaired at the time of the Rock River TMDL implementation.

Section NR 102.06(3)(a) specifically names reaches of rivers for which a phosphorus criterion of 0.1 mg/l applies. For other stream segments that are not specified in s. NR 102.06(3)(a), s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.075 mg/L applies for Koshkonong Creek.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs), effluent flow rate (Qe), and upstream phosphorus concentrations (Cs):

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

Where: WQC = 0.075 mg/L for Koshkonong Creek

Q_s = 100% of the 7-Q₂ of 2.3 cfs at the downstream location

C_s = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Q_e = effluent flow rate = 4.62 MGD = 7.15 cfs

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

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall equal the median of at least four samples collected during the months of May through October, and that all samples collected during a 28-day period shall be considered as a single sample and the average of these concentrations used to determine a median. Averaging begins at date of the first sample in the range of May through October.

A review of all available instream total phosphorus data from six samples from 05/12/2014 – 10/12/2014 stored in the Surface Water Integrated Monitoring System database indicates the median total phosphorus concentration in Koshkonong Creek at Baxter Road (SWIMS station ID # 10022082) is 0.24 mg/L. The receiving water is also listed as impaired at the point of discharge which suggests the background concentration is above criteria.

Substituting a median value of 0.24 mg/L into the limit calculation equation above would result in a calculated limit that is less than the applicable criterion of 0.075 mg/L. However, s. NR 217.13(7), Wis. Adm. Code, specifies that “if the water quality-based effluent limitation calculated pursuant to the procedures in this section is less than the phosphorus criterion specified in s. NR 102.06, Wis. Adm. Code, for the water body, the effluent limit shall be set equal to the criterion.”

Limit Expression

Since the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.225, equal to three times the WQBEL calculated under s. NR 217.13 shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Phosphorus Conclusion

The limits at the point of discharge are more stringent than the TMDL limits, and therefore are recommended. However, a mass limit is also required since the discharge is upstream of a surface water that has an approved TMDL. The **monthly average mass limits based on WLA are recommended** with accordance to the table above as well as the specified concentration limits of **0.075 mg/L as a six-month average and 0.225 mg/L as a monthly average.**

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from October 2022 through December 2023. Due to the facility upgrade for phosphorus removal, which was completed in 2022, and final phosphorus limits that went into effect in October 2022, only data since October 2022 is presented below since it is most representative of current operating conditions.

Attachment #1

Total Phosphorus Effluent Data

	(mg/L)	(lbs/day)
1-day P ₉₉	0.12	4.17
4-day P ₉₉	0.08	2.64
30-day P ₉₉	0.06	1.87
Mean	0.05	1.51
Std	0.02	0.78
Sample size	332 (1 ND)	332
Range	<0.022 - 0.144	0 - 4.66

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

PART 6 – TOTAL SUSPENDED SOLIDS

TMDL Limits

The Rock River TMDL also has wasteload allocations (WLA) for total suspended solids (TSS). TSS monitoring is specified in the current permit at a frequency of five times per week and it is believed this monitoring frequency will remain the same. If there is a change in monitoring frequency, the stated limits should be reevaluated.

Total Suspended Solids (TSS) Effluent Limitations

Month	Monthly TSS WLA ¹ (tons/month)	Days Per Month	Monthly Ave TSS Effluent Limit ² (lbs/day)	Weekly Ave TSS Effluent Limit ³ (lbs/day)
Jan	3.88	31	250	330
Feb	3.88	28	277	366
March	3.88	31	250	330
April	3.89	30	259	342
May	3.88	31	250	330
June	3.89	30	259	342
July	3.53	31	228	301
Aug	2.96	31	191	252
Sept	2.87	30	191	253
Oct	3.88	31	250	330
Nov	3.89	30	259	342
Dec	3.88	31	250	330

Footnotes:

1- Appendix Q. Monthly Total Suspended Solids Allocations by Wastewater Treatment Facility (p. 149)

2- Monthly average TSS effluent limit (lbs/day) = maximum monthly TSS WLA (tons/month) ÷ days per month x 2,000 lbs/ton

3- Weekly average effluent limit (lbs/day) = monthly average limit (lbs/day) x 1.32 multiplier

Weekly average mass limits were calculated in 2013. At that time, the coefficient of variation (the standard deviation divided by the mean) was assumed to be 0.6 (actually calculated to be 0.8), and the monitoring frequency was 5x/week. Given these two factors, a multiplier of 1.32 was used. Using updated mass data, the coefficient of variation is calculated to be 0.52 (= 0.78 ÷ 1.51). This value, along with the 5x/week monitoring frequency, would yield a multiplier of 1.29. However, since Sun Prairie is meeting the current monthly limits, the limits are not recalculated.

Effluent Data

Limits based on a WLA should be given in a permit regardless of reasonable potential. However, for informational purposes, the following table lists the statistics for TSS discharge, as both a concentration and a mass, from October 2018 through December 2023.

	(mg/L)	(lbs/day)
1-day P ₉₉	7	289.8
4-day P ₉₉	4	157.5
30-day P ₉₉	3	85.5
Mean	2	55.4
Std	1.4	59.5
Sample Size	1371 (485 ND)	1371
Range	<2 - 13	0 - 646.68

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

PART 7 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in Chapters NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. The daily maximum effluent temperature limitation shall be 86 °F for discharges to surface waters classified as Limited Aquatic Life according to s. NR 104.02(3)(b)1, Wis. Adm. Code, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 and described in s. NR 106.55(2), Wis. Adm. Code, which has a daily maximum effluent temperature limitation of 120°F. The 86°F limit applies because the hydrologic classification is not listed as a wetland (or wastewater effluent channel) in ch. NR 104, Wis. Adm. Code.

Reasonable Potential

Based on the available discharge temperature data from October 2018 through December 2023, shown below, the maximum daily effluent temperature reported was 71°F; therefore, no reasonable potential for exceeding the daily maximum limit exists, and **no limits are recommended. Thermal monitoring for one year is recommended.**

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	53	55	-	86
FEB	52	53	-	86

Attachment #1

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)
MAR	54	55	-	86
APR	55	57	-	86
MAY	61	63	-	86
JUN	66	68	-	86
JUL	70	71	-	86
AUG	71	71	-	86
SEP	70	71	-	86
OCT	70	71	-	86
NOV	62	64	-	86
DEC	58	59	-	86

PART 8 – 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 100%, 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:

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

Where:

Q_e = annual average flow = 4.62 MGD = 7.15 cfs

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

Q_s = ¼ of the 7-Q₁₀ = 0.02 cfs ÷ 4 = 0.005 cfs

Attachment #1

- The new IWC of 100% is higher than the previous IWC of 85%. This change is due to the increased design flow (4.4 MGD to 4.62 MGD) and because the IWC should consider the presence of aquatic organisms at the outfall and not just the code listing. The modeled natural community at the outfall is warm headwater which indicates aquatic organisms could be present at the outfall and not just downstream where the classification changes to warmwater sport fish. Therefore, the IWC should be protective at the outfall.
- 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 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.

Tests conducted prior to 2005 are not presented in the table below due to significant changes that were made to WET test methods in 2004. These changes were assumed to be fully implemented by certified labs by no later than June 2005. Data collected before July 1, 2005 do not show repeated toxicity that was never resolved and is not the only data that is available.

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	Pass or Fail?	Use in RP?	
01/27/2005	-	-	-	-	>100	>100	Pass	No	1
04/19/2005	-	-	-	-	>100	>100	Pass	No	1
07/19/2005	-	-	-	-	>100	>100	Pass	No	1
11/01/2005	>100	>100	Pass	Yes	>100	>100	Pass	No	1
03/21/2006	-	-	-	-	>100	>100	Pass	No	1
06/03/2014	>100	>100	Pass	Yes	>100	>100	Pass	No	1
03/05/2015	>100	>100	Pass	Yes	>100	>100	Pass	No	1
07/28/2016	>100	>100	Pass	Yes	96.2	>100	Pass	No	1
10/17/2017	>100	>100	Pass	Yes	>100	>100	Pass	No	1
10/09/2018	-	-	-	-	>100	>100	Pass	No	Retest; 1
10/23/2018	-	-	-	-	>100	64.9	Fail	No	Retest; 1
02/19/2019	-	-	-	-	>100	>100	Pass	No	QA Restart; 1

Attachment #1

03/12/2019	>100	>100	Pass	Yes	>100	>100	Pass	No	1
04/21/2020	>100	>100	Pass	Yes	97.3	>100	Pass	No	1
07/13/2021	>100	>100	Pass	Yes	>100	>100	Pass	No	1
10/18/2022	>100	>100	Pass	Yes	>100	>100	Pass	No	1
02/21/2023	>100	>100	Pass	Yes	71.3	>100	Fail	No	1
04/11/2023	-	-	-	-	>100	61.4	Fail	No	1
04/25/2023	-	-	-	-	>100	>100	Pass	Yes	
10/24/2023	-	-	-	-	>100	>100	Pass	Yes	
11/28/2023	-	-	-	-	>100	>100	Pass	Yes	
12/12/2023	-	-	-	-	>100	>100	Pass	Yes	
01/23/2024	-	-	-	-	>100	>100	Pass	Yes	
02/20/2024	-	-	-	-	>100	>100	Pass	Yes	

Footnotes:

1. *Data Not Representative.* Sun Prairie had toxicity in 2023 which triggered a Toxicity Reduction Evaluation (TRE). The investigation was successful, and the facility believes the toxicity has been resolved after working with the Sun Prairie utilities and Milwaukee Tool Company (which owns Imperial Blades) to control their contributions to the WWTF.
- 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.**

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 based on the testing data. However, since Sun Prairie currently has a WET limit of 1.2 TUC, the limit must be retained to prevent antibacksliding. This limit is updated with the new IWC of 100% and is calculated as follows:

$$\text{Chronic WET limit} = [100/\text{IWC}] \text{ TUC} = 100/100 = \mathbf{1.0 \text{ TUC expressed as a monthly average}}$$

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>.

Attachment #1
WET Checklist Summary

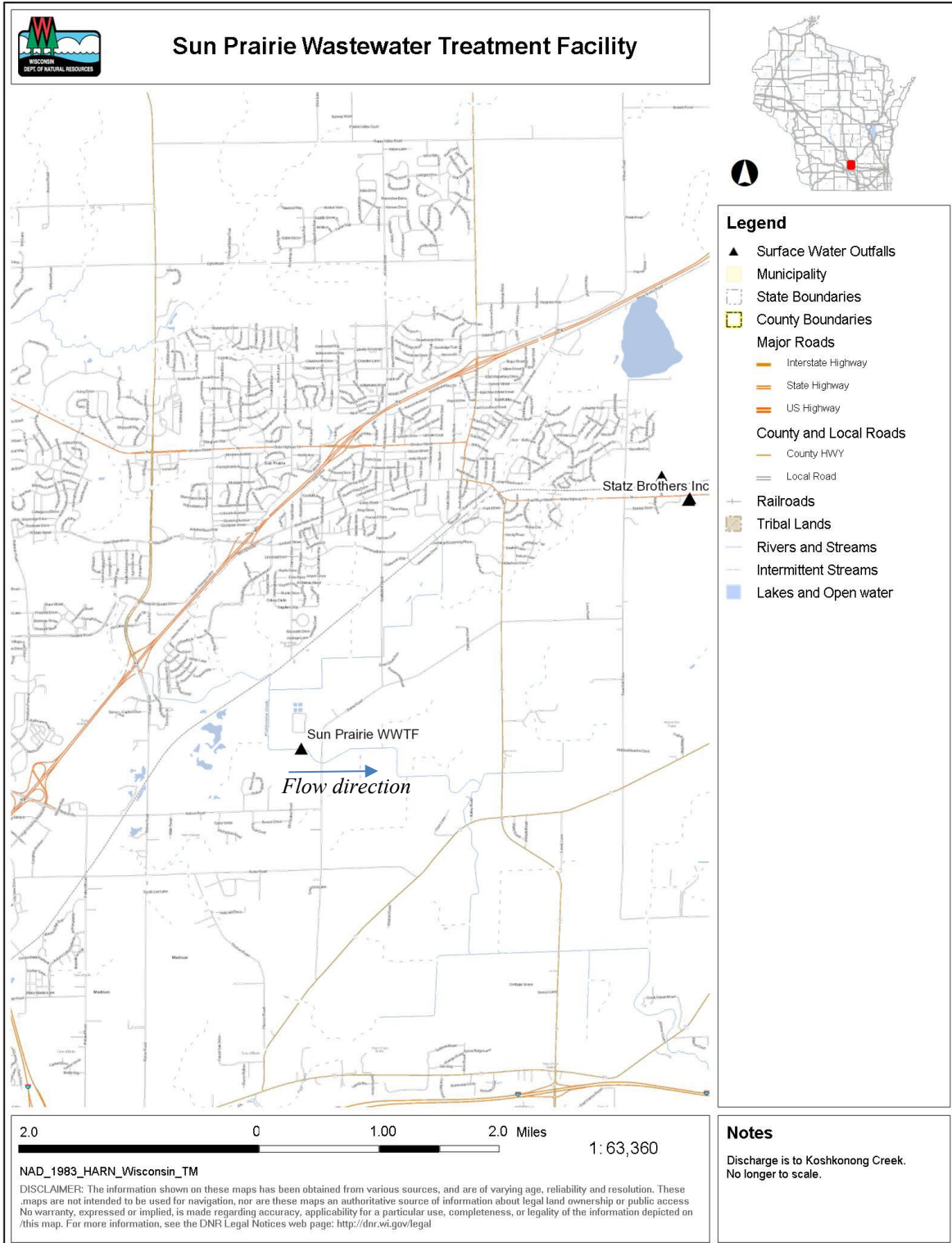
	Acute	Chronic
AMZ/IWC	Not Applicable. 0 Points	IWC = 100% 15 Points
Historical Data	10 tests used to calculate RP. No tests failed. 0 Points	6 tests used to calculate RP. No tests failed. 0 Points
Effluent Variability	Little variability, no upsets or significant violations, consistent WWTF operations. 0 Points	Same as Acute. 0 Points
Receiving Water Classification	Less than 4 mi to non-variance (WWSF) water 5 Points	Same as Acute. 5 Points
Chemical-Specific Data	No reasonable potential for limits based on ATC. Ammonia nitrogen limit carried over from the current permit. Chloride, copper, mercury nickel, zinc detected. Additional Compounds of Concern: Benzene, cyanide, and toluene. 5 Points	Reasonable potential for limits for chloride based on CTC. Ammonia nitrogen limit carried over from the current permit. Copper, mercury nickel, zinc detected. Additional Compounds of Concern: Benzene, cyanide, and toluene. 10 Points
Additives	No biocides and one water quality conditioner (ferric sulfate) added. Permittee has proper P chemical SOP in place. 1 Point	All additives used more than once per 4 days. 1 Point
Discharge Category	3 Industrial Contributors (Hallman/Lindsay Paints, Imperial Blades, and Devon's Chocolates). 7 Points	Same as Acute. 7 Points
Wastewater Treatment	Secondary or better. 0 Points	Same as Acute. 0 Points
Downstream Impacts	No impacts known. 0 Points	Same as Acute. 0 Points
Total Checklist Points:	18 Points	38 Points
Recommended Monitoring Frequency (from Checklist):	2 tests during permit term.	1x yearly.
Limit Required?	No	Limit = 1.0 TU _c
TRE Recommended? (from Checklist)	No	No

- **A minimum of annual acute and chronic monitoring is recommended because Sun Prairie Wastewater Treatment Facility is a major municipal discharger** with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.
- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, **a chronic WET limit is required. The chronic WET limit shall be expressed as 1.0 TU_c as a monthly average** in the

Attachment #1

effluent limits table of the permit. A minimum of annual chronic monitoring is required because a chronic WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.

Attachment #2
Site Map



Ammonia Nitrogen Calculations from the WQBEL Memo Dated June 25, 2018

Limited Aquatic Life		Spring	Summer	Winter
		April	May – Sept.	Oct. - March
Background Information	7-Q ₁₀ (cfs)	0.02	0.02	0.02
	7-Q ₂ (cfs)	0.06	0.06	0.06
	Ammonia (mg/L)	0.09	0.07	0.135
	Temperature (°C)	10	21	7
	pH (s.u.)	8.09	8.08	8.0
	% of Flow used	25	100	25
	Reference Weekly Flow (cfs)	0.005	0.02	0.005
	Reference Monthly Flow (cfs)	0.01275	0.051	0.01275
Criteria mg/L	4-day Chronic	46.54	19.86	55.12
	30-day Chronic	18.62	7.94	22.05
Effluent Limits mg/L	Weekly Average	46.57	19.91	55.15
	Monthly Average	18.65	8.00	22.09

About 2.5 miles downstream from outfall 001, the classification for Koshkonong Creek changes from limited aquatic fish community to warm water sport fish community. Because of this, limits for both classifications must be calculated taking decay into consideration. Complete mixing would have occurred at this downstream location therefore 100% of the receiving water flow is used.

Warm Water Sport Fish Community		Spring	Summer	Winter
		April	May – Sept.	Oct. - March
Background Information	7-Q ₁₀ (cfs)	1.2	1.2	1.2
	7-Q ₂ (cfs)	2.3	2.3	2.3
	Ammonia (mg/L)	0.09	0.07	0.135
	Temperature (°C)	10	21	7
	pH (s.u.)	8.09	8.08	8.0
	% of Flow used	100	100	100
	Reference Weekly Flow (cfs)	1.2	1.2	1.2
	Reference Monthly Flow (cfs)	1.955	1.955	1.955
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	5.32	3.56	
	Early Life Stages Absent			9.88
	30-day Chronic			
	Early Life Stages Present	2.13	1.42	
	Early Life Stages Absent			3.95
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	6.2	4.14	
	Early Life Stages Absent			11.51
	Monthly Average			
	Early Life Stages Present	2.69	1.79	
	Early Life Stages Absent			5.00

Attachment #3

Months Applicable	Limited Aquatic Life		Warm Water Sport Fish		2013 Permit Limits		
	Weekly Average (mg/L)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)	Daily Maximum (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)
April	46.57	18.65	6.2	2.69	14	6.8	2.8
May – Sept	19.91	8.00	4.14	1.79	16	2.8	1.1
Oct – March	55.15	22.09	11.51	5.00	13	11	4.5

The 2013 permit limits were more restrictive than the calculated limits except for the April weekly and monthly average limits. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the 2013 limits should be continued in the reissued permit.

Ammonia Decay: Because the calculated limits are more restrictive than the 2013 limits, ammonia decay is considered for April to determine limits at the outfall to protect the downstream classification. The more restrictive calculated limits should be used to protect at the point of discharge and downstream uses. Where the calculated limits are more restrictive based on downstream uses, ammonia decay can be considered to determine if these more restrictive limits are needed or if the ammonia will decay before it reaches the point of the classification change.

Ammonia decay rates are dependent on temperature with in-stream nitrification essentially non-existent in the winter. In-stream decay is expected so a first order decay model will be used. Based on the available literature, a decay rate of 0.25 day⁻¹ at 20°C has been suggested as a default rate. A temperature correction factor of $\theta = 1.08$ is ($k_t = k_{20} \theta^{(T-20)}$).

$$N_{\text{Limit}} = \left(\frac{N_{\text{down}}}{\text{EXP}(-k_t T)} \right)$$

- Where: N_{Limit} = Ammonia limit needed to protect downstream use (mg/L)
- N_{down} = Ammonia limit calculated based on downstream classification and flow (mg/L)
- $-k_t$ = Ammonia decay rate at background stream temperature (day⁻¹)
- T = Travel time from outfall to downstream use (day)

The velocity of receiving water is assumed to be 5 miles per day and the distance from the point of discharge to the classification change is approximately 2.5 miles for a travel time of 0.5 days. This equation shows that at the location where the classification change, 94% of the ammonia is remaining during April. After decay, the limits are increased as shown in the following table.

Months Applicable	LAL		WWSF		After decay		Current Limits	
	Weekly Average (mg/L)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)
April	46.57	18.65	6.2	2.69	6.6	2.9	6.8	2.8