Permit Fact Sheet

General Information

Permit Number:	WI-0021709-10-0	
Permittee Name:	VILLAGE OF ORFORDVILLE	
Address:	PO Box 409 702 W Brodhead St	
City/State/Zip:	Orfordville WI 53576-8751	
Discharge Location:	Lat: 42.63252° N / Lon: 89.28797° W	
Receiving Water:	Unnamed Effluent Channel Tributary of Swan Creek (Lower Sugar River Watershed, SP11 – Sugar-Pecatonica River Basin) in Rock County	
StreamFlow ($Q_{7,10}$):	0.07 cfs (Effluent Channel), 0.15 cfs (LFF Swan Creek), 0.57 (FAL Swan Creek)	
Stream Classification:	Effluent channel: Limited Aquatic Life (LAL) Swan Creek (west of S. Potter Road): Limited Forage Fish (LFF) Swan Creek (S. Dickey Road): Warmwater Sport Fish (WWSF) by default	
Discharge Type:	Existing, Continuous	
Design Flow	Annual Average	0.398 MGD
Significant Industrial Loading?	None	
Operator at Proper Grade?	Nick Todd, OIC is certified in the following plant's subclasses: A1, B, C,and PP. SS subclass will need to be held by the end of permit term. Orfordville is an Advanced Plant A1 – Suspended Growth, B – Solid Separation, C – Biological Solids, P – Total Nutrient Removal, and SS – Sanitary Sewage Collection System.	
Approved Pretreatment Program?	N/A	

Facility Description

The Village of Orfordville Wastewater Treatment Facility serves a population of approximately 1,500 with no significant industrial contributors. The annual average design flow is 0.398 MGD with actual flows averaging 0.252 MGD over the past permit term. Orfordville Wastewater Treatment Facility consists of a conventional activated sludge, diffused air, package plant with the aeration tank, clarifier, and aerobic digester under one roof (dome). A grit removal facility is available but not used. Biological phosphorus removal is optimized at this facility followed by tertiary sand filters. Chemical phosphorus removal can also be used as a supplemental phosphorus removal measure. This facility is not currently required to disinfect, but a chlorine contact chamber is still intact. A step aerator aerates the wastewater prior to discharge. The digested sludge is land spread spring and fall. Drying beds are sometimes used for additional storage needs.

Substantial Compliance Determination

Enforcement During Last Permit: After a desk top review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, and a site visit on June 17, 2022, conducted by DNR Wastewater Engineer, Ashley Brechlin, and a desktop review on March 8, 2024 this facility has been found to be in substantial compliance with their current permit, WI-0021709-09-0.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	0.252 MGD (Average from 2018 to 2023)	Influent: 24-Hr flow proportional composite samples shall be collected after the wetwell and screening prior to the aeration basin. Flow meter located downstream of influent pump.
001	N/A	Effluent: 24-Hr flow proportional composite and grab samples shall be collected at the bottom of the step aerator, prior to discharge to the tributary of Swan Creek.
002	20 dry U.S. tons (2023 application)	Aerobically digested, Liquid, Class B. Representative sludge samples shall be collected from the discharge from the aerobic digester.
003	20 dry U.S. tons (2023 application)	Aerobically digested, Cake, Class B. Representative sludge samples shall be collected from the drying beds prior to land application.

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

Changes from Previous Permit:

Sample frequency for Flow Rate updated to ‘Daily’ to reflect eDMR reporting.

Explanation of Limits and Monitoring Requirements

Influent monitoring requirements were re-evaluated for the proposed permit term and no changes were made from the previous permit.

Flow, BOD_5 and Total Suspended Solids – Monitoring of influent flow, BOD_5 and total suspended solids (TSS) is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirement for BOD_5 and TSS in s. NR 210.05(1)(a) and (b), Wis. Adm. Code, and in the Standard Requirements section of the permit.

2 Surface Water - Monitoring and Limitations

Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
BOD5, Total	Daily Max	30 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	15 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Daily Max	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	20 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Min	6.0 su	5/Week	Grab	
pH Field	Daily Max	9.0 su	5/Week	Grab	
Dissolved Oxygen	Daily Min	4.0 mg/L	5/Week	Grab	
Phosphorus, Total	Monthly Avg	0.61 mg/L	3/Week	24-Hr Flow Prop Comp	This is an interim limit. See Phosphorus Variance permit section and schedule.
Phosphorus, Total		lbs/day	3/Week	Calculated	Calculate the daily mass discharge of phosphorus on the same days phosphorus sampling occurs. Mass (lbs/day) = Concentration (mg/L) x Flow (MGD) x 8.34.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	15 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	12 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective April - September.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	15 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective October - March.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	5.2 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective April - September.
Nitrogen, Ammonia	Monthly Avg	15 mg/L	3/Week	24-Hr Flow	Limit effective October -

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
(NH3-N) Total				Prop Comp	March.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See 'Nitrogen Series Monitoring' permit section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See 'Nitrogen Series Monitoring' permit section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See 'Nitrogen Series Monitoring' permit section. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring only in 2027.
Chronic WET	Monthly Avg	1.2 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See 'WET Testing' permit section.

Changes from Previous Permit

Monitoring Frequencies: Appropriate monitoring frequencies are evaluated based on the size and type of facility, the ability to characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Monitoring frequency for flows, emerging contaminants, and pollutants with final effluent limits have been evaluated for this facility and will be reflected in the proposed permit. Additionally, there will be a need to demonstrate compliance with anticipated new equipment brought online through the facility upgrade.

After evaluation, an increase in sampling frequency is warranted to capture changes in treatment due to facility upgrades and to align with sampling frequencies of similarly sized facilities with similar effluent quality throughout the state. The proposed permit will include an increased monitoring frequency for the following parameters:

- pH from 3x/week to 5x/week
- DO from 3x/week to 5x/week
- Ammonia-Nitrogen from 2x/week to 3x/week

Phosphorus: The interim phosphorus limit was updated from 1.0 mg/L to 0.61mg/L.

Temperature: Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. Orfordville discharges to an effluent ditch, which has daily maximum temperature limits of 120° F. Based on data collected in 2021 (maximum daily effluent temperature reported was 73 degrees F) there is no reasonable potential for the effluent to exceed that limit. Temperature monitoring in-plant and sampling during the permit term is not required therefore temperature monitoring was removed.

Explanation of Limits and Monitoring Requirements

Categorical Limits

BOD_5, Total Suspended Solids, pH, and Dissolved Oxygen: Standard municipal wastewater requirements for BOD_5, total suspended solids, dissolved oxygen, and pH are included based on ch. NR 210, Wis. Adm. Code 'Sewage Treatment Works' requirements for discharges to fish and aquatic life streams. Chapter NR 102, Wis. Adm. Code 'Water Quality Standards for Surface Waters' also specifies requirements for pH for fish and aquatic life streams.

Water Quality Based Limits

Refer to the "Water Quality-Based Effluent Limitation for the Orfordville Wastewater Treatment Facility" dated October 30, 2023 and prepared by Sarah Luck, which was used for this reissuance.

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. Subchapter III of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for ammonia. See the WQBEL memo for the detailed calculations.

Regulatory changes to s. NR 205.065, Wis. Adm. Code, became effective September 1, 2016 and require limits in this permit to be expressed as weekly average and monthly average limits whenever practicable. These changes are based on 40 CFR 122.45(d).

Phosphorus: Phosphorus requirements are based on NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. The final limits are 0.225mg/L as a monthly average, 0.075 mg/L as a six-month average and 0.075 lbs/day six-month average. These limits are beyond the capabilities of the Village's current treatment plant.

The permittee has applied for an individual phosphorus variance in accordance with s. 283.15, Wis. Stats. Conditions for this variance include maintaining phosphorus effluent concentrations below the interim limit of 0.61 mg/L as a monthly average, implementing a Phosphorus Pollutant Minimization program plan dated last revised February 26, 2024, continued optimization for control of phosphorus, and calculating, reporting and tracking phosphorus mass discharge. The interim limit of 0.61 mg/L is less than the calculated 4-day P99 of phosphorus effluent data generated by the permittee over the past five years. This interim limit reflects a concentration that the permittee can meet without investing in additional treatment, but also prevents backsliding from the current interim limit and conditions. The permittee was determined to not be eligible for the statewide Multi-Discharger Variance for phosphorus.

Total Nitrogen Monitoring (NO2+NO3, TKN and Total N): The department has included effluent monitoring for Total Nitrogen in the permit through the authority under §§ 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the "Guidance for Total Nitrogen Monitoring in Wastewater Permits" dated October 1, 2019. Annual tests are scheduled in the following rotating quarters: October – December 2024; April – June 2025; January – March 2026; July – September 2027; April – June 2028; January – March 2029

Chloride: Acute and chronic chloride toxicity criteria for the protection of aquatic life are included in Tables 1 and 5 of ch. NR 105. Subchapter IV of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for chloride. The calculated daily maximum and weekly average effluent limitations are higher than the corresponding 1-day P99 and 4-day P99 (respectively) of effluent concentrations, therefore, no effluent limitations are recommended. Monthly monitoring for Chloride is included for one year to ensure 11 samples are available for the next permit reissuance.

Whole Effluent Toxicity: Whole effluent toxicity (WET) testing requirements and limits are determined in accordance with ss. NR 106.08 and NR 106.09, 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).

A Standard Operating Procedure for the addition of alum was received in November 2023 and approved on November 30, 2023; therefore, the three recommended acute WET tests in the WQBEL are not required in the proposed permit. Annual chronic WET testing in rotating quarters and a chronic WET limit of 1.2 TUc is included in the proposed permit. Chronic WET tests are required during the following quarters: October – December 2024; April – June 2025; July – September 2026; January – March 2027; October – December 2028; July – September 2029.

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

Disinfection: Disinfection of the effluent is not currently required based on the conditions of s. NR 210.06(3), Wis. Adm. Code. However, it should be noted that the need for disinfection will be re-evaluated next permit term, which will likely result in requiring disinfection of the effluent at that time. Disinfection would likely apply during May through September and would require *Escherichia coli* (*E. coli*) limits for protection of recreational uses.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
002	B	Liquid	Fecal Coliform	Injection and Incorporation	Land Application	20
003	B	Cake	Fecal Coliform	Injection and Incorporation	Land Application	20
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 Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

Sample Point Number: 002- SLUDGE (liquid) and 003- SLUDGE (cake)

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
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	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2025
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2025
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFSA Dry Wt			Annual	Grab	Perfluoroalkyl and

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

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

Explanation of Limits and Monitoring Requirements

Requirements for land application of municipal sludge are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5). 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), 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.

4 Schedules

4.1 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
Land Application Management Plan Submittal: Submit a management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all landspreading activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes.	03/01/2025

4.1.1 Explanation of Land Application Management Plan Schedule

A land application management plan is being required to optimize the permittee's land application processes and ensure compliance with ch. NR 204, Wis. Adm. Code, for Orfordville's sludge outfall if the permittee intends to land apply sludge.

4.2 Phosphorus Pollutant Minimization Program

As a condition of the variance to the water quality-based effluent limitation (WQBEL) for phosphorus granted in accordance with s. 283.15, Wis. Stats., the permittee shall implement the Phosphorus PMP including any subsequent updates.

Required Action	Due Date
Annual Phosphorus Progress Report: Submit an annual progress report that shall discuss which phosphorus pollutant minimization measures have been implemented during the prior calendar year. The report shall include an analysis of trends in weekly average, monthly average and annual total influent and effluent phosphorus concentrations and mass discharge of phosphorus based on phosphorus sampling and flow data. The report shall provide an update on the permittee's: (1) progress in implementing pollutant minimization measures, operational improvements, and minor facility modifications to optimize reductions in phosphorus discharges and, (2) status of evaluating feasible alternatives for meeting phosphorus WQBELs. Note that the monthly average interim limitation listed in the permit's Surface Water section remains enforceable until new enforceable limits are established in the next permit reissuance. The first annual phosphorus progress report is to be submitted by the Date Due.	01/31/2025
Annual Phosphorus Progress Report #2: Submit a phosphorus progress report as defined above for the previous calendar year.	01/31/2026
Annual Phosphorus Progress Report #3: Submit a phosphorus progress report as defined above for the previous calendar year.	01/31/2027
Annual Phosphorus Progress Report #4: Submit a phosphorus progress report as defined above for the previous calendar year.	01/31/2028
Final Phosphorus Report: Submit a final report documenting the success in reducing phosphorus concentrations in the effluent, as well as the anticipated future reduction in phosphorus sources and phosphorus effluent concentrations. The report shall summarize phosphorus pollutant minimization activities that have been implemented during the current permit term and state which, if any, pollutant minimization activities from the approved pollutant minimization program plan were not pursued and why. The report shall include an analysis of trends in monthly and annual total influent and effluent phosphorus concentrations based on phosphorus sampling during the current permit term. The permittee shall also re-evaluate all available compliance options for meeting the final phosphorus WQBELs. If the report concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an adaptive management plan. If the report concludes water quality trading will be used, the submittal shall include a Water Quality Trading Plan. Additionally, if the permittee intends to seek to re-apply for a phosphorus variance per s. 283.15, Wis. Stats for the reissued permit, a detailed pollutant minimization program plan outlining the pollutant minimization activities proposed for the upcoming permit term should be submitted along with the final report.	01/31/2029

Annual Phosphorus Progress Reports After Permit Expiration: In the event that this permit is not reissued by the date the permit expires, the permittee shall continue to submit reports for the previous calendar year following the due date of annual phosphorus progress reports listed above. Annual phosphorus progress reports shall include information as defined above.	

4.2.1 Explanation of Phosphorus Pollutant Minimization Program Schedule

This compliance schedule is a condition of receiving a variance from the water quality standards for phosphorus. Annual phosphorus progress reports update the Department on the progress made in implementing the Pollutant Minimization Program Plan as well as quantifying reductions achieved through plant optimization and from contributing sources within the collection system.

Special Reporting Requirements

None.

Other Comments:

None.

Attachments:

Water Quality Based Effluent Limits dated October 23, 2023, prepared by Sarah Luck, Effluent Limits Calculator
Phosphorus Variance Documents
EPA Datasheet
PMP Plan Dated: February 2024

Expiration Date:

September 30, 2029

Justification Of Any Waivers From Permit Application Requirements

No waivers were requested from permit application monitoring and reporting requirements.

Prepared By: Victoria Ziegler Wastewater Specialist **Date:** March 22, 2024

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: October 30, 2023

TO: Jennifer Jerich – SCR/Horicon

FROM: Sarah Luck – SCR/Fitchburg

SUBJECT: Water Quality-Based Effluent Limitations for the Orfordville Wastewater Treatment Facility WPDES Permit No. WI-0021709-10-0

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 Orfordville Wastewater Treatment Facility in Rock County. This municipal wastewater treatment facility (WWTF) discharges to an effluent channel which flows to Swan Creek, located in the Lower Sugar River Watershed (SP11) in the Sugar Pecatonica Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5	30 mg/L			15 mg/L		1,2
TSS	30 mg/L			20 mg/L		1,2
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1,2
Ammonia Nitrogen April – May June – September October – March	 15 mg/L 15 mg/L 15 mg/L		 12 mg/L 12 mg/L **15 mg/L**	 5.2 mg/L 5.2 mg/L **15 mg/L**		1,3
Phosphorus IPV Interim Limit Final WQBEL				 0.61 mg/L 0.225 mg/L	 0.075 mg/L 0.25 lbs/day	4
TKN, Nitrate+Nitrite, and Total Nitrogen						5
Chloride						6
Acute WET						7
Chronic WET				1.2 TU_c		8,9

Footnotes:

1. No changes from the current permit.
2. These limits are based on the Limited Forage Fish (LFF) community of Swan Creek as described in s. NR 104.02(3)(a), Wis. Adm. Code. While the immediate receiving water (effluent ditch) is classified as Limited Aquatic Life, the LFF limits are more restrictive and are protective of both the immediate and downstream waters.
3. 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.
4. If the individual phosphorus variance (IPV) application is approved by EPA, an interim limit of 0.61 mg/L as a monthly average is recommended. The final WQBELs remain at 0.225 mg/L as a

monthly average and 0.075 mg/L and 0.25 lbs/day as six-month averages.

5. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total Kjeldahl nitrogen (TKN) (all expressed as N).
6. Monitoring in the fourth year of the permit term at a frequency to ensure that 11 samples are available at the next permit issuance.
7. Three acute WET tests are recommended during the permit term. If a SOP for alum is received and approved prior to permit reissuance, no acute WET testing is recommended.
8. The Instream Waste Concentration (IWC) to assess chronic test results is 81%. 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 Swan Creek. 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).
9. The permittee may elect to conduct a toxicity reduction evaluation (TRE) to find and fix the source(s) of the toxicity. Guidance related to TRE schedules is provided in Chapter 1.12 of the WET Guidance Document. If a TRE schedule is given, chronic WET monitoring for compliance may be postponed as the facility conducts WET tests for the TRE. If Orfordville does not receive a TRE schedule, WET monitoring must begin immediately upon permit reissuance. Chronic WET monitoring may be recommended to be more frequent in the first year (quarterly or two times per year) followed by annual tests.

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: Sarah Luck _____ Date: October 30, 2023

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

Attachment #1

Water Quality-Based Effluent Limitations for
Orfordville Wastewater Treatment Facility

WPDES Permit No. WI-0021709-10

PART 1 – BACKGROUND INFORMATION

Facility Description

Orfordville Wastewater Treatment Facility consists of a conventional activated sludge, diffused air, package plant with the aeration tank, clarifier, and aerobic digester under one roof (dome). A grit removal facility is available but not used. Biological phosphorus removal is optimized at this facility followed by tertiary sand filters. Chemical phosphorus removal can also be used as a supplemental phosphorus removal measure. This facility is not currently required to disinfect, but a chlorine contact chamber is still intact. A step aerator aerates the wastewater to meet the DO limit in the permit. The digested sludge is land spread spring and fall. Drying beds are sometimes used to make up the storage needs.

Disinfection of the effluent is not currently required based on the conditions of s. NR 210.06(3), Wis. Adm. Code. However, it should be noted that the need for disinfection will be re-evaluated next permit term, which **will likely result in requiring disinfection of the effluent** at that time. Disinfection would likely apply during May through September and would require *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.

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

Existing Permit Limitations

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5	30 mg/L			15 mg/L		1
TSS	30 mg/L			20 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1
Ammonia Nitrogen						2
April – May	15 mg/L		12 mg/L	5.2 mg/L		
June – September	15 mg/L		12 mg/L	5.2 mg/L		
October – March	15 mg/L		**15 mg/L**	**15 mg/L**		
Temperature						3
Chloride						3

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Phosphorus						4
Interim				4.3 mg/L		
MDV Interim				1.0 mg/L		
Final WQBEL				0.225 mg/L	0.075 mg/L	
Chronic WET				1.23 TU_c		5

Footnotes:

1. These limits are based on the Limited Forage Fish (LFF) community of Swan Creek as described in s. NR 104.02(3)(a), Wis. Adm. Code. While the immediate receiving water (effluent ditch) is classified as Limited Aquatic Life, the LFF limits are more restrictive and are protective of both the immediate and downstream waters.
2. 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.
3. Monitoring only.
4. A compliance schedule is in the current permit to achieve the interim MDV limit of 1.0 mg/L by January 1, 2021.
5. Annual chronic WET tests were required. The IWC for chronic WET was 81%.

Receiving Water Information

- Name: Unnamed effluent channel on the east side of S. Potter Road in Orfordville. Water travels approximately 0.3 mi to Swan Creek.
- Waterbody Identification Code (WBIC): 3000220 (unnamed effluent channel) and 876700 (Swan Creek)
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code:

Location	Classification
Effluent channel	Limited Aquatic Life (LAL) as specified in ch. NR 104, Wis. Adm. Code
Swan Creek (west of S. Potter Road) – approx. 0.3 mi from Outfall 001	Limited Forage Fish (LFF) as specified in ch. NR 104, Wis. Adm. Code
Swan Creek (S. Dickey Road) – approx. 2 mi from Outfall 001	Warmwater Sport Fish (WWSF) by default

- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values are estimated from the Surface Water Data Viewer and were used in the previous limit calculation in 2017.

Location	7-Q_{10} (cfs)	7-Q_2 (cfs)	90-Q_{10} (cfs)	Harmonic Mean Flow* (cfs)
Effluent channel	0.07	0.13	0.11	0.77
Swan Creek (S. Potter Road)	0.15	0.29	0.25	-
Swan Creek (S. Dickey Road)	0.57	1.06	0.96	-

*The Harmonic Mean Flow has been estimated based on average flow and the 7-Q_{10} using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89) and using a drainage area of 1.2 mi^2.

- Hardness = 354 mg/L as $CaCO_3$. This value represents the geometric mean of data (n=8) from 2018-2022 WET tests.
- % 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 Sugar River (SWIMS Station 233001 - Sugar River at Ten Eyck Rd Near Brodhead WI) is used for this evaluation because there is no data available for the effluent channel or Swan Creek. The Sugar River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: None.
- Impaired water status: Swan Creek, located approximately 0.3 mi downstream of the outfall, is 303(d) listed as impaired due to total phosphorus as of 4/1/2016.

Effluent Information

- Flow rate:
  Design annual average = 0.398 MGD (Million Gallons per Day)
  For reference, the actual average flow from July 2018 through July 2023 was 0.244 MGD.
- Hardness = 375 mg/L as $CaCO_3$. This value represents the geometric mean of data (n=4) from January 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 wastewater with water supply from wells.
- Additives: Alum (used for supplemental 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 plus hardness.
- 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	2.9	1/31/2023	4.1	2/16/2023	4.9
1/20/2023	<1.9	2/4/2023	2.9	2/20/2023	4.8
1/23/2023	2.6	2/8/2023	2.9	2/21/2023	3.7
1/27/2023	3.4	2/12/2023	3.2		
Mean = 3.2 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

Sample Date	Chloride (mg/L)	Sample Date	Chloride (mg/L)	Sample Date	Chloride (mg/L)
1/18/2022	250	5/19/2022	244	9/13/2022	98
2/2/2022	310	6/21/2022	205	9/29/2022	161

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Sample Date	Chloride (mg/L)	Sample Date	Chloride (mg/L)	Sample Date	Chloride (mg/L)
2/24/2022	335	7/6/2022	211	10/18/2022	162
3/16/2022	271	7/26/2022	188	11/3/2022	197
4/7/2022	224	8/11/2022	176	11/23/2022	217
4/27/2022	214	8/30/2022	178	12/15/2022	219
1-day P_{99} = 375 mg/L					
4-day P_{99} = 287 mg/L					

The following table presents the average concentrations and loadings at Outfall 001 from July 2018 through July 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	3 mg/L*	
pH field	7.5 s.u.	
Phosphorus	0.67 mg/L	1.59 lbs/day
Ammonia Nitrogen	0.76 mg/L*	
Dissolved Oxygen	8 mg/L	

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

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

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

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

Acute Limits based on 1-Q_{10}

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

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

Where:

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

Code.

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

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

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

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

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

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0.06 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	2	370.5	74.1	<1.1		
Cadmium	354	123.2	0.14	134.4	26.9	<0.19		
Chromium	301	4446	2	4849.9	970	<1.1		
Copper	354	51.2	2	55.7	11.1	3.2		
Lead	354	363		396.1	79.2	<4.3		
Nickel	268	1080		1178.5	236	1.5		
Zinc	333	345		376.0	75.2	25		
Chloride (mg/L)		757	31.1	823			375	335

* 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-Q_{10} flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.02 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		152.2	2	156	31.3	<1.1	
Cadmium	175	3.82	0.14	3.92	0.8	<0.19	
Chromium	301	325.75	2	335	67.0	<1.1	
Copper	371	31.78	2	32.6	6.53	3.2	
Lead	356	95.51		98.2	19.6	<4.3	

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SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Nickel	268	169.08		174	34.8	1.5	
Zinc	333	344.68		354	70.9	25	
Chloride (mg/L)		395	31.1	405			287

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

Monthly Average Limits based on Wildlife Criteria (WC)
The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)
RECEIVING WATER FLOW = 0.19 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	880	0.14	1153	230.7	<0.19
Chromium (+3)	8400000	2	11010586	2202117	<1.1
Lead	2240		2936	587.2	<4.3
Nickel	110000		144186	28837	1.5

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER FLOW = 0.19 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	2	51.8	10.36	<1.1

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

Conclusions and Recommendations
Based on a comparison of the effluent data and calculated effluent limitations, **no effluent limitations are required.** The limits calculated above are based on limited aquatic life for the protection of the immediate receiving water. When the limits were calculated based on limited forage fish for downstream considerations, only one chronic limit was different, but there was still no reasonable potential, so limits are not needed for downstream protection.

Chloride – Considering available effluent data from the current permit term (July 2018 through July 2023), the 1-day P_{99} chloride concentration is 375 mg/L, and the 4-day P_{99} of effluent data is 287 mg/L.

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

Mercury – The permit application did not require monitoring for mercury because Orfordville Wastewater Treatment Facility is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from July 2018 through July 2023 (n=3) was 0.14 mg/kg, with a maximum reported concentration of 0.15 mg/kg. Therefore, **no mercury monitoring is recommended at Outfall 001.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the type of discharge, the effluent flow rate, and lack of indirect dischargers, **PFOS and PFOA monitoring is not recommended.** The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BOD_5 AND TOTAL SUSPENDED SOLIDS

The current permit contains daily maximum and monthly average BOD_5 and total suspended solids (TSS) limits. These limits are set to protect Swan Creek, which is classified as Limited Forage Fish (LFF), in accordance with s. NR 104.02(3) (a), Wis. Adm. Code. However, the immediate receiving water (effluent ditch) is classified as Limited Aquatic Life (LAL). The LFF limits are more restrictive and are therefore protective of both the immediate and downstream receiving waters. **It is recommended that the LFF limits remain in the reissued permit.**

PART 4 – 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.

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 equation on the next page:

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

Where:

A = 0.411 and B = 58.4 for a Limited Forage Fishery,
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 794 sample results were reported from July 2018 through July 2023. The maximum reported value was 8.0 s.u. (Standard pH Units). The effluent pH was 7.8 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.8 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.8 s.u. Therefore, a value of 7.8 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.8 s.u. into the equations above yields an ATC = 18.7 mg/L for the LAL stream and an ATC = 12.1 mg/L for the LFF stream.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

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

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

Daily Maximum Ammonia Nitrogen Determination

	2×ATC	1-Q_{10}
LAL	37	20
LFF	*24*	*15*
LFF (decay consideration)	*NA - 1-Q_{10} is more restrictive*	15

The 1-Q_{10} method for LFF, after accounting for downstream decay (the decay equation is described in Attachment #3), yields the most stringent daily maximum ammonia limits for Orfordville Wastewater Treatment Facility (15 mg/L).

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 July 2018 through July 2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in Orfordville Wastewater Treatment Facility's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Attachment #1

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	April - May	June - September	October - March
1-day P_{99}	2.12	8.66	13.40
4-day P_{99}	1.44	4.66	7.37
30-day P_{99}	0.70	1.93	3.07
Mean*	0.12	0.58	1.09
Std	1.35	3.52	4.51
Sample size	87 (58 ND)	185 (136 ND)	264 (156 ND)
Range	<0.05 - 7.32	<0.03 - 14.37	<0.03 - 15.6

*Values lower than the level of detection were substituted with a zero. ND = non-detect.

Based on this comparison, there is reasonable potential for the discharge to exceed the daily maximum limit of 15 mg/L during October through March because the highest reported value, 15.6 mg/L, exceeded the limit. For the other months of the year, there is no reasonable potential shown. However, **since the permit currently has daily, weekly, and monthly limits year-round, 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 & May	15	12	5.2
June – September	15	12	5.2
October – March	15	**15**	**15**

Additional limits to meet the requirements in s. NR 106.07, Wis. Adm Code, are denoted in bold text.

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.

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

Attachment #1

Annual Average Mass Total Phosphorus Loading

Month	Average Phosphorus Concentration (mg/L)	Total Effluent Flow (Million Gallons)	Calculated Mass (lbs/month)
August 2022	0.21	4.84	8.5
September 2022	0.10	7.24	5.9
October 2022	0.11	4.76	4.2
November 2022	0.16	5.31	7.0
December 2022	0.05	6.43	2.7
January 2023	0.03	6.84	1.7
February 2023	0.05	7.28	2.8
March 2023	0.04	10.79	4.0
April 2023	0.06	10.22	5.5
May 2023	0.10	7.71	6.4
June 2023	0.15	5.01	6.2
July 2023	0.28	4.24	10
Average			**5.4**

Total P (lbs/month) = Monthly average (mg/L) × total flow (MG/month) × 8.34 (lbs/gallon)
Where total flow is the sum of the actual (not design) flow (in MGD) for that month

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

Water Quality-Based Effluent Limits (WQBEL)

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

Phosphorus criteria in s. NR 102.06, Wis. Adm. Code, do not apply to limited aquatic life waters as described in s. NR 102.06(6)(d), Wis. Adm. Code. These waters were not included in the USGS/WDNR stream and river studies and, therefore, the Department lacked the technical basis to determine and propose applicable criteria. At some time in the future, the Department may adopt phosphorus criteria based on new studies focusing on limited aquatic life waters. The *Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges* (2020) suggests that during the interim, WQBELs should be based on the criteria and flow conditions for the next stream segment downstream (or downstream lake or reservoir, if appropriate), because ss. 217.12 and 217.13, Wis. Adm. Code, state that the Department must set WQBELs to protect downstream waters. The discharge location of the wastewater from Orfordville Wastewater Treatment Facility is classified as limited aquatic life from the point of discharge downstream 0.3 mi to Swan Creek, where the classification is limited forage fishery for approximately 1.7 mi before being considered a warm water sport fishery. Swan Creek is listed as an impaired water due to phosphorus.

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 0.075 mg/L applies for Swan 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) provided below.

$$\text{Limitation} = [(WQC)(Qs+(1-f)\ Qe) - (Qs-f\ Qe)\ (Cs)]/Qe$$

Where:

WQC = 0.075 mg/L for Swan Creek
Qs = 100% of the 7-Q_2 of 0.29 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 = 0.398 MGD = 0.617 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.

A previous evaluation resulted in a WQBEL of 0.075 mg/L using a background concentration of 0.130 mg/L based on instream phosphorus samples (n=23) collected by Town and Country Engineering on behalf of Orfordville during 2013-2015 (summarized in the table below). Section NR 217.13(2)(d), Wis. Adm. Code, states that the determination of upstream concentrations shall be evaluated at each permit reissuance. No additional background data were available to be considered in estimating the background phosphorus concentration.

Instream Phosphorus Data

Location: Swan Creek above the confluence with the effluent ditch (South Potter Road)	
Waterbody	Swan Creek
Sample Count	23
First Sample	05/09/2013
Last Sample	05/06/2015
Mean	0.139 mg/L
Median	0.130 mg/L
NR 217 Median	0.130 mg/L

Substituting a background concentration above criteria 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 WQBEL 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."

The impaired water listing of Swan Creek at the confluence with the effluent ditch also substantiates that effluent phosphorus limits equal to the water quality criterion are needed to prevent the discharge from contributing to further impairment of the receiving water. *The Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges (2020)* suggests setting effluent limits equal to the criterion in the absence of an EPA approved total maximum daily load for discharges of phosphorus-to-phosphorus impaired waters.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data.

Total Phosphorus Effluent Data

	July 2018 through July 2023		January 2021 through July 2023 (Data since 1.0 mg/L limit went in to effect)	
	mg/L	**lbs/day**	**mg/L**	**lbs/day**
1-day P_{99}	3.64	9.31	1.12	1.92
4-day P_{99}	1.97	5.03	0.61	1.09
30-day P_{99}	1.05	2.59	0.29	0.48
Mean	0.67	1.59	0.17	0.24
Std	0.75	1.94	0.24	0.44
Sample size	784	781	397	402
Range	0.02 - 6.64	0.01 - 11.54	0.02 - 1.62	0.01 - 5.4

Reasonable Potential Determination
The discharge has reasonable potential to cause or contribute to an exceedance of the water quality criterion because the 30-day P_{99} of reported effluent total phosphorus data is greater than the calculated WQBEL**.** Therefore, **a WQBEL is required.**

Limit Expression
According to s. NR 217.14(2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L 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 mg/L, equal to three times the WQBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Mass Limits
A mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code, because the discharge is to a surface water impaired for phosphorus. **This final mass limit shall be 0.075 mg/L × 8.34 × 0.398 MGD = 0.25 lbs/day expressed as a six-month average.**

Individual Phosphorus Variance
Orfordville Wastewater Treatment Facility was covered under the individual phosphorus variance (IPV) during the previous permit term and has applied for a second term. Eligibility for the variance is not included as part of this review. If a variance is granted and approved by US Environmental Protection Agency**, an interim limit of 0.61 mg/L as a monthly average,** which is equal to the 4-day P_{99} of data from January 2021 through July 2023, **is recommended**.

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in Chapters NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. The daily maximum effluent temperature limitation shall be 86°F for discharges to surface waters classified as

Limited Aquatic Life according to s. NR 104.02(3)(b)1, Wis. Adm. Code, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 and described in s. NR 106.55(2), Wis. Adm. Code, which has a daily maximum effluent temperature limitation of 120°F. The 120°F limit applies because the hydrologic classification is listed as a wastewater effluent channel in ch. NR 104, Wis. Adm. Code.

Reasonable Potential
Based on the available discharge temperature data from January 2021 through December 2021 shown below, the maximum daily effluent temperature reported was 73°F; therefore, no reasonable potential for exceeding the daily maximum limit exists, and **no limits or monitoring are recommended**.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	50	50	-	120
FEB	46	47	-	120
MAR	49	59	-	120
APR	52	55	-	120
MAY	60	61	-	120
JUN	66	68	-	120
JUL	71	72	-	120
AUG	73	73	-	120
SEP	71	73	-	120
OCT	70	70	-	120
NOV	61	62	-	120
DEC	55	56	-	120

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

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

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.

- Chronic 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 IC_{25} (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 81% 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:

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

Where:

Q_e = annual average flow = 0.398 MGD = 0.616 cfs

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

Q_s = ¼ of the 7-Q_{10} = 0.57 cfs ÷ 4 = 0.1425 cfs (Swan Creek at S. Dickey Rd – first non-variance downstream water)

Since the immediate receiving water is classified as LAL, the location for calculating the IWC should consider aquatic populations downstream where the classification changes to support those aquatic populations. For this calculation, the default mixing of 25% of the downstream flow is used since there is no other reason, such as a mixing zone study, to use a different percentage.

It should be noted that the modeled natural community of the immediate receiving water (the unnamed effluent channel) is coldwater. The IWC should be protective of the immediate receiving water if it is supporting aquatic populations as is indicated by the modeled natural community. However, the coldwater natural community has not been verified so the previous IWC is recommended to continue. If the coldwater community is verified, the IWC would change to 97% and the chronic WET limit would change to 1.0 TUc (100/97 = 1.0).

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Swan Creek, 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 does not show repeated toxicity that was never resolved and is not the only data that is available.

Attachment #1

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
09/22/2005	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/30/2013	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
09/09/2014	-	-	-	-	>100	72	Fail	Yes	
10/07/2014	-	-	-	-	>100	>100	Pass	Yes	Retest
10/28/2014	-	-	-	-	>100	>100	Pass	Yes	Retest
05/10/2016	-	-	-	-	>100	>100	Pass	Yes	
08/21/2018	-	-	-	-	>100	-	Pass	Yes	
11/05/2019	-	-	-	-	35	>100	Fail	Yes	
12/10/2019	-	-	-	-	>100	>100	Pass	Yes	Retest
01/07/2020	-	-	-	-	77.5	>100	Fail	Yes	Retest; 1
01/28/2020	-	-	-	-	61.4	>100	Fail	Yes	Retest; 1
09/15/2020	-	-	-	-	>100	>100	Pass	Yes	
06/29/2021	-	-	-	-	>100	>100	Pass	Yes	
03/09/2022	-	-	-	-	>100	>100	Pass	Yes	

Footnote:

1. A failure of a retest automatically triggers the standard requirement that a toxicity reduction evaluation (TRE) plan is submitted within 60 days. However, this was not done. The facility operator did mention that previous operators "used a very large rusty old weight for the sampling tube on the effluent water" and that once it was removed (presumably in 2020), no failure has occurred since. However, since the Department does not have definitive information showing what caused toxicity and that it was permanently removed, previous WET data cannot be excluded from consideration and are still considered representative and part of the reasonable potential determination.

- 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 LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

  Acute Reasonable Potential = $0 < 1.0$, **reasonable potential is not shown, and an acute WET limit is not required.**

Attachment #1

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

Chronic WET Limit Parameters

TUc (maximum) $100/IC_{25}$	**B** (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/35 = 2.9	2.6 Based on 4 detects	81%

[(TUc effluent) (B)(IWC)] = 6.0 > 1.0

Therefore, **reasonable potential is shown for a chronic WET limit** using the procedures in s. NR 106.08(6) and representative data from 2005-2022.

Expression of WET limits

Chronic WET limit = [100/IWC] TU_c = 100/81 = **1.2 TU_c 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.

WET Checklist Summary

	Acute	**Chronic**
AMZ/IWC	Not Applicable. **0 Points**	IWC = 81% **15 Points**
Historical Data	2 tests used to calculate RP. No tests failed. No data from previous five years. **5 Points**	14 tests used to calculate RP. 4 tests failed. **0 Points**
Effluent Variability	Little variability, few violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	< 4 mi to non-variance **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, nickel, and zinc detected. Additional Compounds of Concern: None. **3 Points**	No reasonable potential for limits based on CTC. Ammonia nitrogen limit carried over from the current permit. Chloride, copper, nickel, and zinc detected. Additional Compounds of Concern: None. **3 Points**
Additives	0 Biocides and 1 Water Quality Conditioner (alum) added.	Additives used more than once per 4 days.

Attachment #1

	Acute	Chronic
	Permittee has proper P chemical SOPs in place? No **16 Points**	**16 Points**
Discharge Category	No industrial contributors. **0 Points**	No industrial contributors. **0 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:	**29 Points**	**39 Points**
Recommended Monitoring Frequency (from Checklist):	None	Quarterly
Limit Required?	No	Limit = 1.2 TU_c
TRE Recommended? (from Checklist)	No	Yes

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

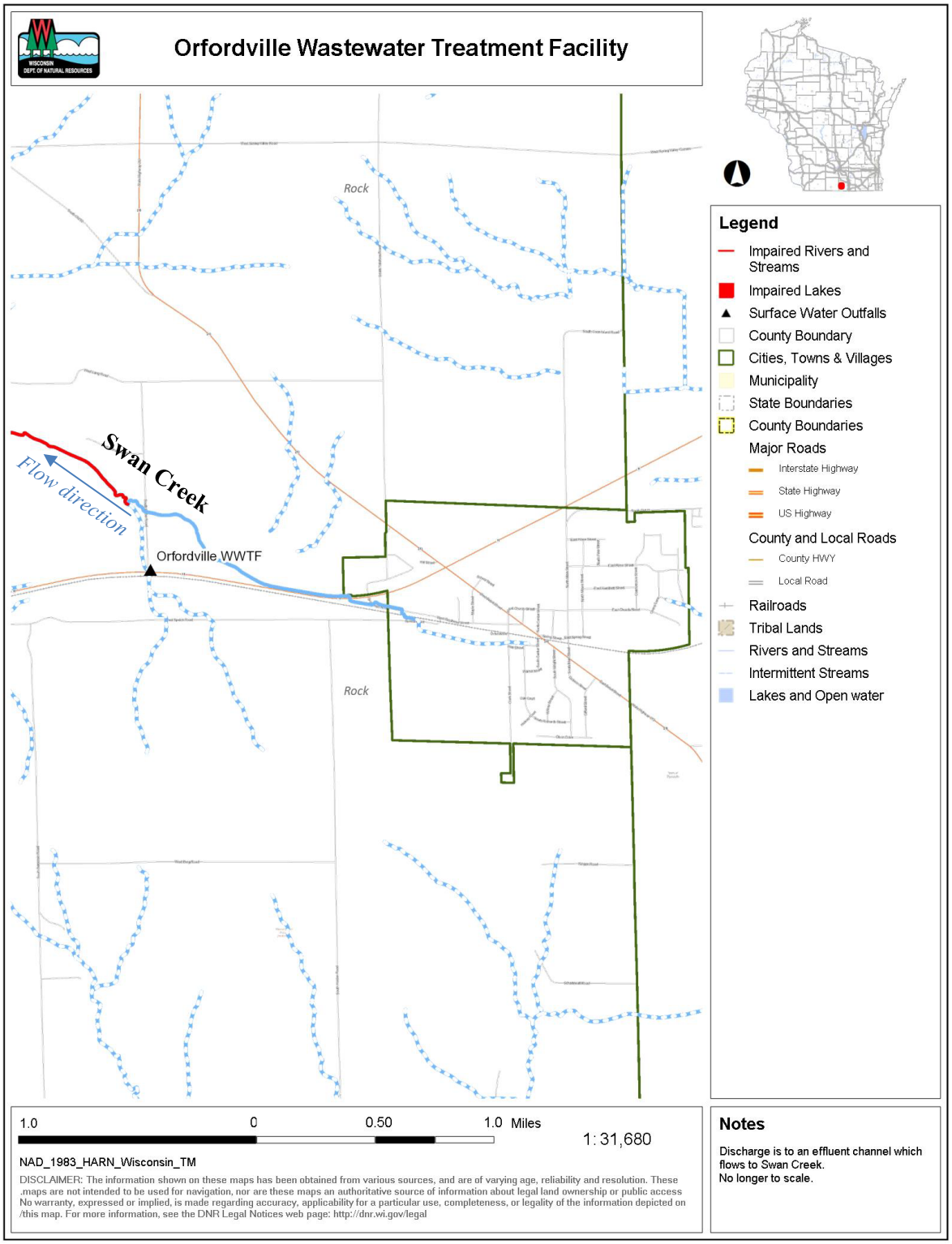
  If Orfordville submits an approvable SOP for alum used for phosphorus removal, 15 points would be removed from the acute and chronic checklists. This would result in the recommendation of **no acute WET testing; chronic WET testing frequency would not change based on the approval of a SOP.**

- Toxicity has been measured in 4 out of 14 chronic WET tests conducted on this effluent, as shown in the WET Data History table above. Due to this repeated toxicity, **a toxicity reduction evaluation (TRE) may be completed** in order to find and fix the source of the toxicity and achieve compliance with the WET limit. If a TRE schedule is given, chronic WET monitoring for compliance may be postponed as the facility conducts WET tests for the TRE. If Orfordville does not receive a TRE schedule, WET monitoring must begin immediately upon permit reissuance. Chronic WET monitoring may be recommended to be more frequent in the first year (quarterly or two times per year) followed by annual tests.

- 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 1.2 TU_c as a monthly average in the 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



Attachment #3

Ammonia Nitrogen Limitations Calculated in the WQBEL Memo Dated April 21, 2017

Effluent Ditch Limited Aquatic Life		Spring April & May	Summer June – Sept.	Winter Oct. - March
Background Information:	7-Q_{10} (cfs)	0.07	0.07	0.07
	7-Q_2 (cfs)	0.13	0.13	0.13
	Ammonia (mg/L)	0.07	0.06	0.12
	Temperature (°C)	15	19	7
	pH (su)	7.87	7.87	7.87
	% of Flow used	50	100	25
	Reference Weekly Flow (cfs)	0.035	0.07	0.0175
	Reference Monthly Flow (cfs)	0.05525	0.1105	0.027625
Criteria mg/L:	4-day Chronic	46.09	30.64	65.93
	30-day Chronic	18.44	12.25	26.37
Effluent Limits mg/L:	Weekly Average	48.71	34.11	67.80
	Monthly Average	20.09	14.44	27.55

Swan Creek Limited Forage Fish		Spring April & May	Summer June – Sept.	Winter Oct. - March
Background Information:	7-Q_{10} (cfs)	0.15	0.15	0.15
	7-Q_2 (cfs)	0.29	0.29	0.29
	Ammonia (mg/L)	0.07	0.06	0.12
	Temperature (°C)	15	19	7
	pH (s.u.)	7.87	7.87	7.87
	% of Flow used	100	100	100
	Reference Weekly Flow (cfs)	0.15	0.15	0.15
	Reference Monthly Flow (cfs)	0.2465	0.2465	0.2465
Criteria mg/L:	4-day Chronic			
	Early Life Stages Present	9.24	9.24	
	Early Life Stages Absent			35.60
	30-day Chronic			
	Early Life Stages Present	3.70	3.70	
	Early Life Stages Absent			14.24
Effluent Limitations mg/L:	Weekly Average			
	Early Life Stages Present	11.47	11.48	
	Early Life Stages Absent			44.24
	Monthly Average			
	Early Life Stages Present	5.15	5.15	
	Early Life Stages Absent			19.89

Ammonia Decay:

When evaluating the limits necessary to protect Swan Creek, decay of ammonia as it travels from the outfall to Swan Creek must be accounted for. Ammonia decay rates are dependent upon temperature and instream nitrification. Instream decay is expressed as first order decay model shown 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 (mg/L)

$-k_t$ = Ammonia decay rate at background stream temperature (day^{-1})
T = Travel time from outfall to downstream use (day)

Based on the available literature a decay rate of 0.25 day^{-1} at 20°C is suggested as a default rate. Use of a temperature correction factor of $\theta = 1.08$ is also suggested for temperatures above 10°C ($k_t = k_{20}\,\theta^{(T-20)}$). The velocity of the receiving water is assumed to be 5 miles per day and the distance from the point of discharge to Swan Creek is approximately 0.32 miles. This yields a travel time of roughly 0.064 days. The table below shows the calculated effluent limits that were adjusted for decay from the limits necessary to protect Swan Creek.

Ammonia Limits	**Limited Forage Fish**	**Adjusted for Decay**
April – May	mg/L	mg/L
Daily Max	14.49	14.65
Weekly Avg	11.47	11.60
Monthly Avg	5.15	5.20
June – Sept		
Daily Max	14.49	14.71
Weekly Avg	11.48	11.65
Monthly Avg	5.15	5.23
Oct – March		
Daily Max	14.48	14.57
Weekly Avg	44.24	44.50
Monthly Avg	19.89	20.01

Facility Specific Phosphorus Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Village of Orfordville

B. Facility Name: Orfordville Wastewater Treatment Facility

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Phosphorus **Date completed:** April 2, 2024

E. Permit #: WI-0021709 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance: 5 years **Start Date:** October 1, 2024 **End Date:** September 30, 2029

G. Date of Variance Application: December 6, 2023

H. Is this permit a:
☐ **First time submittal for variance**
☒ **Renewal of a previous submittal for variance** *(Complete Section X)*

I. Description of proposed variance:

The Village of Orfordville has re-applied for a variance from the total phosphorus water quality standard found in s. NR 102.06, Wis. Adm. Code, of 0.075 mg/L for effluent channel which flows to Swan Creek . The water quality based effluent limits (WQBELs) calculated pursuant to s. NR 217.13, Wis. Adm. Code, are 0.225 mg/L as a monthly average and 0.075 mg/L and 0.25 lbs/day as six-month averages.

The effluent phosphorus concentration for this discharge is 1.05 mg/L (30-day 99th percentile) from July 2018 – July 2023. During the last permit term Orfordville optimized the facility for biological phosphorus removal with supplemental chemical addition. After Orfordville completed the facility upgrades, the effluent phosphorus concentration was 0.29 mg/L from January 2021 – July 2023. This indicates that Orfordville wastewater treatment facility is unable to meet the phosphorus limit (0.075 mg/L) under current operations.

As part of the variance application Orfordville evaluated multiple alternatives for complying with phosphorus WQBELs including advance treatment: disk filtration, membrane filtration, and continuously backwash sand filter. All three of these technologies were economically infeasible at this time.

J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Victoria Ziegler	Victoria.Ziegler@wisconsin.gov	414-391-8946	Permit Drafter
Ashley Brechlin	Ashley.Brechlin@wisconsin.gov	608-438-9930	Compliance Staff
Sarah Luck	Sarah.Luck@wisconsin.gov	608-843-3876	Parts II D-H and K-N, III G-H
Others?			

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: 0.075 mg/L Phosphorus

B. List other criteria likely to be affected by variance: N/A

C. Source of Substance:

The Village of Orfordville discharges to a Tributary of Swan Creek in the Lower Sugar River and Taylor Creek watersheds. According to the Pollutant Load Ratio Estimation Tool (PRESTO) model, 83% of the phosphorus in the 8.89 square mile subwatershed entering the Tributary is attributable from nonpoint sources. The total annual average nonpoint phosphorus loading is 4,955 lbs/year. The Village of Orfordville's average annual phosphorus loading between 2010 and 2012 was 1040 lbs/year. (See PRESTO report)

Citation: PRESTO is a statewide GIS-based tool that compares the average annual phosphorus loads originating from point and nonpoint sources within a watershed. More information about this model is available at http://dnr.wi.gov/topic/surfacewater/presto.html.

D. Ambient Substance Concentration: 130 ug/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation.
The ambient concentration of 130 ug/L is the median phosphorus concentration for 21 samples collected during May and October in 2013 and 2015 at a representative upstream location on Swan Creek. Additional upstream and downstream data was collected throughout 2013 and 2015 with all median concentrations exceeding the water quality criteria of 75 ug/L. No additional ambient data have been collected since 2015.

F. Average effluent discharge rate: 0.244 MGD (July 2018 through July 2023); design rate = 0.398 MGD **Maximum effluent discharge rate:** 0.961 MGD (10/2/2019)

G. Effluent Substance Concentration: ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

1-day P99	1.12 mg/L
4-day P99	0.61 mg/L
30-day P99	0.29 mg/L
Mean	0.17 mg/L
Std	0.24 mg/L
Sample size	397
Range	0.02 – 1.62 mg/L

H. If measured or estimated, what was the basis? Include Citation. The above values are based on reported monitoring data from January 2021 through July 2023 (data since 1.0 mg/L limit went in to effect).
Citation: Submitted electronic Discharge Monitoring Reports (DMRs)

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its phosphorus PMP. Thus, the HAC during the permit term is 0.61 mg/L, which reflects the greatest phosphorus reduction achievable with the current treatment process, in conjunction with the implementation of the permittee's phosphorus PMP. The current effluent condition is reflective of on-site optimization measures that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for Orfordville at this time (See Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Variance Limit: 0.61 mg/L

L. Level currently achievable (LCA): 0.61 mg/L

M. What data were used to calculate the LCA, and how was the LCA derived? (*Immediate compliance with LCA is required.)*
The variance limit of 0.61 mg/L is equal to the 4-day P99 of data from January 2021 through July 2023.

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.
The variance limit is 0.61mg/L This is consistent with the limits expressed in s. NR 217.04, Wis. Adm Code and additionally, this averaging period is consistent with the limit expression in accordance with s. NR 217.14(2), Wis. Adm. Code.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☒ **6**
The Village of Orfordville has been successful in reducing effluent phosphorus concentrations over the past five years through treatment optimization. It is believed that Orfordville can maintain these successes and can take additional actions to lower phosphorus concentrations discharged by installing traditional phosphorus treatment and optimization of that system. Additionally, technology options may improve over the permit term, and will continue to be explored. Orfordville has demonstrated that the current compliance options are economically infeasible at this time. Given the long-term effects

of phosphorus pollution, an interim monthly average limit of 0.61 mg/L is recommended, to be effective once the traditional technology has been installed.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Rock County

B. Receiving waterbody at discharge point: Effluent channel which flows to Swan Creek

C. Flows into which stream/river? Swan Creek **How many miles downstream?** **0.3 miles**

D. Coordinates of discharge point (UTM or Lat/Long): Lat = 42° 37' 56" N, Long = 89° 17' 17" W

E. What are the designated uses associated with this waterbody?
The effluent channel is designated as a limited aquatic life stream and Swan Creek is designated as a limited forage fish (LFF) community stream.

F. Describe downstream waters:

Swan Creek is a warm water stream which originates near Orfordville and flows west and south into Taylor Creek. Swan Creek is listed impaired for total phosphorus. Over 80% of the phosphorus entering Swam Creek is attributed to nonpoint sources and therefore the Village of Orfordville is not believed to significantly impact downstream waters.

G. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the applicable criterion of the substance?
Swan Creek, located approximately 0.3 mi downstream of the outfall, is 303(d) listed as impaired due to total phosphorus as of 4/1/2016. The next downstream waterbody, Taylor Creek, is also impaired due to total phosphorus, as is the next downstream waterbody, Sugar River.

H. Provide the equation used to calculate that distance.
N/A

I. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:
There are no other permittees that discharge to the effluent ditch or to Swan Creek that have a phosphorus variance.

Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet.

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☒ **Yes** ☐ **No** ☐ **Unknown**

River Mile	Pollutant	Impairment
0.00 – 5.13 Swan Creek	Total Phosphorus	Impairment Unknown

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing phosphorus to the POTW? If so, please list.
The Village of Orfordville does not have a pretreatment program as the design flow is < 5MGD. The Village of Orfordville does not have any major industrial contributors.

B. Are all industrial users in compliance with local pretreatment limits for phosphorus? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)
N/A

C. When were local pretreatment limits for phosphorus last calculated?
N/A

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW

N/A

Section V: Public Notice

A. Has a public notice been given for this proposed variance? ☒ Yes ☐ No

B. If yes, was a public hearing held as well? ☒ Yes ☐ No ☐ N/A

C. What type of notice was given?

☒ **Notice of variance included in notice for permit** ☐ **Separate notice of variance**

D. Date of public notice: _____ **Date of hearing:** _____

E. Were comments received from the public in regards to this notice or hearing? ☐ Yes ☐ No
(If yes, please attach on a separate sheet)

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☐ Yes ☒ No

B. Applicable criteria affected by variance: no human health criteria are available for phosphorus in the receiving or downstreams water

C. Identify any expected impacts that the variance may have upon human health, and include any citations: None.

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Limited Aquatic Life for the effluent ditch; limited forage fish community for Swan Creek

B. Applicable criteria affected by variance: 75 ug/L, Fish and Aquatic Life Criteria

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations: According to the Pollutant Load Ratio Estimation Tool (PRESTO) model, 83% of the phosphorus in the 8.89 square mile subwatershed entering the Tributary is attributable from nonpoint sources. The total annual average nonpoint phosphorus loading is 4,955 lbs/year. The Village of Orfordville's average annual phosphorus loading between 2010 and 2012 was 1040 lbs/year. (See PRESTO report). While increased phosphorus removal from the point source is beneficial to the watershed health, it is not overwhelmingly going to lead to restoration.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:

Plant
Small Skullcap (E)
Eastern Pine White Fringed Orchid (E)
Pale Purple Coneflower (T)
Roundstem Foxglove (T)
Fish
Gravel Chub (E)
Starhead Topminnow (E)
Redfin Shiner (T)
River Redhorse (T)
Mussel
Buckhorn (T)

Source: https://dnr.wisconsin.gov/topic/NHI

Section VIII: Economic Impact and Feasibility Drafter/Compliance Staff

A. Describe the permittee's current pollutant control technologies (treatment processes):

Orfordville Wastewater Treatment Facility consists of a conventional activated sludge, diffused air, package plant with the aeration tank, clarifier, and aerobic digester under one roof (dome). A grit removal facility is available but not used. Biological phosphorus removal is optimized at this facility followed by tertiary sand filters. Chemical phosphorus removal can also be used as a supplemental phosphorus removal measure. This facility is not currently required to disinfect, but a chlorine contact chamber is still intact. A step aerator aerates the wastewater to meet the DO limit in the permit. The digested sludge is land spread spring and fall. Drying beds are sometimes used to make up the storage needs.

B. **What modifications would be necessary to comply with the current limits? List additional treatment processes and/or technologies available. Include any citations.**

Physical treatment technologies explored were: disk filtration, membrane filtration, and continuously backwash sand filter. All three of these technologies were economically infeasible at this time.

Water quality trading will be evaluated as part of the PMP actions in the next permit term.

Citation: PMP 2024 with cost estimates

C. Identify any expected environmental impacts that would result from further treatment, and include any citations:

N/A

D. Is it technically and economically feasible for this permittee to modify the treatment process to comply with the water quality-based limits? ☐ **Yes** ☒ **No**

E. If treatment is possible, is it possible to comply with the limits on the substance? ☒ **Yes** ☐ **No**

Tertiary treatment at municipal treatment plants has proven performance across the state in meeting the 0.075 mg/L water quality based effluent limit

F. If yes, what prevents this from being done? Include any citations.

All evaluated compliance options are economically infeasible at this time because of the cost and the small existing user base would result in a user rate above the 2% primary screener threshold.

Citation: PMP 2024 with cost estimates

G. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:

All evaluated compliance options along with the small existing user base would result in user rates above 2% MHI.

Citation: PMP 2024 with cost estimates

H. Describe the economic impacts of compliance: *{applies only to municipalities; include other cost estimates for industries}*

The Village of Orfordville is composed of 534 households and 23 residential user equivalent (REUs) consisting of businesses and institutions. The increase in costs to install and operate a tertiary filtration system would increase the average sewer utility fee to $1,219.37 per year. Current residential sewer user rates are $489.60 annually. The Village is unable to absorb the additional financial burden of an upgrade at this time; user fees would need to substantially increase, resulting in a negative social impact, a weakened and non-vital local economy, and a reduced tax base. The economic impact of construction and maintained compliance by any of the options and the small user base would result in a user rate charge which would be higher than 2% of the MHI.

Economic Factor		Source
MHI	$57,721	http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml

Calculated preliminary screener	2.11%	DNR revision of updated cost estimate dated 2/26/2024
Secondary score value	N/A	

Section IX: Multi-Discharger Variance Feasibility *(this assumes MDV approval)*

A. Does the facility meet the economic indicators to qualify for the MDV? ☒ **Yes** ☐ **No** ☐ **Unknown**

MDV secondary indicator score: **5**

B. Is it technically and economically feasible for this permittee to comply with a phosphorus WQBEL of 1 mg/L or lower? ☒ **Yes** ☐ **No** ☐ **Unknown**

C. Justification for considering an individual variance in lieu of the MDV:

The facility is able to consistently achieve total phosphorus effluent concentrations below 0.2 mg/L – the applicable target value. Therefore, county payments would not be made and variance provisions would not meet highest attainable condition. Since MDV coverage cannot be applied, an individual phosphorus variance is considered.

Section X: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

Influent and effluent TP monitoring has occurred to gather better phosphorus data and analyze trends in the data. In addition, biological phosphorus removal has been optimized along with optimization of the filters to achieve phosphorus concentrations below 1.0 mg/L. The facility also monitors the septage receiving to prevent high strength wastes which might contain high amounts of phosphorus.

Citation: Citation: PMP 2024

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

From subsection 2.2.1.2 Phosphorus Variance of Orfordville's Draft Permit:

This permit contains a variance to the water quality-based effluent limit (WQBEL) for phosphorus approved in accordance with s. 283.15, Wis. Stats. As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation specified in the table above, (b) implement the phosphorus pollutant minimization measures specified in the Pollutant Minimization Program (PMP) Plan dated February 24, 2024 and (c) perform the actions listed in the schedule section of the permit (See the Schedules section herein).

Annual Phosphorus Progress Report: 01/31/2025

Annual Phosphorus Progress Report #2: 01/31/2026

Annual Phosphorus Progress Report #3: 01/31/2027

Final Phosphorus Report: 01/31/2028

Section XI: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: May 21, 2027 **Date of EPA Approval:** **June 22, 2018**

B. Previous Permit #: **WI-0021709-09-0** **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: 1.05 mg/L (July 2018 – 2023) **Variance Limit:** **4.3mg/L**

D. Target Value(s):	Achieved? ☒ Yes ☐ No ☐ Partial

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance
N/A	☐ Yes ☐ No

Village of Orfordville

Phosphorus Pollutant Minimization Plan

January 2023

There are three categories of Total Phosphorus (TP) sources that can be targeted in a phosphorus PMP: reducing effluent TP concentrations, curbing TP loadings to the plant, and watershed reductions. This document describes actions that the Village of Orfordville may take over the next permit term (5 years) to help address each of these sources. The attached table shows a proposed timeline and brief summary of actions, which are described in more detail in the following sections.

Reducing Industry/Influent Sources

Phosphorus is contributed to the WWTF through residential, commercial, and industrial contributions. Residential contributions are relatively minor in nature and would be very difficult if not impossible to minimize. On the other hand, commercial and industrial sources can contribute significantly to the performance of a WWTF. In order to reduce the amount of phosphorus discharged from the WWTF, it is important to look at reducing the amount of influent phosphorus and to equalize the remaining loading of phosphorus from the sources. The most significant contributors of phosphorus to the Orfordville WWTF include:

1. Industrial Wastes:

   The Village of Orfordville does not have any major industrial contributors.

2. Hauled wastes:

   The Village of Orfordville WWTF receives septage and is designed to receive up to an average of 10,000 gpd septage containing 1 lbs/day of phosphorus along with other wastewater constitutes (BOD, TSS, TKN, etc.). On a design basis, the septage receiving constitutes a relatively small 2.8% of influent average flow and 5% of phosphorus load to the WWTF. The WWTF operators informally monitor septage receiving to the WWTF to prevent high strength wastes, which might contain relatively high levels of phosphorus, from being discharged into the WWTF.

3. Polyphosphate addition to Village drinking water:

   The Village of Orfordville does not add polyphosphate to their drinking water; thus again eliminating this typical phosphorus source.

Reducing Effluent Phosphorus Concentrations and Loadings

The Village of Orfordville completed a facility upgrade in 2019 to achieve biological phosphorus removal by creating environments within the activated sludge system to encourage the growth of phosphorus accumulating organisms. These organisms take up a greater amount of phosphorus as compared to the microorganisms typically associated with activated sludge. Biological phosphorus removal can consistently remove phosphorus down to 0.5 mg/L or lower, but requires more operator attention, proper influent conditions, and specific anoxic/anaerobic and aerobic “zones” in the activated sludge system. Since completion of the project, annual effluent phosphorus concentrations in 2020, 2021, and 2022 have been 0.87 mg/L, 0.23 mg/L and 0.13 mg/L, respectively. The Village will continue to refine equipment operations and maintenance procedures to maximize WWTF phosphorus removal performance.

The Village will continue to reduce infiltration and inflow in their collection systems. The Village has a Capacity Management Operation Maintenance (CMOM) plan in place that includes goals for sewer and manhole inspection and cleaning to determine structural conditions and need for repairs. Repairs/replacements that would reduce I/I are typically done concurrently with street improvement projects.

The Village will also collect information on sidestreams such as sludge decant that recycle phosphorus in the plant. During Year 1, monthly sampling of the decant will be performed and these results will be evaluated in Year 2. If operational changes are recommended based on the results, these will be implemented in subsequent years if this can be done with the current equipment and controls.

Watershed Reduction Program

The Village will begin to take steps to identify watershed projects for phosphorus reduction and will continue to work on developing these opportunities. Activities in Year 1 will include meeting with interested landowners and investigating potential phosphorus removal activities. Actions in subsequent years will depend on the results of these Year 1 activities. If opportunities are identified, the follow-up actions will include soil testing (if needed) and quantifying potential phosphorus credits, developing trade agreements for future trades, and implementing the practices.

The Rock County Land Conservation Department will be used as a resource in identifying other potential partners and practices. An initial meeting will be held with the county during the first year of the PMP. Based on the outcome of that meeting, subsequent meetings may be held annually or as needed if the County is able to provide assistance. The intent of the meetings with the County is to identify landowners that may be willing partners, gather information on the types of projects that have the best possibility of success, and identify potential sources of funding for projects. If landowners and projects are identified, the steps taken in subsequent years will be similar to those described in the preceding paragraph. The types of projects that may be considered are taking land out of production, improving/eliminating feedlots, streambank stabilization, and stormwater detention.

The County may also be able to provide information on other potential partners/stakeholders such as non-profit organizations that may be able to assist with planning or funding of projects. If partners/stakeholders are identified, the Commission will meet with the organizations to develop these opportunities.

Public Education

The Orfordville Phosphorus PMP will also include public education actions to inform the residents and business served, encourage input, and help identify other potential phosphorus reductions.

The Village Board will meet in Year 1 to discuss the PMP, encourage input, and identify potential sources of phosphorus within the Village. The Village will also provide information that can be distributed to users regarding potential sources and reduction of phosphorus. The Village will have additional meetings in subsequent years to review progress and provide updates on phosphorus reduction opportunities and plans for the future.

The Village will continue to look for other opportunities as they arise for phosphorus reductions and credits, and will work to identify potential stakeholders and partners as well as sources of funding as described in the previous sections.

Orfordville WWTF Phosphorus Pollutant Minimization Plan (PMP)
Village of Orfordville

Updated 2/21/24

	2023	2024	2025	2026	2027
PMP Activities	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reducing Industry/Influent Sources					
c. Continue efforts to reduce I/I sources.	X	X	X	X	X
d. Continue to monitor septage.	X				
2. Reducing Effluent TP Concentrations/Loadings					
a. Optimize the existing system and modify operational sequences as needed to enhance Bio-P removal.	X	X	X	X	X
c. Perform testing on decant from sludge storage.	X	X	X	X	X
3. Watershed Reduction Program					
a. Initial meeting with Rock County land conservation department and other agencies to identify possible projects such as farmland being taken out of production or feedlot improvements.	X				
b. Follow up annually via phonecall or virtual meeting with Rock County land conservation department to discuss potential projects or ongoining project development.		X	X	X	X
c. Follow up on county-identified trade opportunities and implement if possible, including soil testing, quantification of credits, negotiation of agreements, and implementation.		X	X	X	X
4. Public Relations Program					
a. Distribute information/updates to users regarding potential sources and reduction of phosphorus.	X				
b. Village Board meets to discuss the PMP, encourage input, and identify other sources of P reduction.	X				
c. Look for other opportunities as they arise for phosphorus reductions and credits.	X	X	X	X	X
5. Annual Reporting to DNR					

Village of Orfordville WWTP
Phosphorus Compliance Alternatives
Summary of Alternatives

Rate of Return	4.625%	
Loan Interest	3.00%	
Loan Term	19	
Evaluation Year	2036	
Users (includes commercial/industrial)	557	
Median Household Income (MHI)	$54,286	
Ex Average User Rate ($/qtr)	$122.40	$40.80 per month
Ex Average User Rate as % MHI	0.90%	
Fac Plan Estimated Cost (2016)	$4,000,000	
Fac Plan P&I Pmt	$279,256	
Fac Plan Average User Rate Impact ($/qtr)	$125.34	$41.78 per month
Fac Plan User Rate as % MHI	0.92%	

Assumptions:

1. Design capacity is being maintained.
2. O&M costs for treatment assume a flow of 0.282 MGD; which is a 10 year linear projection between current (0.199 MGD) and the 20 year design (0.365 MGD). WAM and the Statewide Variance assume linear growth each 5 years.

	Advanced Treatment						Non-Point Source			Statewide
	Disk Filtration	Membrane Filtration	CBS Filtration	SorbX	TRT 1.0 ppm, WQT	WQT	WAM 0-5, WQT 6 - 20	WAM 0-10, WQT 11 - 20	WAM 0-15, WQT 16 - 20	Variance
Capital Cost	$6,131,299	$8,660,619	$7,653,062	$2,198,354	$864,322	$679,000	$957,562	$1,006,842	$1,165,042	$581,522
P&I Payment	$428,050	$604,631	$534,290	$153,476	$60,342	$47,404	$66,851	$70,292	$81,336	$40,598
Average O&M Costs	$72,543	$92,926	$75,407	$99,835	$21,909	$0	$24,493	$29,107	$29,107	$25,934
Annual Replacement Costs	$78,335	$142,444	$110,932	$25,787	$25,787	$0	$25,787	$25,787	$25,787	$25,787
Annual NPS Cost	$0	$0	$0	$0	$119,500	$213,000	$84,629	$115,042	$150,213	$0
Annual County Pmt	$0	$0	$0	$0	$0	$0	$0	$0	$0	$17,169
Present Worth Cost	$7,199,604	$10,405,355	$8,965,473	$3,546,772	$2,750,134	$3,100,090	$2,623,455	$3,051,280	$3,493,416	$1,480,340
Variation	174.43%	296.63%	241.74%	35.19%	4.83%	18.17%	0.00%	16.31%	33.16%	
Average Annual Cost	$578,928	$840,001	$720,629	$279,097	$227,538	$260,404	$201,761	$240,227	$286,443	$109,488
Average Annual Cost per User	$1,039.37	$1,508.08	$1,293.77	$501.07	$408.51	$467.51	$362.23	$431.29	$514.26	$196.57
Average Monthly Cost	$86.61	$125.67	$107.81	$41.76	$34.04	$38.96	$30.19	$35.94	$42.86	$16.38
Average Quarterly Cost	$259.84	$377.02	$323.44	$125.27	$102.13	$116.88	$90.56	$107.82	$128.57	$49.14
% MHI (Phosphorus Only)	1.91%	2.78%	2.38%	0.92%	0.75%	0.86%	0.67%	0.79%	0.95%	0.36%
% MHI (Total without FP Upgrade)	2.84%	3.70%	3.31%	1.85%	1.68%	1.78%	1.59%	1.72%	1.87%	1.29%
% MHI (Total with FP Upgrade)	3.74%	4.60%	4.21%	2.75%	2.58%	2.69%	2.49%	2.62%	2.77%	2.19%

Notes:
1. The Facilities Plan submitted in 2011 had an estimated upgrade cost of $2,162,980. The cost estimate was revised in 2016 and includes some additional cost items.