Permit Fact Sheet

General Information

Permit Number	WI-0025020-11-0
Permittee Name and Address	VILLAGE OF OSCEOLA 310 Chieftain Street OSCEOLA WI 54020-0217
Permitted Facility Name and Address	Village of Osceola 103 Depot Road, Osceola, Wisconsin
Permit Term	July 01, 2025 to June 30, 2030
Discharge Location	103 Depot Road, Osceola, Wisconsin, east bank of the St. Croix River ½ mile south of Highway 243 bridge (NE¼ SE¼ Section 28; T33N-R19W)
Receiving Water	The St. Croix River within the Trout Brook Watershed in the St. Croix River Drainage Basin in Polk County.
Stream Flow (Q _{7,10})	1,100 cfs
Stream Classification	Warm water sport fish (WWSF), exceptional resource water (ERW), non- public water supply and within the ceded territory.
Wild Rice Impacts (no specific wild rice standards exist at this time)	No impacts identified. It is assumed that there is wild rice on the St. Croix in Polk County, but surveys have not been conducted. (Evaluation completed March 2017)
Discharge Type	Existing continuous discharger.
Annual Average Design Flow (MGD)	0.606 MGD
Industrial or Commercial Contributors	There are no Categorical or Significant Industrial users identified, but Invest Cast Inc.(Metal Casting), F&M Plastics (Plastic Injection Molding), EPC (Plastic Injection Molding), Northwire (Wire Manufacturing), MMP (Injection Molding) are contributing industries.
Plant Classification	A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; P - Total Phosphorus; D - Disinfection; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

The Village of Osceola owns and operates a domestic wastewater treatment system that serves the communities of Osceola and Dresser. The plant designed to treat 606,000 gallons per day currently treats an average of 294,000 gallons per day (2020 - 2025 data).

The facility is an activated sludge plant utilizing an extended aeration period. Primary treatment consists of headworks (fine screens and grit separators) for debris removal, chemical addition, oxidation ditch, clarifiers and disinfection. More specifically, the activated sludge process is composed of settled solids containing naturally occurring microorganisms recycled from the treatment system. Ferric chloride is added to the wastewater in the splitter box to precipitate phosphorus. The wastewater then enters the oxidation ditch (air added) where the microorganisms metabolize and reduce organic matter. Then water is pumped into final clarifiers where the remaining solids including phosphorus settles. The

treated wastewater (effluent) is disinfected seasonally (April through October) using an UV system prior to discharge to the St. Croix River.

Settled solids (sludge) is removed from the clarifiers; some is returned to the oxidation ditch to re-seed the new wastewater entering the system. The sludge that is not used as activated sludge is treated by bacteria and organisms through aerobic digestion; reducing harmful pathogens and hauled to the West Central Wisconsin Biosolids Facility at Ellsworth for further treatment. Centrate (wastewater generated from dewatering sludge) from the West Central Wisconsin Biosolids facility is accepted at a receiving tank in Dresser and returned to the Osceola wastewater treatment facility.

Substantial Compliance Determination

All conditions and standard requirements of the permit are being met. No further action is required.

After a review of all Discharge Monitoring Reports, CMARs, and a site visit on 06/18/2028, by Carson Johnson, WDNR, the Village of Osceola has been found to be in substantial compliance with their current permit.

Sample Point Descriptions

	Sample Point Designation					
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)				
701	INFLUENT An average of 0.294 MGD (2020 – 2024 data)	Representative samples shall be collected in the Parshall flume after the bar screen.				
001	EFFLUENT An average of 0.254 MGD (2020 -2024 data)	Representative samples shall be collected prior to the disinfection unit for BOD, total suspended solids, pH, chlorides, and phosphorus and immediately following the disinfection unit for fecal coliform.				
002	SLUDGE An annual average of 120 tons is sent to the WCWBF. Sludge is not land spread by the facility.	Sludge samples shall be collected prior to hauling to another permitted facility. Test results shall be reported on Form 3400-49 'Waste Characteristics Report'. Hauled sludge reports shall be submitted on Form 3400-52 'Other Methods of Disposal or Distribution Report' following each year sludge is hauled.				

Permit Requirements

1 Influent – Monitoring Requirements

1.1 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	3/Week	24-Hr Flow Prop Comp		

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

1.1.1 Changes from Previous Permit:

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

1.1.2 Explanation of Limits and Monitoring Requirements

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

2 Surface Water - Monitoring and Limitations

Monitoring Requirements and Limitations						
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes	
Flow Rate		MGD	Daily	Continuous		
BOD5, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp		
BOD5, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp		
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp		
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp		
pH Field	Daily Max	9.0 su	3/Week	Grab		
pH Field	Daily Min	6.0 su	3/Week	Grab		
Phosphorus, Total	Monthly Avg	1.0 mg/L	3/Week	24-Hr Flow Prop Comp		
Phosphorus, Total	Monthly Avg	9.2 lbs/day	3/Week	Calculated	See the Total Maximum Daily Load (TMDL) Limitations section below.	
Phosphorus, Total		lbs/yr	Monthly	Calculated	Calculate the 12-month rolling sum of total monthly	

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations							
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes		
					mass of phosphorus discharged and report on the last day of the month on the DMR. See the Total Maximum Daily Load (TMDL) Limitations section below.		
E. coli	Monthly Avg	126 #/100 ml	Weekly	Grab	Monitoring and limit effective April through October.		
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective April through October. See the E. coli Percent Limit section below. Enter the result in the DMR on the last day of the month.		
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	In 2027 monthly monitoring is required May through October.		
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	108 mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring and limit effective November through April.		
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	108 mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring and limit effective November through April.		
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring and limit effective November through April. Enter the daily ammonia result on the eDMR and compare to the Nitrogen, Ammonia Variable Limit column to determine compliance.		
Nitrogen, Ammonia Variable Limit		mg/L	Monthly	See Table	November through April use the daily pH result to look up the applicable ammonia limit in the "Ammonia Limitation" section and report the variable limit on the eDMR.		

	Monitoring Requirements and Limitations							
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes			
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	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Nitrogen Series Monitoring section for testing schedule.			
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Nitrogen Series Monitoring section for testing schedule.			
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Total Nitrogen = Total Nitrogen Kjeldahl (mg/L) + Nitrite + Nitrate Nitrogen (mg/L). See the Nitrogen Series Monitoring section for testing schedule.			
Hardness, Total as CaCO3		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring required during 2028.			
Copper, Total Recoverable		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring required during 2028.			
Chloride		mg/L	Monthly	Grab	Monitoring required during 2028.			

2.1.1 Changes from Previous Permit

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

- Additional monthly monitoring for **nitrogen ammonia** is required May through October 2027 in preparation for the next permit reissuance.
- E. coli monitoring and limits replace fecal coliform monitoring and limits.
- **PFOS and PFOA** monitoring once every two months is included in the permit in accordance with s. NR 106.98(2)(c), Wis. Adm. Code.
- Annual **Total Nitrogen Monitoring** (TKN, N02+N03 and Total N) monitoring is required in specific quarters as outlined in the permit.

• Monthly monitoring for **hardness**, **copper** and **chloride** is required in 2028 in preparation for the next permit reissuance.

2.1.2 Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo dated December 5, 2024.

BOD and Total Suspended Solids - Categorical limits for BOD and TSS are required per NR 104 and 210.05, Wis. Adm. Code.

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

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

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 municipal dischargers with an average flow rate less than 1 MGD, to be evaluated on a case-by-case basis to determine if monitoring is required pursuant to s. NR 106.98(2)(c), Wis. Adm. Code. The department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, it was identified that the POTW has an indirect discharger(s) that may be a potential source of PFOS/PFOA.

Therefore, monitoring once every two months is included. 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.

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

3 Land Application - Monitoring and Limitations

Municipal Sludge Description								
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)		
002	В	Liquid	Sludge hauled Biosolids Fact	l to West Centra ility	120 dry tons/year			
Does sludge n	nanagement der	nonstrate comp	liance? Yes					
Is additional s	Is additional sludge storage required? No							
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No, the most recent set of samples (2024) the highest value recorded was 1.54 pCi/liter.								
Is a priority po	Is a priority pollutant scan required? No							

3.1 Sample Point Number: 002- HAULED SLUDGE

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

Monitoring Requirements and Limitations						
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite		
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite		
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite		
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite		
PCB Total Dry Wt	Ceiling	50 mg/kg	Annual	Composite		
PCB Total Dry Wt	High Quality	10 mg/kg	Annual	Composite		
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.	
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.	

3.1.1 Changes from Previous Permit:

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

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

3.1.2 Explanation of Limits and Monitoring Requirements

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

PFAS - The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of 2025. The department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" will be followed.

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

4 Schedules

4.1 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
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.	06/30/2026
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.	
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.	06/30/2027
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.	
The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan.	
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.	
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.	

4.1.1 Explanation of Schedule

PFOS/PFOA Minimization Plan Determination of Need- As stated above, ch. NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Section 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.

Attachments

Water Flow Schematic updated in 2013

Water Quality Based Effluent Limits memo dated December 5, 2024

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance

Prepared By: Sheri A. Snowbank

Wastewater Specialist

Date: March 5, 2025



CORRESPONDENCE/MEMORANDUM ____

DATE: December 5, 2024

TO: Monica Begley – WY/3

Michael Polkinghorn - NOR/Rhinelander Service Center Michael Polkinghorn FROM:

SUBJECT: Facility Planning Water Quality-Based Effluent Limitations for the Village of Osceola WPDES Permit No. WI-0025020

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) for facility planning using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Village of Osceola in Polk County. This municipal wastewater treatment facility (WWTF) discharges to the St. Croix River, located in the Trout Brook Watershed in the Lower St. Croix River Basin. This discharge is included in the Lake St. Croix Basin Total Maximum Daily Load report as approved by EPA on 08/08/2012. 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:

	Daily	Daily	Weekly	Monthly	Footnotes
Parameter	Maximum	Minimum	Average	Average	
Flow Rate					1
BOD ₅			45 mg/L	30 mg/L	1, 2
TSS			45 mg/L	30 mg/L	1, 2
pН	9.0 s.u.	6.0 s.u.			1, 2
<i>E. coli</i> April 15 – October 15				126 #/100 mL geometric mean	3
Ammonia Nitrogen November – April	Variable		108 mg/L	108 mg/L	4, 5
Phosphorus				1.0 mg/L 9.2 lbs/day	1,6
Copper (Total Recoverable)					1
PFOS and PFOA					7
Chloride					1
TKN, Nitrate+Nitrite, and Total Nitrogen					8

Footnotes:

- 1. No changes from the current permit.
- 2. These limits are based on the Warm Water Sport Fish (WWSF) community of the immediate receiving water as described in s. NR 210.05(1), Wis. Adm. Code.
- 3. <u>Additional final limit:</u> No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
- 4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
- 5. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit. Weekly monitoring for 1 year is



recommended during May – October during the reissued permit term to determine the need for ammonia nitrogen limits at the next permit reissuance.

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

Daily Maximum Ammonia Nitrogen Limits

- 6. The concentration limit is a state technology-based limit as described in subch. II of NR 217, Wis. Adm. Code. The mass limit is based on the Lake St. Croix Basin Total Maximum Daily Load (LSCB TMDL) area to address phosphorus water quality impairments within the TMDL area.
- 7. Every other month monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code.
- 8. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total Kjeldahl nitrogen (TKN) (all expressed as N).

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

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

Attachments (3) – Narrative, discharge area map, & weekly/monthly average ammonia nitrogen limits.

PREPARED BY: Michael A. Polkinghorn – Water Resources Engineer

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

Water Quality-Based Effluent Limitations for Village of Osceola

WPDES Permit No. WI-0025020

Prepared by: Michael A. Polkinghorn

PART 1 – BACKGROUND INFORMATION

Facility Description

Preliminary treatment consists of a fine bar screen and grit separators for debris solids removal. Influent from the Villages of Osceola and Dresser are combined at the headworks with Village of Osceola aerobic digester supernatant and Ellsworth West Central Biosolids Facility supernatant. Primary and secondary treatment are achieved by an aerated oxidation ditch via activated sludge, where naturally occurring metabolizing microorganisms present in the wastewater break down organic matter. Ferric chloride is added at the influent of the oxidation ditch for chemical phosphorus removal. Tertiary treatment is utilized by two final clarifiers in parallel where suspended solids are settled out, and an ultraviolet light unit where bacteria are disinfected. Disinfection occurs seasonally (April 15 – October 15) and effluent is discharged on a continuous basis to the east bank of the St. Croix River, approx. 0.5 miles downstream (south) of the Highway 243 Bridge.

SEH, consultant representing the Village of Osceola, has requested updated WQBELs to assist in the facility planning study subject to ch. NR 110, Wis. Adm. Code. The request letter (October 2024) indicates both the annual average design flow and the discharge location have not changed. Upon initial review of the effluent limits and monitoring requirements recommended by the WQBEL evaluation (August 2019), only the following parameters could potentially change in comparison to this request:

- Need of toxic substances limits via permit application monitoring
- Need of PFOA/PFOS monitoring
- Need of ammonia nitrogen limits during May October
- Conversion of bacteria limits from fecal coliform to *E. coli* with potential compliance schedule
- Need of additional/update to existing phosphorus WQBEL(s)
- Need of temperature WQBELs
- Need of whole effluent toxicity (WET) limits and monitoring

This evaluation will consider the present discharge characteristics with the priorly listed parameters only. **Determinations made for other parameters made in the previous WQBEL Evaluation (August 2019) will remain unchanged.** The following effluent limitations and monitoring requirements for the current permit, expiring on 12/31/2024, are included below for informational purposes:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
BOD ₅			45 mg/L	30 mg/L	2, 3
TSS			45 mg/L	30 mg/L	2, 3

	Daily	Daily	Weekly	Monthly	Footnotes
Parameter	Maximum	Minimum	Average	Average	
pН	9.0 s.u.	6.0 s.u.			2, 3
Fecal Coliform			656#/100 mL	400#/100 mL	Λ
April 15 – October 15			geometric mean	geometric mean	4
Ammonia Nitrogen					15
November – April	Variable		108 mg/L	108 mg/L	4, 5
Phosphorus				1.0 mg/L	6
				9.2 lbs/day	0
Hardness (Total as CaCO ₃)					1
Copper (Total Recoverable)					1
Chloride					1

Footnotes:

- 1. Monitoring only.
- 2. These limits are based on the Warm Water Sport Fish (WWSF) community of the immediate receiving water as described in s. NR 210.05(1), Wis. Adm. Code.
- 3. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
- 4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
- 5. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit.

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

Daily Maximum Ammonia Nitrogen Limits

6. The concentration limit is a state technology-based limit as described in subch. II of NR 217, Wis. Adm. Code. The mass limit is based on the Lake St. Croix Basin Total Maximum Daily Load (LSCB TMDL) area to address phosphorus water quality impairments within the TMDL area.

Receiving Water Information

- Name: St. Croix River
- Waterbody Identification Code (WBIC): 2601400
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: WWSF community, Exceptional Resource Water (ERW), non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are from USGS Station SC3 or SW ¼, NW ¼, Sec. 30, T34N-R18W at St. Croix Falls, approx. 8.4 miles upstream of Outfall 001:

 $7-Q_{10} = 1,100$ cubic feet per second (cfs)

$$7-Q_2 = 1,530$$
 cfs

Harmonic Mean Flow = 3,200 cfs

- Hardness = 106 mg/L as CaCO₃. This value represents the geometric mean of data (n = 5, September 1996 March 2010) from historic whole effluent toxicity (WET) testing.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%.
- Source of background concentration data: Metals data from the St. Croix River at CTH 8 near St. Croix Falls 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 and phosphorus are described later in this evaluation.
- Multiple dischargers: There are several other dischargers to the St. Croix River 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 St. Croix River is on the Clean Water Act Section 303(d) list for polychlorinated biphenyl (PCB)-contaminated fish tissue (stream mi 44.72 54.55). Outfall 001 is included in the LSCB TMDL area which addresses phosphorus impairments within the TMDL area.

Effluent Information

• Design flow rate(s):

Annual average = 0.606 million gallons per day (MGD)

For reference, the actual average flow from January 2020 - September 2024 was 0.255 MGD.

- Hardness = 223 mg/L as CaCO₃. This value represents the geometric mean of data (n = 8, January 2022 November 2022) from the current permit required monitoring.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with 5 industrial contributors. Water supply from the Villages of Osceola and Dresser municipal supplies.
- Total phosphorus wasteload allocation (WLA): 245 kg/yr = 539 lbs/year = 1.5 lbs/day (see Table A.4 of the TMDL report document, "*Lake St. Croix Nutrient Total Maximum Daily Load, May 2012*, page 71").
- Additives: Ferric chloride for chemical phosphorus removal.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances. The current permit required monitoring for hardness, copper, chloride, and ammonia nitrogen.
- 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

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data are shown in the tables below or in their respective parts in this evaluation.

Sample Date	Copper (µg/L)	Chloride (mg/L)
01/12/2022	23	315
02/09/2022	26	281
03/09/2022	20	292
04/12/2022	18	
05/11/2022	19	240
06/08/2022	12	222
07/13/2022	12	231
08/10/2022	13	270
09/14/2022	7	238
10/12/2022	10	250
11/09/2022	11	230
12/14/2022	22	313
1-day P ₉₉	35	351
4-day P ₉₉	24	304

The following table presents the average concentrations and loadings at Outfall 001 from January 2020 – September 2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

i ulumeter meduges with Limits							
	Average Measurement*	Average Mass Discharged					
BOD ₅	11 mg/L						
TSS	6.2 mg/L						
pH field	6.9 s.u.						
Fecal Coliform	94 #/100 mL						
Ammonia Nitrogen	8.6 mg/L						
Phosphorus	0.51 mg/L	1.1 lbs/day					

Parameter Averages with Limits

*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)

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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 $1-Q_{10}$ receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

Limitation = (WQC) (Qs + (1-f) Qe) - (Qs - f Qe) (Cs)Qe

Where:

- WQC =Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.
- $Qs = average minimum 1-day flow which occurs once in 10 years (1-day Q_{10})$
 - if the 1-day Q_{10} flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q_{10}).
- Qe = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.
- f = Fraction of the effluent flow that is withdrawn from the receiving water, and

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

If the receiving water is effluent dominated under low stream flow conditions, the $1-Q_{10}$ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for Village of Osceola and the limits are set based on two times the acute toxicity criteria.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 880 cfs, $(1-Q_{10} \text{ (estimated as 80\% of 7-}Q_{10}))$, as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

	REF. HARD.	ATC	MAX. EFFL.	1/5 OF EFFL.	MEAN EFFL.	1-day	1-day MAX.
SUBSTANCE	mg/L		LIMIT*	LIMIT	CONC.	P ₉₉	CONC.
Arsenic		340	679.6	135.9	1.4		1.4
Cadmium	223	25.9	51.7	10.3	<1		<1
Chromium	223	3478	6,955	1,391	<2		<2
Copper	223	33.1	66.1			35	26
Lead	223	232	464.1	92.8	<1		<1
Nickel	223	925	1,849	370	<9		<9
Zinc	223	243	485.5	97.1	31		31

Attachment #1							
	REF.		MAX.	1/5 OF	MEAN		1-day
	HARD.	ATC	EFFL.	EFFL.	EFFL.	1-day	MAX.
SUBSTANCE	mg/L		LIMIT*	LIMIT	CONC.	P99	CONC.
Chloride (mg/L)		757	1,514			351	315

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 275 cfs ($\frac{1}{4}$ of the 7-Q₁₀), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

	REF.		MEAN	WEEKLY	1/5 OF	MEAN	
	HARD.	CTC	BACK-	AVE.	EFFL.	EFFL.	4-day
SUBSTANCE	mg/L		GRD.	LIMIT	LIMIT	CONC.	P ₉₉
Arsenic		152.2		44,791	8,958	1.4	
Cadmium	106	2.58	0.0041	758.06	151.6	<1	
Chromium	106	138.57		40,779	8,156	<2	
Copper	106	10.88	0.618	3,021			24
Lead	106	29.63	0.0975	8,691	1,738	<1	
Nickel	106	54.83		16,136	3,227	<9	
Zinc	106	126.67	0.75	37,057	7,412	31	
Chloride (mg/L)		395	5.9	114,513			304

Monthly Average Limits based on Wildlife Criteria (WC)

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

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 800 cfs (1/4 of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

		MEAN	MO'LY	1/5 OF	MEAN
	HTC	BACK-	AVE.	EFFL.	EFFL.
SUBSTANCE		GRD.	LIMIT	LIMIT	CONC.
Cadmium	370	0.0041	316,051	63,210	<1
Chromium	3,818,000		3,261,340,640	652,268,128	<2
Lead	140	0.0975	119,505	23,901	<1
Nickel	43,000		36,730,657	7,346,131	<9

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 800 cfs (1/4 of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

		MEAN	MO'LY	1/5 OF	MEAN
	HCC	BACK-	AVE.	EFFL.	EFFL.
SUBSTANCE		GRD.	LIMIT	LIMIT	CONC.
Arsenic	13.3		11,361	2,272	1.4

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

Conclusions and Recommendations

Based on a comparison of the effluent data and calculated effluent limitations, **effluent limitations are not recommended for any toxic substances during the reissued permit term.** Monitoring recommendations are made in the paragraphs below:

<u>Chloride</u> – Considering available effluent data from the current permit term (January 2022 – December 2022), the 1-day and 4-day P₉₉ concentrations are 351 and 304 mg/L respectively. These effluent concentrations are below the calculated chloride WQBELs; therefore, effluent limits are not recommended during the reissued permit term. **Monitoring is recommended to ensure that 11 sample results are available at the next permit issuance to meet the data requirements of s. NR 106.85**, Wis. Adm. Code.

<u>Copper</u> – Considering available effluent data from the current permit term (January 2022 – December 2022), the 1-day and 4-day P₉₉ concentrations are 35 and 24 mg/L respectively. These effluent concentrations are below the calculated copper WQBELs; therefore, effluent limits are not recommended during the reissued permit term. **Monthly monitoring for 1 year is recommended to continue during the reissued permit term to determine the need for copper limits at the next permit reissuance.**

<u>Mercury</u> – The permit application did not require monitoring for mercury because the Village of Osceola is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past 3 years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from July 2020 – October 2022 was 1.2 mg/kg, with a maximum reported concentration of 2.6 mg/kg. **Therefore, mercury monitoring is not recommended during the reissued permit term.**

<u>PFOS and PFOA</u> – 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 results of 1.16 and 0.721 ng/L and PFOA results of 4.10 and 8.71 ng/L. These results are less than one fifth of the respective criteria for each substance. However, based on the types of indirect dischargers contributing to the collection system, **PFOS and PFOA monitoring is recommended during the reissued permit term at a frequency of every other month.**

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 during November – April. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.

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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 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 WWSF community. pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation (n = 1,233, January 2020 – September 2024). The maximum reported value was 8.0 s.u. (Standard pH Units). The effluent pH was 7.9 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 8.0 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.9 s.u. Therefore, a value of 8.0 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.0 s.u. into the equation above yields an ATC = 9.18 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are either set equal to two times the ATC or based on the 1- Q_{10} low flow method 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 $2 \times ATC$ approach are shown below.

Method	Ammonia Nitrogen Limit (mg/L)	
2×ATC	18	
1-Q ₁₀	8,586	

Daily Maximum Ammonia Nitrogen Determination

The 2×ATC method yields the most stringent limits for the Village of Osceola.

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.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \le pH \le 6.1$	108	$7.0 < pH \leq 7.1$	66	$8.0 < pH \le 8.1$	14
$6.1 < pH \le 6.2$	106	$7.1 < pH \le 7.2$	59	$8.1 < pH \le 8.2$	11
$6.2 < pH \le 6.3$	104	$7.2 < pH \le 7.3$	52	$8.2 < pH \le 8.3$	9.4

Daily Maximum Ammonia	Nitrogen Limits -	WWSF
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Attachment #1					
$6.3 < pH \le 6.4$	101	$7.3 < pH \le 7.4$	46	$8.3 < pH \le 8.4$ 7.8	
$6.4 < pH \le 6.5$	98	$7.4 < pH \le 7.5$	40	$8.4 < pH \le 8.5$ 6.4	
$6.5 < pH \le 6.6$	94	$7.5 < pH \le 7.6$	34	$8.5 < pH \le 8.6$	5.3
$6.6 < pH \le 6.7$	89	$7.6 < pH \le 7.7$	29	$8.6 < pH \leq 8.7$	4.4
$6.7 < pH \le 6.8$	84	$7.7 < pH \le 7.8$	24	$8.7 < pH \le 8.8$ 3.7	
$6.8 < pH \le 6.9$	78	$7.8 < pH \le 7.9$	20	$8.8 < pH \le 8.9$ 3.	
$6.9 < pH \le 7.0$	72	$7.9 < pH \le 8.0$	17	17 $8.9 < pH \le 9.0$ 2.6	

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

The weekly and monthly average ammonia nitrogen limits calculation from the previous limit evaluation do not change because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous limit evaluation (August 2019) are shown in attachment #3.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from February 2020 - April 2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Village of Osceola 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 Millogen Emident Data			
Statistics	May – October	November – April	
1-day P ₉₉		54.9	
4-day P ₉₉		30.6	
30-day P ₉₉		16.4	
Mean*	<0.1	10.5	
Std		11.7	
Sample size	6	27	
Range	<0.1	<0.1 - 35.3	

Ammonia Nitrogen Effluent Data

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

Based on this comparison, daily maximum limits are recommended during November – April. The current permit has daily maximum, weekly average and monthly average limits during November – April. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

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

Because variable daily maximum limits based on effluent pH are in the current permit during November – April, they would be typically implemented year round per Department policy. In this case all effluent ammonia nitrogen samples taken during May – October are undetectable at <0.1 mg/L; Therefore, the variable daily maximum limits will remain during November – April only. Weekly monitoring for 1 year is recommended during May – October during the reissued permit term to determine the need for ammonia nitrogen limits at the next permit reissuance.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

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

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

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

These limits are required during April 15th – October 15th. This disinfection season was extended beyond the minimum range of May – September due to the expected amount of recreation on this section of the St. Croix River. Because of a lack of information indicating this use has changed, no changes are recommended to the current recreational period and the required disinfection season.

Effluent Data

The Village of Osceola has monitored effluent *E. coli* from October 2023 – September 2024 and a total of 26 results are available. A geometric mean of 126 counts/100 mL was never exceeded, with a maximum monthly geometric mean of 21 counts/100 mL. Effluent data has exceeded 410 counts/100 mL 1 time (which is 4% of the total sample results). The maximum reported value was 740 counts/100 mL (07/17/2024). Based on this effluent data it appears that the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.

PART 5 – PHOSPHORUS

Technology-Based Effluent Limit

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of total phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit. Because the Village of Osceola currently has a limit of 1.0 mg/L, this limit should continue during the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

Water Quality-Based Effluent Limits (WQBEL)

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

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Section NR 102.06(3)(a), Wis. Adm. Code, specifically names river segments for which a phosphorus criterion of 0.100 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.100 mg/L applies for the St. Croix River.

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) provided below.

$$Limitation = [(WQC)(Qs+(1-f)Qe) - (Qs-fQe)(Cs)]/Qe$$

Where:

WQC = 0.100 mg/L for the St. Croix River. Qs = 100% of the 7-Q₂ of 1,530 cfs. Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code Qe = effluent flow rate = 0.606 MGD = 0.938 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 be calculated as a median using the procedures specified in s. NR 102.07(1)(b) to (c), Wis. Code. All representative data from the most recent 5 years shall be used, but data from the most recent 10 years may be used if representative of current conditions.

The previous limit evaluation (August 2019) resulted in a WQBEL of 85 mg/L using a background concentration of 0.048 mg/L. This value was based on background total phosphorus data from the St. Croix River at the Interstate Park boat landing (SWIMS station ID 493210, May 2007 – June 2017), approx. 8.0 mi upstream of Outfall 001. Section NR 217.13(2)(d), Wis. Adm. Code, states that the determination of upstream concentrations shall be evaluated at each permit reissuance. Additional data were considered in estimating the background phosphorus concentration.

A review of available in stream total phosphorus data from the prior stated location during July 2015 – October 2024 indicates the median background total phosphorus concentration is 0.0319 mg/L. Substituting this median value into the limit calculation equation above, the calculated limit is 111 mg/L. This limit is not recommended during the reissued permit term since the effective technology-based limit is more stringent.

TMDL Limits

The phosphorus mass limit is based on the TMDL study for Lake St. Croix to address phosphorus water quality impairments for Lake St. Croix. The TMDL report was approved by EPA on August 8, 2012. The Village of Osceola is included in a group of permitted facilities subject to an aggregate phosphorus wasteload allocation of 6,932 lbs/yr (3,151 kg/yr) under the Lake St. Croix TMDL report. The facility will be considered in compliance with its Lake St. Croix TMDL allocation if the phosphorus discharged from the facility is less than the permittee's individual allocation of 240 kg/yr (528 lbs/yr) or the total annual loading from all permittees in the aggregate category is less than the aggregate allocation.

The TMDL report states that point sources covered by the aggregate loading cap will be deemed as meeting the aggregate WLA as long as the sum of effluent loads from all 13 point sources remains under

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the aggregate load cap. According to the TMDL report's implementation recommendations, when the total loading from all 13 point sources equals or exceeds 85% of the aggregate loading cap, permittees exceeding their individual share of the aggregate loading cap should receive individual WLAs.

A review of the calculated 12-month rolling sums of monthly phosphorus loads (n = 46, January 2020 – September 2024) show the Village of Osceola was always below its annual WLA. The maximum value was 470 lbs/yr during the February 2023 – January 2024 12-month rolling period. Therefore, the monthly average limit of 9.2 lbs/day is recommended to continue during the reissued permit term. The reissued permit should contain requirements for monitoring effluent phosphorus to calculate and report monthly phosphorus loads and 12-month rolling sums of monthly phosphorus loads. Monthly loads are calculated using the monthly average phosphorus concentration and the total effluent flow for the month.

The following table lists the statistics for concentration and mass-based effluent phosphorus levels (January 2020 – September 2024) for informational purposes.

Statistics	Conc. (mg/L)	Mass (lbs/day)
1-day P ₉₉	1.2	2.59
4-day P ₉₉	0.81	1.74
30-day P ₉₉	0.61	1.31
Mean	0.51	1.09
Std	0.22	0.46
Sample Size	738	739
Range	0.16 - 1.85	0.36 - 3.92

Phosphorus Effluent Data

PART 6 – THERMAL

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

Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >20:1), the lowest calculated limitation is 120° F as a daily maximum as described in s. NR 106.55(6)(a), Wis. Adm. Code. At temperatures above approximately 103° F, conventional biological treatment systems do not function properly and experience upsets. There is no indication that this has ever occurred in this treatment system, so there is no reasonable potential for the discharge to exceed this limit. Therefore, temperature limits or monitoring are not recommended during the reissued permit term.

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and

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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)*.

• Chronic testing is usually not recommended where the ratio of the 7-Q₁₀ to the effluent flow exceeds 100:1 and acute testing is not recommended if the ratio exceeds 1000:1. For the Village of Osceola, that ratio is approximately 1,173:1. With this amount of dilution, there is believed to be little potential for acute or chronic toxicity effects in the St. Croix River associated with the discharge from the Village of Osceola. **Therefore, WET testing is not recommended during the reissued permit term.**



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	<u> </u>	Summer	Winter
		May – Oct.	Nov April
Effluent Flow	Qe (MGD)	0.606	0.606
	$7-Q_{10}$ (cfs)	1,100	1,100
	$7-Q_2$ (cfs)	1,530	1,530
	Ammonia (mg/L)	0.04	0.08
Background	Average Temperature (°C)	19	3
Information	Maximum Temperature (°C)	24	8
	pH (s.u.)	7.90	7.75
	% of Flow used	100	25
	Reference Weekly Flow (cfs)	1,100	275
	Reference Monthly Flow (cfs)	1,301	325
	4-day Chronic		
	Early Life Stages Present	3.82	
Criteria	Early Life Stages Absent		13.0
mg/L	30-day Chronic		
	Early Life Stages Present	1.53	
	Early Life Stages Absent		5.22
	Weekly Average		
Effluent	Early Life Stages Present	4,441	
Limitations	Early Life Stages Absent		3,816
mg/L	Monthly Average		
	Early Life Stages Present	2,067	
	Early Life Stages Absent		1,787

Attachment #3 Weekly & Monthly Average Ammonia Nitrogen Limits