Permit Fact Sheet

General Information

Permit Number	WI-0028975-10-0
Permittee Name and Address	ROXBURY SANITARY DISTRICT #1 7216 St. Dominic Road, Sauk City, WI 53583
Permitted Facility Name and Address	Roxbury Sanitary District #1 WWTF 7318 INAMA ROAD, ROXBURY, WISCONSIN
Permit Term	October 01, 2025 to September 30, 2030
Discharge Location	East bank of Roxbury Creek, 2,100 feet downstream of the Inama Road Bridge. NE ¼ of SE ¼, Section 17, T9N, R7E, Lat: 43.25514˚N, Long: 89.68092W˚
Receiving Water	Roxbury Creek in the Roxbury Creek Watershed of the Lower Wisconsin River Basin (LW18) in Dane County
Stream Flow ($Q_{7,10}$)	0.03 cfs
Stream Classification	Warm Water Sport Fish (WWSF) community; non-public water supply
Discharge Type	Existing; Continuous
Annual Average Design Flow (MGD)	0.025 MGD
Industrial or Commercial Contributors	None
Plant Classification	A3 - Recirculating Media Filters; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

Roxbury Sanitary District #1 operates a wastewater treatment facility that serves a population of approximately 250 residential, commercial, and public users with no industrial contributors. Treatment consists of primary settling using two trains of septic tanks followed by a dosing chamber that flows to a combination of any of the four bed recirculating sand filters for BOD_5 and ammonia treatment. Up to 80% of the effluent from the recirculating sand filter beds is returned to the dosing chamber and is re-applied to the sand filter beds. The flow that is not returned to the sand filter beds is discharged to the east bank of Roxbury Creek, approximately 2,000 feet downstream of the Inama Road Bridge. The existing facility was constructed in 1999 and the design flow is 25,000 gallons per day. For this permit term, Roxbury has applied for an individual phosphorus variance and a chloride variance.

Substantial Compliance Determination

Enforcement During Last Permit: In February 2022, a Notice of Noncompliance (NON) was sent for phosphorus and ammonia exceedances spanning from August 2021 to January 2022. The facility has completed all previously required actions as part of the enforcement process.

After a desk top review of all discharge monitoring reports, CMARs, compliance schedule items, and a site visit on 11/17/23, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Jordan Main, Wastewater Engineer, on 4/3/25.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	0.025 MGD (Avg. 10/1/19-1/31/25)	Influent: 24-hr flow proportional influent samples collected from the inlet side of septic tank #1. Flow meter located in the meter vault.
001	0.026 MGD (Avg. 10/1/19-1/31/25)	Effluent: 24-hr flow proportional composite and grab samples collected from the effluent splitter box, prior to discharge to Roxbury Creek.
901	N/A	Septic Tank: Solids removed from the septic tank of the Recirculating Sand Filter WWTF.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Week	24-Hr Flow Prop Comp	

1.1.1 Changes from Previous Permit:

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

1.1.2 Explanation of Limits and Monitoring Requirements

Monitoring of influent flow, BOD_5 and total suspended solids is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code, and in the Standard Requirements section of the permit.

2 Surface Water - Monitoring and Limitations

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Daily Max	30 mg/L	2/Week	24-Hr Flow Prop Comp	This is an interim limit. See the BOD Effluent Limits Schedule.
BOD5, Total	Monthly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	This is an interim limit. See the BOD Effluent Limits Schedule.
Suspended Solids, Total	Daily Max	30 mg/L	2/Week	24-Hr Flow Prop Comp	This is an interim limit. See the TSS Effluent Limits Schedule.
Suspended Solids, Total	Monthly Avg	20 mg/L	2/Week	24-Hr Flow Prop Comp	This is an interim limit. See the TSS Effluent Limits Schedule.
Dissolved Oxygen	Daily Min	4.0 mg/L	5/Week	Grab	This is an interim limit. See the DO Effluent Limits Schedule.
pH Field	Daily Min	6.0 su	5/Week	Grab	
pH Field	Daily Max	9.0 su	5/Week	Grab	
Nitrogen, Ammonia (NH3-N) Total	Daily Max	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective January, February, June and December.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	17 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective March and November.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	22 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective April and August.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	18 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective May.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	24 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective July and September.
Nitrogen, Ammonia (NH3-N) Total	Daily Max	16 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective October.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	14 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective January.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	13 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective February and November.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	16 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective March.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective April.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	10 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective May.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	5.0 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective June and July.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	4.8 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective August.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	8.0 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective September.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	9.3 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective October.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	12 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective December.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	9.6 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective January.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	8.9 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective February.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective March and April.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	10 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective May and December.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	5.0 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective June and July.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	4.8 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective August.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	8.0 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective September.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	7.7 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective October.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	11 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective November.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit section below. Enter the result in the eDMR on the last day of the month.
Chlorine, Total Residual	Daily Max	31 ug/L	5/Week	Grab	Monitoring and limit apply only if chlorine is used to disinfect.
Chlorine, Total Residual	Weekly Avg	8.7 ug/L	5/Week	Grab	Monitoring and limit apply only if chlorine is used to disinfect.
Chlorine, Total Residual	Monthly Avg	8.7 ug/L	5/Week	Grab	Monitoring and limit apply only if chlorine is used to disinfect.
Phosphorus, Total	Monthly Avg	4.8 mg/L	2/Week	24-Hr Flow Prop Comp	Interim limit. See the Phosphorus Variance - Implement Pollutant Minimization Plan section and the Phosphorus PMP Schedule.
Phosphorus, Total		lbs/day	2/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
Chloride	Weekly Avg	510 mg/L	4/Month	24-Hr Flow Prop Comp	Interim limit. Sampling shall be conducted on four consecutive days one week per month. See the Chloride Variance - Implement Source Reduction Measures section and the Chloride

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					SRM (Target Value) Schedule.
Temperature Maximum		deg F	2/Week	Continuous	Monitoring only January-December 2029.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual monitoring in rotating quarters. See Nitrogen Series Monitoring section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual monitoring in rotating quarters. See Nitrogen Series Monitoring section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual monitoring in rotating quarters. See Nitrogen Series Monitoring section. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity (WET) Testing section.
Chronic WET	Monthly Avg	1.2 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity (WET) Testing section.

2.1.1 Changes from Previous Permit

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

- Addition of schedules to come into compliance with new, more stringent effluent limits for BOD_5, TSS and DO; current limits act as interim limits until the end of the schedules.
- Addition of Escherichia coli (E. coli) monitoring and limits, to become effective per the Effluent Limitations for E. Coli Schedule.
- Addition of total residual chlorine monitoring and limits; monitoring and limits apply only if chlorine is used to disinfect.
- The permittee has applied for an individual phosphorus variance (IPV) for this permit term. An IPV interim limit of 4.8 mg/L as a monthly average is included throughout the permit term.

- The permittee has applied for a chloride variance for this permit term. This includes the addition of a chloride variance interim limit of 510 mg/L as a weekly average and source reduction measures (SRMs) throughout the permit term.
- The year in which temperature maximum effluent monitoring is required has been updated to calendar year 2029.
- Addition of annual total nitrogen monitoring (TKN, NO_2+NO_3 and Total N) in rotating quarters throughout the permit term.
- Addition of a Chronic Whole Effluent Toxicity (WET) testing effluent limit and increased monitoring frequency.

2.1.2 Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo, by Sarah Luck, Water Resources Engineer, dated March 12, 2025.

Monitoring Frequencies – The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. The monitoring frequency for pH was reduced from Daily to 5/Week at request of the permittee and with consideration of overall compliance with the effluent limits during the previous permit term.

Expression of Limits – In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average limits whenever practicable. Minor changes have been made to ammonia nitrogen and total residual chlorine.

BOD_5, TSS and DO – During the previous permit term, Roxbury Creek was classified as LFF. However, that classification has since changed to WWSF. A site visit to conduct fish and qualitative habitat surveys was performed by Department staff on 6/13/24 to confirm this classification. Due to the stream classification change, the effluent limits for BOD_5, TSS and DO were updated. Compliance schedules are included in the permit to meet these new, more stringent limits. The current limits serve as interim limits until the final effluent limits become effective (July 1, 2030).

The final effluent limits for BOD_5, TSS and DO are summarized in the following table:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average
BOD_5				
May – October			11 mg/L 2.2 lbs/day	11 mg/L
November – April			17 mg/L 3.6 lbs/day	17 mg/L
TSS				
May – October			11 mg/L 2.2 lbs/day	11 mg/L
November – April			17 mg/L 3.6 lbs/day	17 mg/L
Dissolved Oxygen		7.0 mg/L		

Disinfection and E. coli – Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. Section NR 102.04(5)(a), Wis. Adm. Code, states that all surface waters shall be suitable for recreational use and meet the E. coli criteria established to protect this use. Section NR 102.04(5)(b), Wis. Adm. Code, states that exceptions to the disinfection requirement can be made if the Department determines, in accordance with the procedures specified in s. NR 210.06(3), Wis. Adm. Code, that disinfection is not required to meet water quality criteria. As part of the reissuance process, the requirements for disinfection were reviewed under s. NR 210.06(3), Wis. Adm. Code.

It was determined that the permittee is required to disinfect, during the months of May – September each year. At the end of the compliance schedule, disinfection requirements and E. coli limits of 126 #/100 mL as a monthly geometric mean that may not be exceeded and 410 #/100 mL as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply. Monitoring is not required until the limit becomes effective at the end of the compliance schedule.

Phosphorus – 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 4.8 mg/L as a monthly average, implementing the phosphorus pollutant minimization program (PMP) plan dated June 2025, continued optimization for control of phosphorus, and calculating, reporting and tracking phosphorus mass discharge. If approved by EPA, compliance with state water quality standards would be met through the interim limit along with all additional phosphorus variance provisions.

Chloride – The permittee has applied for a chloride variance, under the provisions of s. NR 106.83, Wis. Adm. Code, with its application for permit reissuance. The Department reviewed Roxbury's application for a chloride variance and the information supplied in the application supports the establishment of an interim effluent limit. The permittee and the Department have reached agreement on an interim chloride limit of 510 mg/L (expressed as a weekly average), a target value of 470 mg/L (the calculated WQBEL), implementation of the chloride source reduction measures (SRMs) plan dated June 2025, and submittal of annual progress reports each year by March 31st. The Department concludes that Roxbury is qualified for a variance from the water quality standard for chloride and proposes reissuance of this permit with the proposed variance.

Total Nitrogen Monitoring (TKN, NO_2+NO_3, and Total N) – The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under s. 283.55(1)(e), Wis. Stats. Testing is required during the following quarters: October – December 2025; July – September 2026; April – June 2027; January – March 2028; and October – December 2029.

Acute WET – Testing is required during the following quarters: July – September 2026; and October – December 2029.

Chronic WET – Testing is required during the following quarters: October – December 2025; July – September 2026; April – June 2027; January – March 2028; and October – December 2029.

3 Septage Management - Monitoring and Limitations

Septage management is required in accordance ch. NR 113, Wisconsin Administrative Code. Records must be kept and made available to the Department on request. Required record keeping includes volumes of septage pumped, dates when the septage was removed, land application site DNR number and method used to satisfy pathogen and vector control, and/or the treatment plant where septage is disposed. Annual reporting is required when the permittee land applies the septage. Annual reporting is also required when the permittee disposes of septage at a designated treatment facility.

3.1 Sample Point Number: 901- SEPTIC TANK

3.1.1 Changes from Previous Permit:

Septage management requirements were evaluated for this permit term and no changes were required.

Explanation of Limits and Monitoring Requirements

Requirements for septage management are determined in accordance with ch. NR 113, Wis. Adm. Code.

4 Schedules

4.1 BOD Effluent Limits

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

Required Action	Due Date
Report on Effluent Discharges: The permittee shall prepare and submit to the Department for approval a report on effluent discharges. The report shall include an evaluation of collected effluent data and the facility's ability to comply with the final Biological Oxygen Demand (BOD) limits. The report shall conclude whether current treatment, operational improvements, or a facility upgrade will result in compliance with the final BOD limits. FACILITY PLAN - If the Report on Effluent Discharges concludes that current treatment or operational improvement does not result in compliance with the final BOD limits and a facility upgrade is required, the permittee shall initiate development of a facility plan for meeting final BOD limits and comply with the remaining required actions in this schedule.	06/30/2026
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code, for complying with the BOD limits. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	04/30/2027
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to achieve compliance with final BOD limits, and a schedule for completing construction of the upgrades by the complete construction date specified below.	03/31/2028
Treatment Plant Upgrade to Meet Limits: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41, Wis. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule, the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	09/30/2028
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2029
Complete Construction: The permittee shall complete construction of the wastewater treatment system upgrades.	03/31/2030
Achieve Compliance: The permittee shall achieve compliance with the final BOD limits.	09/30/2030

4.1.1 Explanation of Schedule

BOD Effluent Limits – A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and complete any necessary changes at the facility in order to come into compliance with the new, more stringent water quality-based effluent limits for BOD_5.

4.2 TSS Effluent Limits

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

Required Action	Due Date
Report on Effluent Discharges: The permittee shall prepare and submit to the Department for approval a report on effluent discharges. The report shall include an evaluation of collected effluent data and the facility's ability to comply with the final Total Suspended Solids (TSS) limits. The report shall conclude whether current treatment, operational improvements, or a facility upgrade will result in compliance with the final TSS limits. FACILITY PLAN - If the Report on Effluent Discharges concludes that current treatment or operational improvement does not result in compliance with the final TSS limits and a facility upgrade is required, the permittee shall initiate development of a facility plan for meeting final TSS limits and comply with the remaining required actions in this schedule.	06/30/2026
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code, for complying with the TSS limits. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	04/30/2027
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to achieve compliance with final TSS limits, and a schedule for completing construction of the upgrades by the complete construction date specified below.	03/31/2028
Treatment Plant Upgrade to Meet Limits: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41, Wis. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule, the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	09/30/2028
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2029
Complete Construction: The permittee shall complete construction of the wastewater treatment system upgrades.	03/31/2030
Achieve Compliance: The permittee shall achieve compliance with the final TSS limits.	09/30/2030

4.2.1 Explanation of Schedule

TSS Effluent Limits – A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and complete any necessary changes at the facility in order to come into compliance with the new, more stringent water quality-based effluent limits for TSS.

4.3 DO Effluent Limits

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

Required Action	Due Date
Report on Effluent Discharges: The permittee shall prepare and submit to the Department for approval a report on effluent discharges. The report shall include an evaluation of collected effluent data and the facility's ability to comply with the final Dissolved Oxygen (DO) limits. The report shall conclude whether current treatment, operational improvements, or a facility upgrade will result in	06/30/2026

compliance with the final DO limits. FACILITY PLAN - If the Report on Effluent Discharges concludes that current treatment or operational improvement does not result in compliance with the final DO limits and a facility upgrade is required, the permittee shall initiate development of a facility plan for meeting final DO limits and comply with the remaining required actions in this schedule.	
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code, for complying with the DO limits. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	04/30/2027
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to achieve compliance with final DO limits, and a schedule for completing construction of the upgrades by the complete construction date specified below.	03/31/2028
Treatment Plant Upgrade to Meet Limits: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41, Wis. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule, the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	09/30/2028
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2029
Complete Construction: The permittee shall complete construction of the wastewater treatment system upgrades.	03/31/2030
Achieve Compliance: The permittee shall achieve compliance with the final DO limits.	09/30/2030

4.3.1 Explanation of Schedule

DO Effluent Limits – A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and complete any necessary changes at the facility in order to come into compliance with the new, more stringent water quality-based effluent limits for DO.

4.4 Disinfection and Effluent Limitations for E. coli

The permittee shall install disinfection treatment and comply with surface water limitations for E. coli as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills that requirement.

Required Action	Due Date
Progress Report: The permittee shall submit a progress report on development and submittal of a facility plan for upgrades to meet disinfection requirements and E. coli limits.	06/30/2026
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code for meeting disinfection requirements and complying with E. coli surface water limitations. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	04/30/2027
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to meet disinfection requirements per s. NR 210.06(1), Wis. Adm	03/31/2028

Code, achieve compliance with final E. coli limitations, and a schedule for completing construction of the upgrades by the complete construction date specified below.	
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	09/30/2028
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2029
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	03/31/2030
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	04/30/2030

4.4.1 Explanation of Schedule

Disinfection and Effluent Limitations for E. coli – A compliance schedule is included in the permit to provide time for the permittee to investigate options for meeting new E. coli water quality-based effluent limits while coming into compliance with the limits as soon as reasonably possible.

4.5 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.	03/31/2026
Annual Phosphorus Progress Report #2: Submit a phosphorus progress report as defined above for the previous calendar year.	03/31/2027
Annual Phosphorus Progress Report #3: Submit a phosphorus progress report as defined above for the previous calendar year.	03/31/2028
Annual Phosphorus Progress Report #4: Submit a phosphorus progress report as defined above for the previous calendar year.	03/31/2029

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.	03/31/2030
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.	

4.5.1 Explanation of Schedule

Phosphorus Pollutant Minimization Program – This schedule is to be implemented as a condition of the permittee's variance to 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.

4.6 Chloride Source Reduction Measures (Target Value)

As a condition of the variance to the water quality based effluent limitation(s) for chloride granted in accordance with s. NR 106.83(2), Wis. Adm. Code, the permittee shall perform the following actions.

Required Action	Due Date
Annual Chloride Progress Report: Submit an annual chloride progress report related to the source reduction activities for the previous year. The annual chloride progress report shall: Indicate which chloride source reduction measures or activities in the Source Reduction Plan have been implemented and state which, if any, source reduction measures from the Source Reduction Plan were not pursued and why. Include an assessment of whether each implemented source reduction measure appears to be effective or ineffective at reducing pollutant discharge concentrations and identify actions planned for the upcoming year; Include an analysis of trends in weekly, monthly and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data; and Include an analysis of how effluent chloride varies with time and with significant loadings of chloride. Note that the interim limitation listed in the Surface Water section of this permit remains enforceable until new enforceable limits are established in the next permit issuance. The first annual chloride progress report is to be submitted by the Date Due.	03/31/2026

Annual Chloride Progress Report #2: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	03/31/2027
Annual Chloride Progress Report #3: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	03/31/2028
Annual Chloride Progress Report #4: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	03/31/2029
Final Chloride Report: Submit the final chloride report documenting the success in meeting the chloride target value of 470 mg/L (as a weekly average), as well as the anticipated future reduction in chloride sources and chloride effluent concentrations. The report shall: Summarize chloride source reduction measures that have been implemented during the current permit term and state which, if any, source reduction measures from the Source Reduction Plan were not pursued and why; Include an assessment of which source reduction measures appear to have been effective or ineffective. Evaluate any needed changes to the pollutant reduction strategy accordingly; Include an analysis of trends in weekly, monthly and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data during the current permit term; and Include an analysis of how influent and effluent chloride varies with time and with significant loadings of chloride as identified in the source reduction plan. If the permittee intends to reapply for a chloride variance, for the reissued permit, proposed target limits and a detailed source reduction measures plan, outlining the source reduction activities proposed for the upcoming permit term, shall also be included per ss. NR 106.90 (5) and NR 106.83 (4), Wis. Adm. Code. An updated source reduction measures plan shall: Include an explanation of why or how each source reduction measure will result in reduced discharge of the target pollutant; and Evaluate any available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant, and Identify any information needs that would help to better determine pollutant sources and make plans to collect that information. Note that the target value is the benchmark for evaluating the effectiveness of the chloride source reduction measures but is not an enforceable limitation under the terms of this permit.	03/31/2030
Annual Chloride 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 annual chloride reports for the previous year following the due date of Annual Chloride Progress Reports listed above. Annual Chloride Progress Reports shall include the information as defined above.	

4.6.1 Explanation of Schedule

Chloride Source Reduction Measures (Target Value) – This schedule is required to ensure that the permittee maintains compliance with the conditions and requirements of receiving a variance from the water quality-based chloride effluent limits of 470 mg/L expressed as a weekly average and a monthly average and 98 lbs/day expressed as a weekly average. Since a compliance schedule is being granted, an interim limit is required, and that limit is established as 510 mg/L (as a weekly average). The schedule requires that annual reports shall indicate which source reduction measures have been

implemented during each calendar year, and an analysis of chloride concentration and mass discharge data based on chloride sampling and flow data. The annual reports shall document progress made towards meeting the chloride target value of 470 mg/L (weekly average) by the end of the permit term.

Attachments

WQBEL Memo: Water Quality-Based Effluent Limitations for the Roxbury Sanitary District #1 WWTF WPDES Permit No. WI-0028975-10-0, by Sarah Luck, Water Resources Engineer, dated March 12, 2025

Chloride Variance EPA Data Sheet

Chloride SRM (Source Reduction Measures) Plan, Roxbury Sanitary District #1, dated June 2025

Phosphorus Variance EPA Data Sheet

Phosphorus PMP (Pollutant Minimization Program) Plan, Roxbury Sanitary District #1, dated June 2025

Justification Of Any Waivers From Permit Application Requirements

No waivers from permit application requirements were requested or granted.

Prepared By: Sarah Donoughe, Wastewater Specialist-Adv **Date:** June 17, 2025

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: March 12, 2025

TO: Sarah Donoughe – SER/Green Bay

FROM: Sarah Luck – SCR/Fitchburg

SUBJECT: Water Quality-Based Effluent Limitations for the Roxbury Sanitary District #1 WWTF
WPDES Permit No. WI-0028975-10-0

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 Roxbury Sanitary District #1 WWTF in Dane County. This municipal wastewater treatment facility (WWTF) discharges to Roxbury Creek, located in the Roxbury Creek Watershed in the Lower Wisconsin River Basin. This discharge is located outside of the Wisconsin River Basin TMDL area and is therefore not required to have TMDL allocations or limits. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,4
BOD_5						2,3
Interim	30 mg/L			15 mg/L		
Final						
May – October			11 mg/L 2.2 lbs/day	**11 mg/L**		
November – April			17 mg/L 3.6 lbs/day	**17 mg/L**		
TSS						2,3
Interim	30 mg/L			20 mg/L		
Final						
May – October			11 mg/L 2.2 lbs/day	**11 mg/L**		
November – April			17 mg/L 3.6 lbs/day	**17 mg/L**		
Dissolved Oxygen						2
Interim		4.0 mg/L				
Final		7.0 mg/L				
pH	9.0 s.u.	6.0 s.u.				4
Ammonia Nitrogen						3,4
January	15 mg/L		14 mg/L	9.6 mg/L		
February	15 mg/L		13 mg/L	8.9 mg/L		
March	17 mg/L		16 mg/L	15 mg/L		
April	22 mg/L		15 mg/L	**15 mg/L**		
May	18 mg/L		10 mg/L	**10 mg/L**		
June	15 mg/L		5.0 mg/L	**5.0 mg/L**		
July	24 mg/L		5.0 mg/L	**5.0 mg/L**		
August	22 mg/L		4.8 mg/L	**4.8 mg/L**		

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
September October November December	24 mg/L 16 mg/L 17 mg/L 15 mg/L		8.0 mg/L 9.3 mg/L 13 mg/L 12 mg/L	**8.0 mg/L** 7.7 mg/L 11 mg/L 10 mg/L		
E. coli May – September				126 #/100 mL geometric mean		5
Residual Chlorine	31 µg/L		8.7 µg/L	**8.7 µg/L**		3,6
Chloride Concentration limit Mass limit			 470 mg/L 98 lbs/day	 **470 mg/L**		3,7
Phosphorus						8
Interim (variance)				4.8 mg/L		
Final (WQBELs)				0.225 mg/L	0.075 mg/L 0.016 lbs/day	
Temperature, Maximum						9
TKN, Nitrate+Nitrite, and Total Nitrogen						10
Acute WET						11,13
Chronic WET				1.2 TU_c		12,13

Footnotes:

1. Monitoring only.
2. A compliance schedule may be included in the reissued permit to meet the BOD_5, TSS, and DO limits. The current limits may be included as interim limits.
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. No changes from the current permit.
5. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL. The permit will include a compliance schedule to meet these limits.
6. These limits apply only if chlorine is used to disinfect in order to meet *E. coli* limits.
7. These are the WQBELs for chloride. If these limits are included in the permit, a wet weather mass limit would also need to be included. An alternative effluent limitation of 510 mg/L as a weekly average, equal to the 4-day P_{99} of representative effluent data, may be included in the permit in place of the WQBELs if the chloride variance application is approved by EPA.
8. If the phosphorus variance application is approved by EPA, the existing interim limit of 4.8 mg/L as a monthly average may be extended beyond the end of the compliance schedule along with a requirement for total phosphorus pollutant minimization program.
9. At least one full year of temperature monitoring is required during the third or fourth year of the permit term. A new DC study will be required if any upgrades are completed to comply with new limits.
10. As recommended in the Department's October 1, 2019 *Guidance for Total Nitrogen Monitoring in Wastewater Permits*, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total Kjeldahl nitrogen (TKN) (all expressed as N).

11. Two acute WET tests are required. 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.
12. Annual chronic WET tests are required. The Instream Waste Concentration (IWC) to assess chronic test results is 84%. 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 Roxbury Creek.
13. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Sarah Luck (Sarah.Luck@wisconsin.gov) or Diane Figiel (Diane.Figiel@wisconsin.gov).

Attachments (4) – Narrative, Site Map, Ammonia Nitrogen Calculations, and Thermal Table

PREPARED BY: Sarah Luck _____ Date: March 12, 2025

Sarah Luck
Water Resources Engineer

E-cc: Jordan Main, Wastewater Engineer – SCR/Fitchburg
Lisa Creegan, Regional Wastewater Supervisor – SCR/Fitchburg
Diane Figiel, Water Resources Engineer – WY/3
Kari Fleming, Biomonitoring Coordinator – WY/3
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Roxbury Sanitary District #1 WWTF

WPDES Permit No. WI-0028975-10-0

PART 1 – BACKGROUND INFORMATION

Facility Description
Roxbury Sanitary District #1 operates a wastewater treatment facility that serves a population of approximately 250 residential, commercial, and public users with no industrial contributors. Treatment consists of primary settling using two trains of septic tanks followed by a dosing chamber that flows to a combination of any of the four bed recirculating sand filters for BOD_5 and ammonia treatment. Up to 80% of the effluent from the recirculating sand filter beds is returned to the dosing chamber and is re-applied to the sand filter beds. The flow that is not returned to the sand filter beds is discharged to the east bank of Roxbury Creek, approximately 2,000 feet downstream of the Inama Road Bridge.

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

Existing Permit Limitations
The current permit, which expired on September 30, 2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5	30 mg/L			15 mg/L		-
TSS	30 mg/L			20 mg/L		-
pH	9.0 s.u.	6.0 s.u.				2
Dissolved Oxygen		4.0 mg/L				-
Ammonia Nitrogen						-
January	15 mg/L		14 mg/L	9.6 mg/L		
February	15 mg/L		13 mg/L	8.9 mg/L		
March	17 mg/L		16 mg/L	15 mg/L		
April	22 mg/L		15 mg/L	15 mg/L		
May	18 mg/L		10 mg/L	10 mg/L		
June	15 mg/L		5.0 mg/L	5.0 mg/L		
July	24 mg/L		5.0 mg/L	5.0 mg/L		
August	22 mg/L		4.8 mg/L	4.8 mg/L		
September	24 mg/L		8.0 mg/L	8.0 mg/L		
October	16 mg/L		9.3 mg/L	7.7 mg/L		
November	17 mg/L		13 mg/L	11 mg/L		
December	15 mg/L		12 mg/L	10 mg/L		
Chloride						1
Phosphorus						3
Interim				4.8 mg/L		

Attachment #1

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Final				0.225 mg/L	0.075 mg/L 0.016 lbs/day	
Temperature						1
Acute & Chronic WET						4

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. The facility was covered under an individual phosphorus variance.
4. Two acute and three chronic WET tests were required. The IWC for chronic WET was 84%.

Receiving Water Information

- Name: Roxbury Creek
- Waterbody Identification Code (WBIC): 1259900
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply. A site visit to conduct fish and qualitative habitat surveys was performed by Department staff on June 13, 2024 to confirm this classification. The findings of this site visit are documented in the stream classification memo dated 12/11/2024.
- 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 from USGS for Roxbury Creek north of Highway Y. Annual low flows were developed by USGS in 2006.
  7-Q_{10} = 0.03 cubic feet per second (cfs)
  7-Q_2 = 0.14 cfs
  90-Q_{10} = 0.12
  Harmonic Mean Flow = 0.73 cfs using a drainage area of 17.6 mi^2
  The Harmonic Mean has been estimated based on average flow and the 7-Q_{10} using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q_{10} (cfs)	0.05	0.04	0.08	0.15	0.09	0.05	0.05	0.04	0.05	0.06	0.07	0.05
7-Q_2 (cfs)	0.25	0.22	0.49	0.74	0.54	0.41	0.36	0.32	0.33	0.35	0.40	0.31

- Hardness = 312 mg/L as $CaCO_3$. This value represents the geometric mean of data from three WET tests conducted by Roxbury Sanitary District #1 WWTF in 2021 and 2023.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Since no data is available for Roxbury Creek, the background concentration is assumed to be negligible and a value of zero is used in the computations.
- Multiple dischargers: Discharge from Crystal Lake occurs approximately 1.5 miles upstream. However, the mixing zones do not overlap so the discharge does not impact this evaluation.
- Impaired water status: Roxbury Creek is listed as impaired for total phosphorus at the point of discharge. Roxbury Creek is located outside of the Wisconsin River Basin TMDL area.

Effluent Information

- Flow rates:
  Design annual average = 0.025 million gallons per day (MGD)
  Peak daily = 0.10 MGD
  Peak monthly = 0.049 MGD
  For reference, the actual average flow from October 2019 through August 2024 was 0.026 MGD.
- Hardness = 310 mg/L as $CaCO_3$. This value represents the geometric mean of four samples collected in August 2023 which were 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: Neo Water FX (phosphorus removal) – ongoing pilot program.
- 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 and 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)
08/08/23	22.4	09/07/23	6.0	09/26/23	16.3
08/15/23	33.0	09/12/23	8.5	10/03/23	16.2
08/22/23	18.1	09/14/23	18.5	10/10/23	12.7
08/29/23	17.8	09/19/23	18.7		
1-day P_{99} = 40.0 µg/L					
4-day P_{99} = 27.0 µg/L					

Chloride Effluent Data

Sample Date	Chloride (mg/L)	Sample Date	Chloride (mg/L)	Sample Date	Chloride (mg/L)
01/03/23	440	05/02/23	420	09/05/23	360
02/02/23	440	06/08/23	500	10/03/23	470
03/02/23	500	07/03/23	480	11/02/23	480
04/04/23	410	08/01/23	380	12/04/23	530
1-day P_{99} = 584 mg/L					
4-day P_{99} = 514 mg/L					

The following table presents the average concentrations and loadings at Outfall 001 from October 2019 through August 2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Averages of Parameters with Limits

	Average Measurement	Average Mass Discharged
BOD_5	6.9 mg/L*	
TSS	2.4 mg/L*	

Attachment #1

	Average Measurement	Average Mass Discharged
pH field	7.19 s.u.	
Phosphorus	3.9 mg/L	0.65 lbs/day
Ammonia Nitrogen	2.8 mg/L*	
Dissolved Oxygen	5.14 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 = 0.02 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	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Chlorine		19.0	30.8	6.17	-		
Arsenic		340	550.6	110.1	<7.7		
Cadmium	310	37.8	61.2	12.2	<0.41		
Chromium	301	4446	7204.3	1441	<1.1		
Copper	310	45.2	73.2			40.0	33.0
Lead	310	319	517.3	103.5	<1.4		
Nickel	268	1080	1750.5	350	2.2		
Zinc	310	324	524.9	105.0	25.3		
Chloride (mg/L)		757	1226.7			584	530

* 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 = 0.0075 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	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Chlorine		7.28	8.69	1.74	-	
Arsenic		152.2	182	36.3	<7.7	
Cadmium	175	3.82	4.56	0.9	<0.41	
Chromium	301	325.75	389	77.8	<1.1	
Copper	312	27.39	32.7			27.0
Lead	312	84.05	100.3	20.1	<1.4	
Nickel	268	120.18	143	28.7	2.2	
Zinc	312	325.47	389	77.7	25.3	
Chloride (mg/L)		395	472			**514**

* 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.

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Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0.18 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	2115	422.9	<0.41
Chromium (+3)	3818000	21819857	4363971	<1.1
Lead	140	800	160.0	<1.4
Nickel	43000	245745	49149	2.2

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0.18 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3	76.0	15.20	<7.7

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

Conclusions and Recommendations

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

Chloride – Considering available effluent data from the current permit term (January 2023 through December 2023), the 1-day P_{99} chloride concentration is 584 mg/L, and the 4-day P_{99} of effluent data is 514 mg/L. Since the 4-day P_{99} exceeds the calculated weekly average WQBEL, an effluent limit is needed in accordance with s. NR 106.05(4)(b), Wis. Adm. Code.

However, Subchapter VII of ch. NR 106, Wis. Adm. Code, provides for a variance from water quality standards for this substance, and Roxbury Sanitary District #1 WWTF has requested such a variance. That variance may be granted subject to the following conditions:

1) The permit shall include an "Interim" limitation intended to prevent an increase in the discharge of chloride;
2) The permit shall specify "Source Reduction Measures" to be implemented during the permit term, with periodic progress reports; and
3) The permit shall include a "Target Limit" or "Target Value" to gage the effectiveness of the Source Reduction Measures, and progress toward the WQBELs.

Interim Limit for Chloride

Section NR 106.82(9), Wis. Adm. Code, defines a "Weekly average interim limitation" as either the 4-day P_{99} concentration or 105% of the highest weekly average concentration of the representative data. After rounding to two significant digits, **the suggested interim limit for Roxbury Sanitary District #1 WWTF is 510 mg/L expressed as a weekly average**, based on the upper 99th percentile of Roxbury Sanitary District #1 WWTF's 4–day average of representative data.

A target limit and permit language for Source Reduction Measures are outside the scope of this evaluation and should be based on discussion with Roxbury Sanitary District #1 WWTF. If the Department and Roxbury Sanitary District #1 WWTF are unable to reach agreement on all the terms of a chloride variance, the calculated limits described below should be included in the permit, in accordance with s. NR 106.83(3), Wis. Adm. Code.

Chloride Monitoring Recommendations
Four samples per month (on consecutive days) are recommended. This allows for averaging of the results to compare with the interim limit and allows the use of the average in determining future interim limits, and degree of success with chloride reduction measures.

In the Absence of a Variance
If a variance is not granted, Roxbury Sanitary District #1 WWTF would be subject to a weekly average limit of 470 mg/L (rounded) in accordance with s. NR 106.05(4)(b), Wis. Adm. Code. In addition to the concentration limit, a mass effluent limit would also be required in accordance with s. NR 106.05(4)(b), Wis. Adm. Code. The chronic mass limitation of 98 lbs/day (rounded) as a weekly average is based on the concentration limit and the annual average design flow rate of 0.025 MGD (472 mg/L × 0.025 MGD × 8.34) in accordance with s. NR 106.07(2)(c), Wis. Adm. Code. An alternative wet weather mass limit would also need to be included in accordance with s. NR 106.07(9), Wis. Adm. Code.

A monthly average concentration limit of 470 mg/L would be included in the permit for expression of limit requirements per s. NR 106.07(4), Wis. Adm. Code, as follows:

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

Mass limitations are not subject to the limit expression requirements if concentration limits are given.

Mercury – The permit application did not require monitoring for mercury because Roxbury Sanitary District #1 WWTF 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)." However, sludge sampling is not available because Roxbury Sanitary District #1 WWTF is a recirculating sand filter preceded by septic tanks, and generated solids are hauled away as septage. It is not expected that there are exceedances of the high-quality mercury concentration based on similar municipal treatment plants and the lack of industries. **No monitoring is recommended.**

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.

Attachment #1

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BOD_5, TSS, AND DISSOLVED OXYGEN

The BOD_5 and TSS limits in the current permit are variance limits as described in s. NR 104.02(3)(a), Wis. Adm. Code, applicable to limited forage fish (LFF) designated receiving waters. The current limits are no longer applicable for Roxbury Sanitary District #1 WWTF because the receiving water is no longer considered a LFF community. Therefore, conventional pollutant limits will be reevaluated for the protection of the warm water sport fish community of Roxbury Creek.

BOD_5 & DO

In establishing biological oxygen demand (BOD_5) limitations, the primary intent is to prevent a lowering of dissolved oxygen (DO) levels in the receiving water below water quality standards as specified in ss. NR 102.04(4)(a) and (b), Wis. Adm. Codes. The 26-lb method (13-lb method for cold water community streams) is the most frequently used approach for calculating BOD_5 limits when resources are not available to develop a detailed water quality model. This simplified model was developed in the 1970's by the Wisconsin Committee on Water Pollution on the Fox, Wisconsin, Oconto, and Flambeau Rivers. Further studies throughout the 1970's proved this model to be relatively accurate. The model has since then been used by the Department on many occasions when resources are not available to perform a site-specific model. The "26" value stems from the following equation:

$$\frac{26\ {}^{\text{lbs}}/_{\text{day}}}{{}^{\text{ft}^3}/_{\text{sec}}} * \frac{1\,\text{day}}{86{,}400\,\text{sec}} * \frac{454{,}000\,\text{mg}}{\text{lbs}} * \frac{1\,\text{ft}^3}{28.32\,\text{L}} = 4.8 = 2.4 * 2\ {}^{\text{mg}}/_{\text{L}}$$

The 4.8 mg/L has been calculated by taking 2.4 mg/L which is the number one receives when converting 26 lbs of BOD/day/cfs into mg/L, multiplied by 2.0 which is the change in the DO level for warm water community streams. A typical background DO level for Wisconsin waters is 7.0 mg/L, so a 2.0 mg/L decrease is allowed to meet the 5.0 mg/L standard for WWSF community streams. The above relationship is temperature dependent, and an appropriate temperature correction factor is applied. The 26-lb method is based on a typical 24°C summer value for warm water streams. Adjustments for temperature are made using the following equation:

$$k_t = k_{24}\left(0.967^{(T-24)}\right)$$

Where k_{24} = 26 lbs of BOD/day/cfs

<u>Calculations based on Full Assimilative Capacity at 7-Q_{10} Conditions:</u>

$$WA\ Limit\ \left(\frac{mg}{L}\right) = 2.4 * (DO_o - DO_{std}) * \frac{7Q_{10} + Q_e * (1-f)}{Q_e} * 0.967^{T-24}$$

Where:

Q_e = effluent flow = 0.025 MGD
DO_{stream} = background dissolved oxygen = 7.0 mg/L
DO_{eff} = 7.0 mg/L
DO_{std} = dissolved oxygen criteria from s. NR 102.04(4), Wis. Adm. Code = 5.0 mg/L
7-Q_{10} = 0.05 cfs
f = 0

DO_o = Initial mixed river DO = $\frac{DO_{eff} * Q_e + DO_{stream} * (7 - Q_{10} - Q_e * f)}{Q_e * (1-f) + 7 - Q_{10}}$ = 7.0 mg/L

T = Receiving water temperatures from s. NR 102.25, Wis. Adm. Code, Table 2 - Warm - Small

The table below shows the calculated weekly average BOD_5 WQBELs during May – October and November – April. Monthly receiving water temperatures are from s. NR 102.25, Wis. Adm. Code, and are averaged over discharge periods:

Calculated Weekly Average BOD_5 WQBELs

Parameter	May – October	November – April
Effluent Flow (MGD)	0.025	0.025
River Flow 7-Q_{10} (cfs)	0.03	0.03
River Temperature (°F)	62	38
River Temperature (°C)	17	3.3
Effluent DO (mg/L)	7.0	7.0
Background DO (mg/L)	7.0	7.0
Mix DO (mg/L)	7.0	7.0
DO Criterion (mg/L)	5.0	5.0
f	0	0
Concentration Limits (mg/L)	**11**	**17**
Mass Limits (lbs/day)	**2.2**	**3.6**

A dissolved oxygen limit of 7.0 mg/L as a daily minimum is also recommended.

The current permit has daily maximum and monthly average BOD_5 limits of 30 mg/L and 15 mg/L, respectively, and a daily minimum DO limit of 4.0 mg/L. **The recommended weekly average BOD_5 limits and daily minimum DO limit of 7.0 mg/L are more stringent than the current limits and are therefore recommended.**

Effluent Data

Data from January 2020 through May 2024 for BOD_5 and DO are summarized in the table below.

BOD_5 and DO Effluent Data

	May – October (mg/L)	November – April (mg/L)	DO (mg/L)
1-day P_{99}	26.2	22.0	6.88
4-day P_{99}	15.3	13.6	5.96
30-day P_{99}	9.6	8.9	5.43
Mean*	7.1	6.8	5.14
Std	5.2	4.3	0.67
Sample size	251 (8 ND)	260 (14 ND)	533
Range	<2.0 - 36	<2.0 - 33	3.50 - 7.41

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

The effluent data shows the Roxbury Sanitary District #1 WWTF would likely exceed the BOD_5 and DO limits based on WWSF. Therefore, a **compliance schedule to meet the BOD_5 and DO limits is recommended in the reissued permit. The current limits based on the LFF classification may be included in the reissued permit as interim limits.**

Total Suspended Solids (TSS)
Total suspended solids (TSS) effluent limits are regulated via narrative standards described in NR 102.04(1), Wis. Adm. Code. TSS effluent limits are included whenever BOD_5 limits are needed and are set equal to the BOD_5 limits. **Since BOD_5 weekly average limits of 11 mg/L and 2.2 lbs/day (May – October) and 17 mg/L and 3.6 lbs/day (November – April) are recommended, the same TSS limits are recommended during the reissued permit term.**

The current permit has daily maximum and monthly average TSS limits of 30 mg/L and 20 mg/L, respectively. **The recommended weekly average TSS limits are more stringent than the current limits and are therefore recommended.**

Effluent Data
Data from January 2020 through May 2024 for TSS are summarized in the table below.

TSS Effluent Data

	May – October (mg/L)	November – April (mg/L)
1-day P_{99}	11.3	16.7
4-day P_{99}	7.1	8.9
30-day P_{99}	4.0	4.1
Mean*	2.6	2.1
Std	2.4	4.3
Sample size	252 (90 ND)	260 (139 ND)
Range	<2.0 - 15	<2.0 - 40

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

The effluent data shows that Roxbury Sanitary District #1 WWTF may exceed the TSS limits calculated for WWSF. Therefore, a **compliance schedule to meet the TSS limits is recommended in the reissued permit. The current limits based on the LFF classification may be included in the reissued permit as interim limits.**

Expression of Limits
Sections NR 106.07(3) and NR 205.067(7), Wis. Adm. Code, require WPDES permits contain weekly average and monthly average limitations whenever practicable and necessary to protect water quality. **Therefore, monthly average limits for BOD_5 and TSS are required** to meet expression of limits requirements in addition to the weekly average limits.

Recommendations

In summary, after rounding to two significant figures, the following BOD_5, TSS, and DO limits are recommended.

Recommended BOD_5, TSS, and DO Limits

	Daily minimum	Weekly Average	Monthly Average
BOD_5			
May – October		11 mg/L 2.2 lbs/day	**11 mg/L**
November – April		17 mg/L 3.6 lbs/day	**17 mg/L**
TSS			
May – October		11 mg/L 2.2 lbs/day	**11 mg/L**
November – April		17 mg/L 3.6 lbs/day	**17 mg/L**
Dissolved Oxygen	7.0 mg/L		

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

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.
- The maximum expected effluent pH has changed.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

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

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

Where:

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

The effluent pH data was examined as part of this evaluation. A total of 1126 sample results were reported from October 2019 through August 2024. The maximum reported value was 7.81 s.u. (Standard pH Units). The effluent pH was 7.55 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 7.51 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 7.49 s.u. Therefore, a value of 7.55 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 7.55 s.u. into the equation above yields an ATC = 18.43 mg/L.

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

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

Daily Maximum Ammonia Nitrogen Limit Determination

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2×ATC	37	37	37	37	37	37	37	37	37	37	37	37
1-Q_{10}	23	22	26	33	36	37	37	34	28	24	25	23

The 1-Q_{10} method yields the most stringent limits for Roxbury Sanitary District #1 WWTF (except June and July).

The calculated limits shown in the table above are all greater than the current daily maximum limits. If Roxbury Sanitary District #1 WWTF would like to request an increase to the existing permit limits, an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. This evaluation is on a parameter-by-parameter basis and includes consideration of operations, maintenance, and temporary upsets. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, **the current limits must be continued in the reissued permit.**

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – WWSF based on the 1-Q_{10}

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \leq pH \leq 6.1$	88	$7.0 < pH \leq 7.1$	53	$8.0 < pH \leq 8.1$	11
$6.1 < pH \leq 6.2$	86	$7.1 < pH \leq 7.2$	48	$8.1 < pH \leq 8.2$	9.2
$6.2 < pH \leq 6.3$	84	$7.2 < pH \leq 7.3$	42	$8.2 < pH \leq 8.3$	7.6
$6.3 < pH \leq 6.4$	82	$7.3 < pH \leq 7.4$	37	$8.3 < pH \leq 8.4$	6.3
$6.4 < pH \leq 6.5$	79	$7.4 < pH \leq 7.5$	32	$8.4 < pH \leq 8.5$	5.2
$6.5 < pH \leq 6.6$	76	$7.5 < pH \leq 7.6$	28	$8.5 < pH \leq 8.6$	4.3
$6.6 < pH \leq 6.7$	72	$7.6 < pH \leq 7.7$	23	$8.6 < pH \leq 8.7$	3.5
$6.7 < pH \leq 6.8$	68	$7.7 < pH \leq 7.8$	20	$8.7 < pH \leq 8.8$	3.0
$6.8 < pH \leq 6.9$	63	$7.8 < pH \leq 7.9$	16	$8.8 < pH \leq 8.9$	2.5

Attachment #1

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.9 < pH \leq 7.0$	58	$7.9 < pH \leq 8.0$	14	$8.9 < pH \leq 9.0$	2.1

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)
The weekly and monthly average ammonia nitrogen limits calculations from the previous memo do not change because there have been no changes in the effluent and receiving water flow rates, and the limits were calculated using a warm water sport fish classification for the receiving water. The calculations from the previous WQBEL memo are shown in Attachment #3.

As noted in the previous memo, the calculated weekly and monthly average limits for May through October and January through March are less restrictive than the limits that are currently in effect. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, **the current limits must be continued in the reissued permit.**

Effluent Data
The following table evaluates the statistics based upon ammonia data reported from October 2019 through August 2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Roxbury Sanitary District #1 WWTF permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia and comparing the those to the calculated limits.

Ammonia Nitrogen Effluent Data

Data in mg/L	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1-day P_{99}	31	23	19	9.5	3.6	3.9	3.1	4.7	7.2	5.9	9.0	13
4-day P_{99}	18	14	11	5.2	2.1	2.3	2.0	2.6	3.9	3.3	5.0	8.0
30-day P_{99}	11	10	6.9	2.9	1.1	1.3	1.2	1.4	1.7	1.7	2.6	5.3
Mean*	8.0	7.7	5.0	1.9	0.7	0.8	0.8	0.9	0.8	1.1	1.7	4.1
Std	6.2	4.3	3.8	2.0	0.8	0.8	0.6	1.0	1.9	1.3	1.9	2.5
Sample size	43	41	45 (2 ND)	43 (2 ND)	42 (10 ND)	45 (10 ND)	43 (11 ND)	44 (7 ND)	35 (16 ND)	43 (8 ND)	44 (5 ND)	44 (1 ND)
Range	0.34 - 22	1.9 - 17	<0.2 - 18	<0.2 - 9.0	<0.2 - 4.4	<0.2 - 3.1	<0.2 - 2.6	<0.2 - 4.3	<0.2 - 6.6	<0.1 - 5.0	<0.14 - 8.0	<0.14 - 8.7

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

Based on this comparison, daily maximum, weekly, and monthly limits are required in January and February, and a daily maximum limit is required in March. Additionally, since the permit currently has daily maximum, weekly, and monthly limits year-round, the **limits must be retained regardless of reasonable potential**, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

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

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.

Recommended Ammonia Nitrogen Limits

	Daily Maximum (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)
January	15	14	9.6
February	15	13	8.9
March	17	16	15
April	22	15	**15**
May	18	10	**10**
June	15	5.0	**5.0**
July	24	5.0	**5.0**
August	22	4.8	**4.8**
September	24	8.0	**8.0**
October	16	9.3	7.7
November	17	13	11
December	15	12	10

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

PART 5 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

Roxbury Sanitary District #1 WWTF had previously been exempted from disinfection based on the presumed limited forage fish (LFF) aquatic life classification of the receiving water. The receiving water classification has since been updated to be considered warm water sport fish, and therefore disinfection must be considered.

Section NR 102.04(5), Wis. Adm. Code, states that all surface waters shall be suitable for supporting recreational use and shall meet *E. coli* criteria during the recreation season. Section NR 102.04(5)(b), Wis. Adm. Code, allows the Department to make exceptions when it determines, in accordance with s. NR 210.06(3), Wis. Adm. Code, that wastewater disinfection is not required to meet *E. coli* limits and protect the recreational use. Section NR 210.06(3), Wis. Adm. Code, tasks the Department with determining the need for disinfection using a site-specific analysis based on potential risk to human or animal health. It sets out the factors that must be considered in determining the necessity to disinfect municipal wastewater or to change the length of the disinfection season.

Discharges to streams with $Q_{7,10}$ values < 0.1 cfs usually result in effluent-dominated situations. The risk of illness is related to the concentration of *E. coli* and therefore dilution is an important consideration when considering risk to human health. Since little to no dilution is present in these situations, disinfection should not be exempted.

The Department has considered the information required by s. NR 210.06(3), Wis. Adm. Code, and has determined that the discharge cannot meet bacteria limits without disinfection. Section NR 210.06(2)(a)1,

Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

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

These limits are required during May through September. The permit will include a compliance schedule to meet these limits.

If chlorine is added as a disinfectant, effluent limitations are recommended to assure proper operation of the de-chlorination system. Section NR 210.06(2)(b), Wis. Adm. Code, states, "When chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L." Because the WQBELs are more restrictive, they are recommended instead. **Specifically, a daily maximum limit of 31 µg/L and weekly and monthly average limits of 8.7 µg/L** are required. Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required.

PART 6 – 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 Roxbury Sanitary District #1 WWTF does not currently have an existing technology-based limit, the need for this limit 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.**

Annual Average Mass Total Phosphorus Loading

Month	Average Phosphorus Concentration (mg/L)	Total Effluent Flow (Million Gallons)	Calculated Mass (lbs/month)
October 2023	0.87	0.261	6.2
November 2023	2.50	0.265	1.9
December 2023	2.64	0.357	7.4
January 2024	2.76	0.429	9.5
February 2024	3.48	0.428	9.8
March 2024	2.97	0.372	11
April 2024	2.67	0.455	11
May 2024	2.35	0.483	11
June 2024	1.78	0.927	18
July 2024	2.03	0.860	13
August 2024	2.86	0.399	6.8
Average			**9.6**

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.

Note: Data from September 2023 is not reported because there was a flow meter failure and data was unable to be recovered or estimated.

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.

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 Roxbury 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 Roxbury Creek
Qs = 100% of the 7-Q_2 of 0.14 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 = 0.025 MGD = 0.039 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. Adm. 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 0.129 mg/L. Section NR 217.13(2)(d), Wis. Adm. Code, states that the determination of upstream concentrations shall be evaluated at each permit reissuance.

Instream total phosphorus data upstream of the discharge is not available, however the following data were considered in estimating the background phosphorus concentration:

SWIMS ID	10031636
Station Name	Monitoring station at STH 78
Waterbody	Roxbury Creek
Sample Count	4
First Sample	06/14/2018
Last Sample	09/18/2018
Mean	0.307 mg/L
Median	0.166 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 Roxbury Creek at the point of discharge also points towards the notion 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 from October 2019 through August 2024.

Total Phosphorus Effluent Data

	mg/L	lbs/day
1-day P_{99}	10.0	1.91
4-day P_{99}	6.6	1.18
30-day P_{99}	4.8	0.82
Mean*	3.9	0.65
Std	1.8	0.36
Sample size	512 (1 ND)	502
Range	<0.14 - 9.5	0 - 3.11

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

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 that is impaired for total phosphorus. **This final mass limit shall be 0.075 mg/L × 8.34 × 0.025 MGD = 0.016 lbs/day expressed as a six-month average.**

Variance Request
The facility has applied for an individual phosphorus variance under s. 283.15, Wis. Stats. Eligibility for the variance is not included as part of this review. If a variance is granted and approved by the U.S. Environmental Protection Agency**, the current interim limit of 4.8 mg/L may be extended beyond the end of the compliance schedule.**

PART 7 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from October 2019 through August 2024.

The table below summarizes the maximum temperatures reported during monitoring from February 2023 through December 2023.

Monthly Temperature Effluent Data & Limits

				Daily Maximum Effluent Limitation (°F)
JAN	Not sampled	Not sampled	51	78
FEB	38	42	51	78
MAR	42	46	53	79
APR	54	60	57	85
MAY	63	74	67	85
JUN	72	75	77	85
JUL	73	76	83	87
AUG	74	76	84	86
SEP	72	73	75	84
OCT	68	69	**62**	80
NOV	51	53	**50**	79
DEC	44	47	50	78

Reasonable Potential

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

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

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. Based on this analysis, weekly average temperature limits are necessary for the months of October and November. However, Roxbury Sanitary District #1 WWTF has requested continued consideration of a dissipative cooling study that was conducted in accordance with NR 106.59, Wis. Adm. Code, and that was approved on 04/02/2015. The study included instream assessments of conductivity and temperature collected in October 2014, and demonstrated that the discharge is rapidly mixed with the receiving water, supports conditions for rapid heat dissipation, and there is a zone of free passage. That is, the discharge does not cause an exceedance of the water quality standards for temperature in the receiving water beyond a very small mixing zone. Therefore, **temperature limits are not required, but a full year of monitoring is recommended during the third or fourth year** of the permit to be used for the next permit reissuance. The complete thermal table used for this calculation is in Attachment #4.

Future WPDES Permit Reissuance

Dissipative cooling (DC) requests must be re-evaluated every permit reissuance. The permittee is responsible for submitting an updated DC request prior to permit reissuance. Such a request must either include:

a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or
b) New information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

A new DC study will be required if any upgrades are completed to comply with new limits.

PART 8 – WHOLE EFFLUENT TOXICITY (WET)

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

judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document* (2022).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid 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 84%**, shown in the WET Checklist summary below, was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

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

Where:

Q_e = annual average flow = 0.025 MGD = 0.039 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the 7-Q_{10} = 0.03 cfs ÷ 4 = 0.0075 cfs

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

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
11/11/2014	-	-	-	-	>100	>100	Pass	Yes	
06/18/2015	-	-	-	-	>100	>100	Pass	Yes	
11/03/2020	>100	>100	Pass	Yes	22.7	>100	Fail	Yes	

Attachment #1

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?	
01/26/2021	-	-	-	-	>100	>100	Pass	Yes	Retest
09/28/2021	-	-	-	-	>100	>100	Pass	Yes	
11/28/2023	>100	>100	Pass	Yes	>100	>100	Pass	Yes	

- 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.**

  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
100/22.7 = 4.4	6.2 Based on 1 detect	84%

[(TUc effluent) (B)(IWC)] = 23 > 1.0

Therefore, **reasonable potential is shown a chronic WET limit** using the procedures in s. NR 106.08(6) and representative data from November 2014 through November 2023.

Expression of WET Limit
Chronic WET limit = [100/IWC] TU_c = 100/84 = **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 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. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: https://dnr.wisconsin.gov/topic/Wastewater/WET.html.

Attachment #1

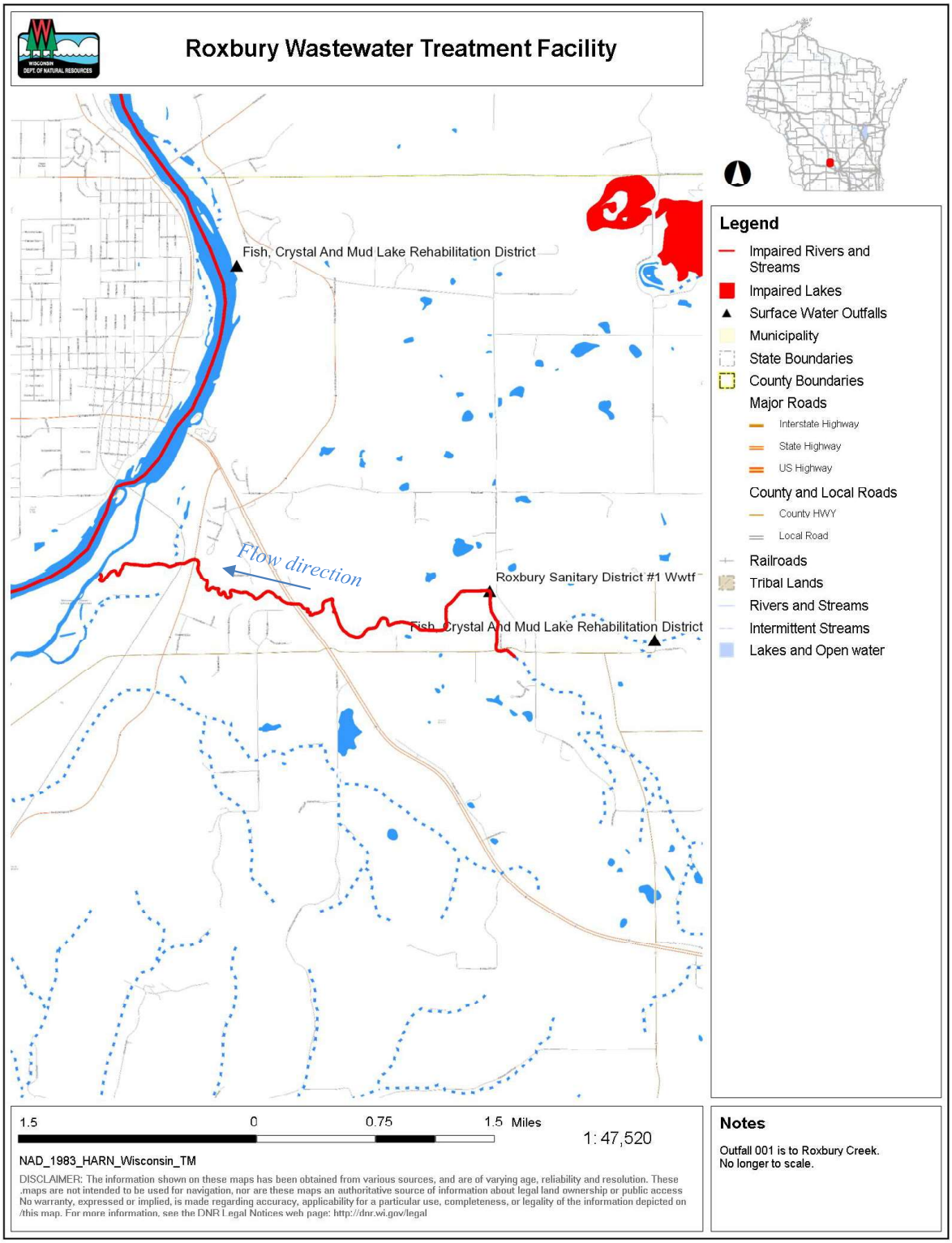
WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 84% **15 Points**
Historical Data	2 tests used to calculate RP. No tests failed. **0 Points**	6 tests used to calculate RP. One test failed. **0 Points**
Effluent Variability	Upsets rare, intermittent limit noncompliance for ammonia, phosphorus, and BOD. **5 Points**	Same as Acute. **0 Points**
Receiving Water Classification	WWSF **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for limits for ammonia nitrogen based on ATC. Chloride, copper, nickel, and zinc detected. Additional Compounds of Concern: None. **8 Points**	Reasonable potential for limits for chloride and ammonia based on CTC. Copper, nickel, and zinc detected. Additional Compounds of Concern: None. **9 Points**
Additives	No biocides and one water quality conditioner (Neo Water FX) added. Chemical SOP is not required unless additive use becomes permanent (currently used in long-term pilot study). **1 Point**	All additives used more than once per 4 days. **1 Point**
Discharge Category	No industrial contributors. **0 Points**	Same as Acute. **0 Points**
Wastewater Treatment	Secondary or better. **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**
Total Checklist		**30 Points**
Recommended Monitoring Frequency		3 tests during permit term from checklist points; annual testing required due to WET limit.
		Limit = 1.2 TU_c
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's *WET Program Guidance Document* (2022) and other information described above, **two acute WET tests and annual 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).

- 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 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 Calculations from the WQBEL Memo Dated July 10, 2018

		Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*
Background Information	7-Q_{10} (cfs)	0.05	0.04	0.08	0.15	0.09	0.05
	7-Q_2 (cfs)	0.25	0.22	0.49	0.74	0.54	0.41
	Ammonia (mg/L)	0.12	0.12	0.12	0.06	0.06	0.06
	Temperature (°C)	0.56	1.11	3.33	8.89	14.44	18.89
	pH (s.u.)	7.9	7.9	7.9	8.09	8.09	8.09
	% of Flow used	25	25	25	25	50	100
	Reference Weekly Flow (cfs)	0.0125	0.01	0.02	0.0375	0.045	0.05
	Reference Monthly Flow (cfs)	0.053125	0.04675	0.104125	0.15725	0.2295	0.3485
Criteria mg/L	4-day Chronic						
	Early Life Stages Present	6.99	6.99	6.99	5.32	5.32	4.02
	Early Life Stages Absent	11.36	11.36	11.36	7.65	5.35	4.02
	30-day Chronic						
	Early Life Stages Present	2.80	2.80	2.80	2.13	2.13	1.61
	Early Life Stages Absent	4.54	4.54	4.54	3.06	2.14	1.61
Effluent Limitations mg/L	Weekly Average						
	Early Life Stages Present					**11.45**	**9.13**
	Early Life Stages Absent	**14.99**	**14.26**	**17.17**	**15.01**		
	Monthly Average						
	Early Life Stages Present					**14.41**	**15.54**
	Early Life Stages Absent	**10.62**	**9.89**	**16.45**	**15.26**		

		Jul	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*
Background Information	7-Q_{10} (cfs)	0.05	0.04	0.05	0.06	0.07	0.05
	7-Q_2 (cfs)	0.36	0.32	0.33	0.35	0.4	0.31
	Ammonia (mg/L)	0.06	0.06	0.06	0.05	0.05	0.05
	Temperature (°C)	20.56	19.44	15.56	10.00	4.44	1.67
	pH (s.u.)	8.08	8.08	8.08	8.06	8.06	8.06
	% of Flow used	100	100	50	25	25	25
	Reference Weekly Flow (cfs)	0.05	0.04	0.025	0.015	0.0175	0.0125
	Reference Monthly Flow (cfs)	0.306	0.272	0.14025	0.074375	0.085	0.065875
Criteria mg/L	4-day Chronic						
	Early Life Stages Present	3.66	3.94	5.05	5.57	5.57	5.57
	Early Life Stages Absent	3.66	3.94	5.05	7.45	9.04	9.04
	30-day Chronic						
	Early Life Stages Present	1.46	1.57	2.02	2.23	2.23	2.23
	Early Life Stages Absent	1.46	1.57	2.02	2.98	3.62	3.62
Effluent Limitations mg/L	Weekly Average						
	Early Life Stages Present	**8.32**	**7.94**	**8.28**			
	Early Life Stages Absent				**10.32**	**13.11**	**11.95**
	Monthly Average						
	Early Life Stages Present	**12.58**	**12.22**	**9.13**			
	Early Life Stages Absent				**8.62**	**11.46**	**9.69**

Attachment #4

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

						Temp Dates	Flow Dates
Facility:	Roxbury SD#1 WWTF		**7-Q_{10}:**	0.03	cfs		
Outfall(s):	001		**Dilution:**	25%		**Start:** 02/01/23	10/01/19
Date Prepared:	12/2/2024		**f:**	0		**End:** 12/31/23	08/31/24
Design Flow (Qe):	0.025	MGD	**Stream type:**	Small warm water sport or forage fis			
Storm Sewer Dist.	0	ft	**Qs:Qe ratio:**	0.2	:1		
			Calculation Needed?	YES			

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(cfs)	(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	0.05	0.084	0.142	0			51	78
FEB	34	50	76	0.04	0.080	0.160	0	38	42	51	78
MAR	38	52	77	0.08	0.173	0.255	0	42	46	53	79
APR	48	55	79	0.15	0.076	0.120	0	54	60	57	85
MAY	58	65	82	0.09	0.066	0.124	0	63	74	67	85
JUN	66	76	84	0.05	0.055	0.119	0	72	75	77	85
JUL	69	81	85	0.05	0.048	0.078	0	73	76	83	87
AUG	67	81	84	0.04	0.034	0.055	0	74	76	84	86
SEP	60	73	82	0.05	0.043	0.075	0	72	73	75	84
OCT	50	61	80	0.06	0.212	0.636	0	68	69	**62**	80
NOV	40	49	77	0.07	0.101	0.196	0	51	53	**50**	79
DEC	35	49	76	0.05	0.091	0.156	0	44	47	50	78

Facility Specific Chloride 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: Roxbury Sanitary District #1

B. Facility Name: Roxbury Sanitary District #1 Wastewater Treatment Facility (WWTF)

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Chloride **Date completed:** June 17, 2025

E. Permit #: WI-0028975-10-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** October 1, 2025 **End Date:** September 30, 2030

G. Date of Variance Application: February 12, 2024

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

I. Description of proposed variance:

The Roxbury Sanitary District #1 Wastewater Treatment Facility (WWTF) discharges to Roxbury Creek located in the Roxbury Creek Watershed in the Lower Wisconsin River Basin in Dane County. The Roxbury Sanitary District #1 seeks a variance to the water quality standards for chloride for its WWTF.

The Department concludes that the Roxbury Sanitary District #1 has met the requirements of s. NR 106.83(2), Wis. Adm. Code, and s. 283.15, Wis. Stats. The Department further concludes that requiring the Roxbury Sanitary District #1 to meet the water quality standard for chloride would result in substantial and widespread adverse social and economic impacts in its service area. Furthermore, the Department concludes that there is no feasible pollutant control technology that can be applied to achieve compliance with the chloride water quality-based effluent limit (WQBEL). The Department therefore proposes that this permit include a discharger-specific variance to the chloride water quality standard for aquatic life.

The proposed variance for chloride, from the chronic WQBEL of 470 mg/L, to an interim limit of 510 mg/L, is expressed as a weekly average limit. The Department concludes that the interim limit reflects the greatest pollutant reduction achievable by the permittee with the pollutant control technologies currently applied in the permittee's WWTF. The permit requires the permittee to implement Source Reduction Measures (SRMs). The Department considers the highest attainable condition (HAC) of the receiving water to be the interim limit – applied for the term of the variance – combined with the permittee's implementation of SRMs. The term of the proposed variance is five years, concurrent with the term of the proposed WPDES permit. The underlying designated uses and criteria of Wisconsin's chloride water quality standards (WQS) will be retained, and all other applicable WQS will remain in effect with adoption of the proposed variance.

This is the first submittal to EPA for a chloride variance for this permittee.

Citation: An interim chloride effluent limitation under s. NR 106.83(2), Wis. Adm. Code, represents a variance to water quality standards authorized by s. 283.15, Wis. Stats., and 40 CFR §131.14.

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

Name	Email	Phone	Contribution
Sarah Donoughe	Sarah.Donoughe@Wisconsin.gov	920-366-6076	Permit Drafter
Jordan Main	Jordan.Main@Wisconsin.gov	608-535-0368	Compliance Engineer
Sarah Luck	Sarah.Luck@Wisconsin.gov	608-843-3876	Limit Calculator

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: 470 mg/L (calculated chronic toxicity criterion)

B. List other criteria likely to be affected by variance: None.

C. Source of Substance: Sources of chloride are expected to be from residential softeners and salt application during winter road maintenance.

D. Ambient Substance Concentration: No in-stream data available. ☐ **Measured** ☐ **Estimated** ☐ **Default** ☒ **Unknown**

E. If measured or estimated, what was the basis? Include citation. N/A

F. Average effluent discharge rate: 0.026 MGD (average 10/1/19-8/31/24) **Maximum effluent discharge rate:** 0.636 MGD

G. Effluent Substance Concentration: 1-day P_{99} = 584 mg/L; 4-day P_{99} = 514 mg/L; Average = 451 mg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. Effluent concentration data collected from January 2023 through December 2023 (12 samples).

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 Chloride SRM plan. Thus, the HAC at commencement of this variance is 510 mg/L expressed as a weekly average, which reflects the greatest chloride reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's Chloride SRM plan. 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 Roxbury Sanitary District #1 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: 510 mg/L as a weekly average

L. Level currently achievable (LCA): 510 mg/L as a weekly average

M. What data were used to calculate the LCA, and how was the LCA derived? (*Immediate compliance with LCA is required.)*
The LCA is equal to the 4-day P_{99} (after rounding) of effluent concentration data collected from January 2023 through December 2023 (12 samples).

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.
Chapter NR 106, Subchapter VII, Wis. Adm. Code, allows for a variance; the imposition of a less restrictive interim limit; a compliance schedule that stresses source reduction and public education; and allowance for a target value or limit to be a goal for reduction.

The weekly average variance limit = 4-day P_{99}. The limit is established in accordance with s. 283.15 (5), Wis. Stats. and ch. NR 106 Subchapter II, 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 use of a reverse osmosis system was evaluated. The cost of the system was estimated to an average cost per household that would result in a MHI of 2.19%. Upgrading to a public water supply with a centralized lime softening treatment system was also evaluated. The cost of the system was estimated to an average cost per household that would result in a MHI of 5.07%. Without a variance, meeting the water quality standard of 470 mg/L would result in substantial and widespread economic and social impacts.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Dane

B. Receiving waterbody at discharge point: Roxbury Creek

C. Flows into which stream/river? Wisconsin River **How many miles downstream?** 4

D. Coordinates of discharge point (UTM or Lat/Long): Lat: 43.25512º N / Long: 89.68092º W

E. 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 chronic criterion of the substance for aquatic life protection?
Approximately 2 miles, just after the point where Roxbury Creek meets the unnamed side channel of the Wisconsin River

F. Provide the equation used to calculate that distance *(Include definitions of all variables, identify the values used for the clarification, and include citation):*

(interim limit in mg/L x effluent design flow in cfs) + (background concentration mg/L x background stream flow in cfs)) / (effluent design flow in cfs + background stream flow in cfs) = $\leq$ 395 mg/L.

(510 mg/L x 0.039 cfs) + (0 mg/L x 3.48 cfs) / (0.039 cfs + 3.48 cfs) = 5.6 mg/L < 395 mg/L

Roxbury Creek flows approximately 2 miles from Outfall 001 to an unnamed side channel of the Wisconsin River, which rejoins the Wisconsin River after an additional approximately 1.25 miles. The annual 7-Q_{10} in the unnamed side channel of the Wisconsin River is estimated to be 3.48 cfs from the Wisconsin Surface Water Data Viewer Natural Communities layer. There is no background chloride data for the unnamed side channel of the Wisconsin River or for the Wisconsin River, so the background concentration is assumed to be 0 mg/L. Assuming a weekly average discharge concentration of 510 mg/L and background concentration of 0 mg/L at the unnamed side channel of the Wisconsin River, the calculated mixed instream chloride is 5.6 mg/L at the unnamed side channel of the Wisconsin River, which is below criteria.

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?
Warm Water Sport Fish (WWSF), non-public water supply

H. 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: None.

Permit Number	Facility Name	Facility Location	Variance Limit [mg/L]
N/A			

I. 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
See attached map (Roxbury WWTF - Current Outfall Variances).

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
Roxbury Creek (0-4)	Total Phosphorus	Degraded Biological Community

***K.* Please list any contributors to the POTW in the following categories:**
May need to contact facility for this information

Food processors (cheese, vegetables, meat, pickles, soy sauce, etc.)	None
Metal Plating/Metal Finishing	None
Car Washes	None
Municipal Maintenance Sheds (salt storage, truck washing, etc.)	None

Laundromats	None
Other presumed commercial or industrial chloride contributors to the POTW	None

L. If the POTW does not have a DNR-approved pretreatment program, is a sewer use ordinance enacted to address the chloride contributions from the industrial and commercial users? If so, please describe.

Roxbury WWTF does not have an approved pretreatment program. The Roxbury sewer use ordinance (SUO) does not have chloride-specific loading limits. There is a provision in the SUO for "Limitations related to treatment plant influent" that provides, "Any discharge prohibited or limited as determined by the Commission to be necessary to meet the objectives of this ordinance or the conditions of its WPDES permit."

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 chloride to the POTW? If so, please list.

N/A

B. Are all industrial users in compliance with local pretreatment limits for chloride? 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 chloride 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: June 26, 2025 **Date of hearing:** August 11, 2025

E. Were comments received from the public in regards to this notice or hearing? *(If yes, see notice of final determination)* ☐ Yes ☐ No

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 for chloride.

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: Warm Water Sport Fish (WWSF), non-public water supply

B. Applicable criteria affected by variance: Chronic toxicity criterion of 395 mg/L from ch. NR 105, Wis. Adm. Code, applicable in all Wisconsin waters regardless of use designation. The calculated (site specific) chronic toxicity criterion is 470 mg/L.

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:

The interim limit of 510 mg/L exceeds the genus mean chronic value for *Ceriodaphnia*.

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

There are no Endangered or Threatened species known that would affect the water quality criterion, as the chronic toxicity criterion for chloride is more stringent than all genus mean chronic values for organisms with chloride toxicity data. As a result, no endangered species with data would need more protection than already provided by the existing criterion.

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:

There is currently no chloride-specific treatment technology in place at the Roxbury WWTF. Treatment consists of primary settling using two trains of septic tanks followed by a dosing chamber that flows to a combination of any of the four bed recirculating sand filters. Much of the effluent from the recirculating sand filter beds is returned to the dosing chamber and is re-applied to the sand filter beds. The flow that is not returned to the sand filter beds is discharged to the east bank of Roxbury Creek.

B. What modifications would be necessary to comply with the current limits? Include any citations.

Installation of reverse osmosis treatment at the facility.

C. How long would it take to implement these changes?

N/A – The cost of providing reverse osmosis at the wastewater treatment facility was evaluated and determined to be prohibitively expensive.

D. Estimate the capital cost *(Citation)***:** $41,063 for RO treatment (source: WDNR Form 3400-193 Chloride Variance Application from permittee; adjusted 2010 $ to 2025 $)

E. Estimate additional O & M cost *(Citation)***:** $13,323/yr for RO treatment (source: WDNR Form 3400-193 Chloride Variance Application from permittee; adjusted 2010 $ to 2025 $)

F. Estimate the impact of treatment on the effluent substance concentration, and include any citations:

Reverse osmosis (RO) systems can be operated to achieve levels of chloride below the water quality standard of 470 mg/L. However, it is not economically feasible for the Roxbury Sanitary District #1 at this time.

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

End-of-pipe RO wastewater treatment technology for chloride produces concentrated brine that can be as much or more of an environmental liability than the untreated effluent. Since the concentrated brine cannot be further treated, the only recourse for the disposal of the brine is transfer to another community, which is often not feasible. Appropriate chloride source reduction activities are preferable environmentally to effluent end-of-pipe treatment in most cases, since the end product of treatment (production of a concentrated brine) does not remove the load of chloride from the environment.

There would be some impacts based on disposal of brine from RO. These include air pollution impacts from trucking brine and increased chloride impacts at the point where brine is discharged.

H. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the discharge? ☐ **Yes** ☒ **No** ☐ **Unknown**

RO treatment of the Roxbury WWTF effluent to meet the WQBEL is technically feasible. However, it is not economically feasible. See WDNR variance application and screening tool for costs of RO. Use of RO was evaluated. The resulting total cost for sewer user rates was estimated to result in an average cost to households that would be 2.19% of the MHI. An increase of this magnitude would cause substantial and widespread adverse social and economic impacts in the area where the discharge is located.

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

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

The cost of adding RO to the existing treatment plant's treatment train would cause substantial and widespread adverse social and economic impacts in the area where the discharge is located. Implementation of the SRMs in the proposed permit is preferable economically and environmentally to installing RO.

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

Alternative water supply sources were considered, since water softening was determined to be a primary source of chloride discharged by the WWTF. Presently, the Sanitary District's residents are all served by private wells. If municipal wells were installed to provide the water supply, it is likely that the Sanitary District's residents would continue to use water softeners, as the groundwater is naturally hard due to the geography in the region. If the Roxbury Sanitary District #1 were to obtain its water from a different municipal water system, a water distribution system would also need to be installed to serve the Sanitary District. The costs associated with this option make it cost prohibitive.

An alternative to the current practice of having the Sanitary District's residents provide their own water softening has been identified as a potential practice for consideration. Specifically, that alternative involves installing a municipal water system that includes lime softening to serve the Sanitary District. The costs associated with this option also make it cost prohibitive.

As noted above, the cost of RO treatment at the WWTF is prohibitive; the Department has considered other wastewater treatment options, including hauling or piping wastewater to another POTW. In this situation, the distance to the nearest POTW would be approximately 14 miles (Village of Waunakee). The cost of installing a wastewater pipeline over that distance would cost in the range of $1 million per mile to install – and would be cost prohibitive. Hauling wastewater from the Roxbury Sanitary District #1 to another POTW for treatment – approximately 26,000 gal/day – was deemed practicably unfeasible.

See guidance document Justification for Variances to Water Quality Standards for Chloride in Wisconsin (07/09/2010 DRAFT).

Section IX: 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.

N/A – first time submittal for variance

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.

As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation (b) implement the chloride source reduction measures specified in the Source Reduction Plan dated June 2025, and (c) perform the actions listed in the schedule section of the permit.

1. Educate homeowners, by mailer or online, on salt usage and their ability to investigate rebate programs for voluntary replacement. Provide documentation of this education in the Annual Reports.
2. Conduct softener survey for all homes in Roxbury, by mailer or online, and keep up to date records of this survey. Provide survey documentation in Annual Reports.
    a. Analyze survey results. Update list of softener deficiencies and recommend repair or replacement by sending letters to respective homeowners.
    b. Evaluate the potential of subsidies for a reduced-cost residential softener tune-up program.
3. General education for homeowners, provided by mailer in billing statements or online, on the impact of chlorides from residential softeners. Also discuss options available for increasing softener salt efficiency and request voluntary reductions. Provide documentation of this education in the Annual Reports.
4. Recommend residential softener tune-ups on a voluntary basis. Recommendation to come with education mailers.
    a. Record how many tune-ups are completed each year and document in the Annual Reports.

5. Develop informational/educational material concerning operation and maintenance of water softeners.
    a. Distribute informational materials by mailer or posting online. Document in the Annual Report.
6. Educate licensed installers and self-installers of softeners on providing optional hard water for outside faucets for residences.
7. Evaluate the implementation of a softener tune-up program.
    a. Determine if Roxbury resources can support a mandated or only a voluntary program. Create a list of users who have softeners. Document in the Annual Report.
8. Develop, disseminate, and implement a winter road maintenance plan. Plan is to detail who is responsible for winter road maintenance. If this is not done by the municipality, address how Roxbury will work with the County or contractor to accomplish this.
    a. Disseminate the winter road maintenance plan and provide training on smart salting practices (Salt Wise Certified).
    b. Implement the winter road maintenance plan.

Citation: Section 2.2.1.3 of the proposed permit and the Roxbury SD #1 SRP dated June 2025

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

A. Date of previous submittal: N/A **Date of EPA Approval:** _____

B. Previous Permit #: _____ **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: _____ **Variance Limit:** _____

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 – first time submittal for variance	☐ **Yes** ☐ **No**

Roxbury SD Chloride Reduction Plan

Roxbury Sanitary District #1
Roxbury, Wisconsin
June 2025

Prepared by:

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Project No. 00157021

Roxbury Chloride Reduction Plan
Roxbury Sanitary District #1

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CHAPTER 1 – INTRODUCTION

1.1 BACKGROUND

Roxbury Sanitary District #1 operates a wastewater treatment facility that serves a population of approximately 250 residential, commercial, and public users with no industrial contributors. Treatment consists of primary settling using two trains of septic tanks followed by a dosing chamber that flows to a combination of any of the four bed recirculating sand filters for BOD and ammonia treatment. A schematic of the treatment facility is provided in **Appendix A**. Up to 80% of the effluent from the recirculating sand filter beds is returned to the doing chamber and is re-applied to the sand filter beds. The flow that is not returned is discharged to the east bank of Roxbury Creek, approximately 2,000 feet downstream of the Inama Road Bridge. The existing facility was constructed in 1999 and the design flow is 25,000 gallons per day. For this upcoming permit term, Roxbury is applying for individual chloride variance.

In the current permit term, Roxbury has been permitted to monitor effluent chloride concentrations. The recorded concentrations during this period exceeded the 4-day P99 water quality-based effluent limit (WQBEL) of 456.7 mg/L. Because of these exceedances, it is expected that in the upcoming permit term, the provided WQBEL chloride limit will be added to the discharger's permit.

Roxbury SD has submitted for a chloride variance, and therefore, is required to submit a Chloride Reduction Plan to evaluate all source reduction measures (SRMs) and to establish appropriate implementation activities and schedules for all SRMs. Roxbury's WPDES permit is attached in **Appendix B.**

1.2 PURPOSE AND SCOPE

The purpose of this plan is to:

- Identify sources of chloride in the sewer system
- Document the chloride source reduction measures that have been implemented in the Roxbury SD sewer system throughout the permit term, and the effect on effluent chloride concentrations
- Outline a plan of action for additional source control measures

CHAPTER 2 – HISTORICAL CHLORIDE LODINGS

2.1 CHLORIDE LOADINGS

Influent chloride concentrations are monitored on a monthly basis and will serve as the baseline for the monitoring progress in the reduction plan outlined in this document. **Table 1** lists yearly average chloride concentrations and loads for the years 2018, 2019, and 2023. Based on data collected throughout 2023, the average concentration of chloride was 450.8 mg/L. This is a historically high concentration when compared to previous years data. Despite the historic high concentration throughout the year of 2023, the average effluent chloride loading has decreased by 30% since 2019. **Figure 1 and Figure 2** show the historical influent flow with chloride concentrations and loading.

Table 1: Chloride Concentration and Loading Summary

Year	Average Effluent Chloride (mg/L)	Average Effluent Chloride (lb/d)	Sample Count
2018	393.8	116.1	8
2019	301.1	195.1	9
2023	450.8	59.4	12

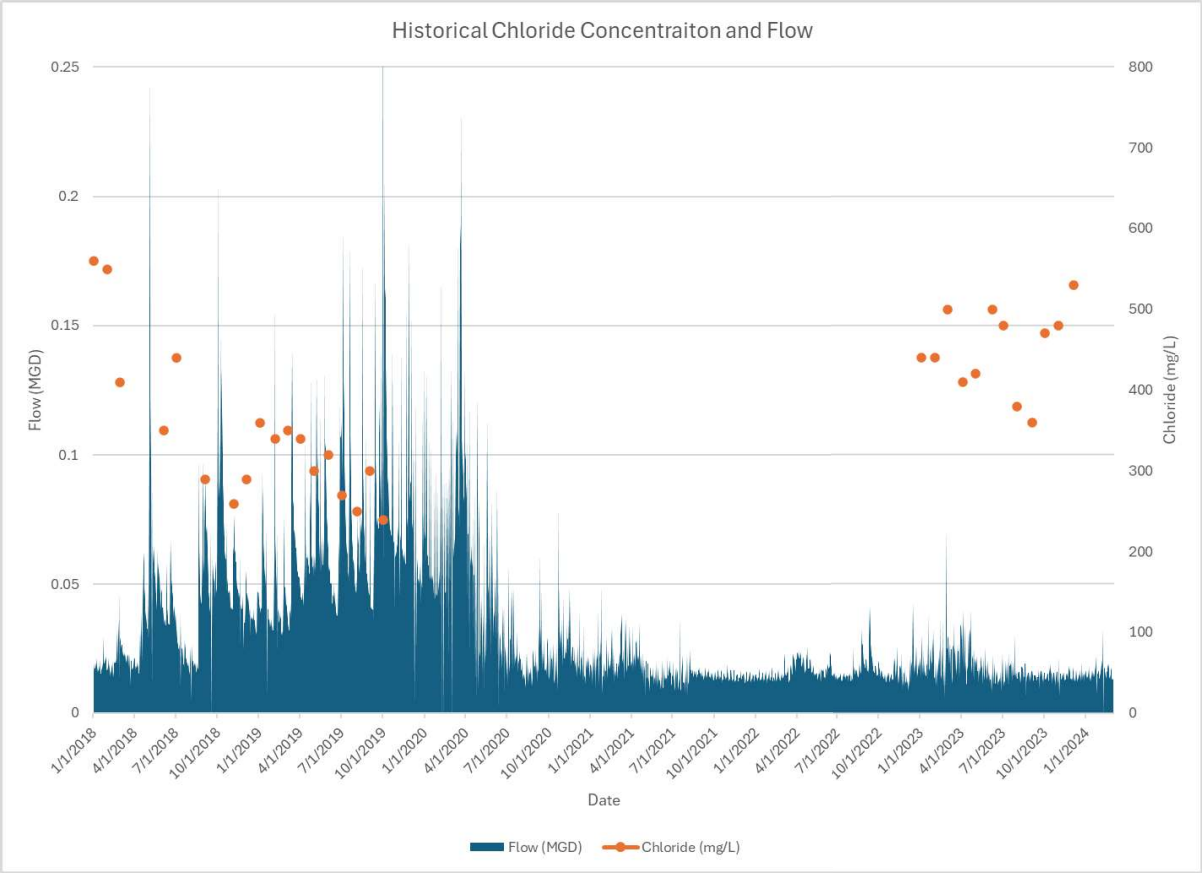

Figure 1: Roxbury Historical Chloride Concentration and Flow (2018-2023)

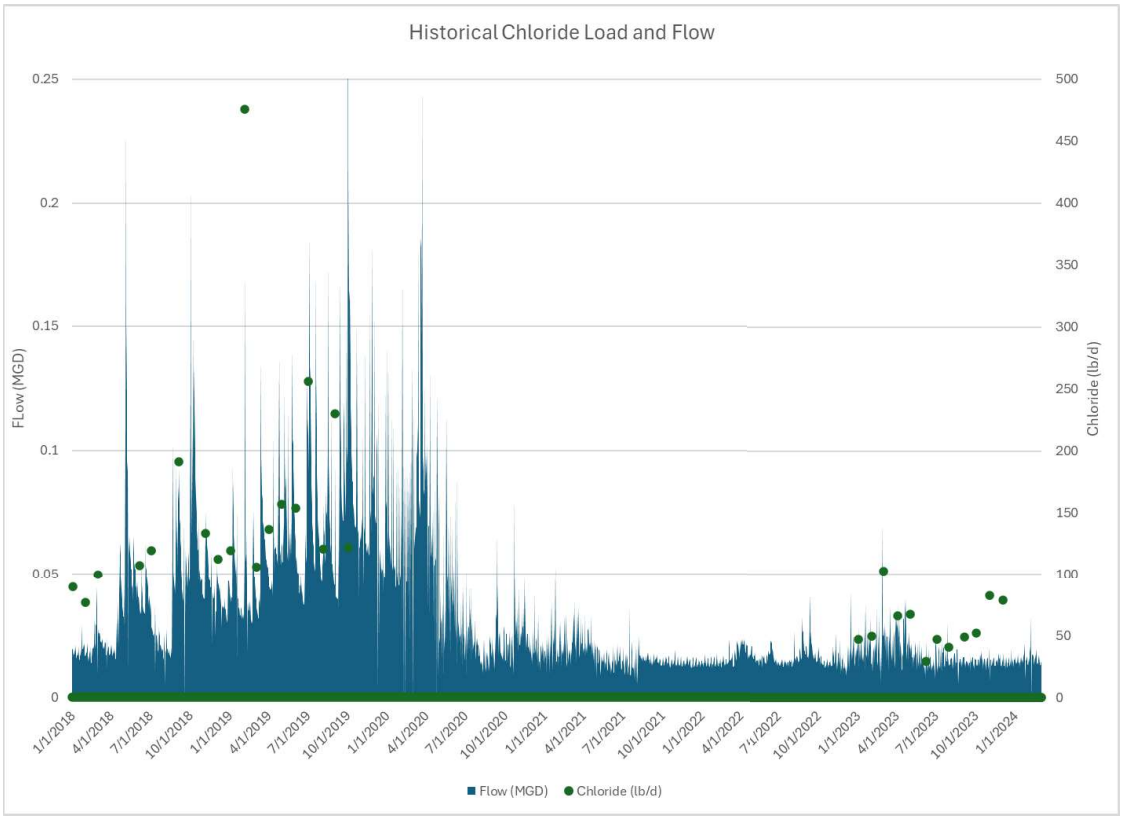

Figure 2: Roxbury Historical Chloride Loading and Flows (2018-2023)

In the years 2018-2020, the average flow entering the facility was 0.05 MGD. After completion of their sewer rehabilitation project, the average influent flow decreased 30% to 0.017 MGD in the years 2021-2023. Due to I/I prevention measures, roughly 0.035 MGD of clearwater entering the collection system was eliminated. The removal of significant I/I sources has led to higher chloride concentrations of chloride due to decreased flows. Despite chloride concentrations being greater, chloride loadings have decreased.

CHAPTER 3 – CHLORIDE SOURCES

3.1 RESIDENTIAL SOFTENERS

Potable water within the Roxbury SD is provided to via private wells, as there is no public water system. Due to the geography and location, elevated hardness concentrations are likely present in the public water. It is considered that there are many residential softeners of varying age and design in use throughout this community. The type and condition of the resin in the softeners is also unknown as well as the salting rate, capacity, and hardness setting of each softener.

3.2 SALT APPLICATION

Throughout the 2023 monitoring schedule, the months December through March exhibited peak concentrations of chloride. Considering the location, these peaks throughout the winter months could potentially be caused by winter road maintenance.

CHAPTER 4 –PROPOSED CHLORIDE LIMITS

4.1 CHLORIDE MONITORING AND LIMITS

During their October 01, 2019, permit term, Roxbury SD complied with the WPDES permitted monthly chloride monitoring requirement for the year 2023. The monthly chloride monitoring data in **Table 2** shows six months where the effluent chloride concentration exceeds the water quality effluent-based limit (WQBEL) 4-day P99 value of 456.7 mg/L. The 1-day P99 WQBEL of 532.2 mg/L was never exceeded throughout the 2023 sampling term.

The forementioned WQBEL chloride limits are expected to be included in the next permit period for Roxbury SD. Roxbury did not trigger these WQBEL chloride limits previously, most likely due to the large amount of clearwater entering the collection system. The chloride loads have historically decreased, but the concentration of chloride is seen to increase due to a reduction of I/I flows.

Table 2: 2023 Influent Flows and Effluent Chloride Concentration and Load

Date	Flow (MGD)	Chloride (mg/L)	Chloride (lb/d)
Jan-23	0.013	440	46.97
Feb-23	0.014	440	49.54
Mar-23	0.025	500	103.00
Apr-23	0.019	410	65.99
May-23	0.019	420	67.60
Jun-23	0.007	500	29.19
Jul-23	0.012	480	47.24
Aug-23	0.013	380	40.71
Sep-23	0.016	360	49.11
Oct-23	0.013	470	52.02
Nov-23	0.021	480	82.69
Dec-23	0.018	530	78.68

CHAPTER 5 – CHLORIDE REDUCTION MEASURES

5.1 REDUCTION PLAN

Table 3 below lists source reduction measures (SRMs) and their start dates. The SRMs are categorized by two project phases: 1) Pollutant Source Identification and 2) Actions to Minimize Pollutant Sources. Pollutant Source Identification SRMs are action items resulting from the residential softener inventory survey which will identify deficient softeners to repair or replace to achieve potential chloride reductions. Actions to Minimize Pollutant Sources SRMs are action items tasked with reviewing and altering the POA ordinances to maintain proper softener replacement and operation and maintenance standards to achieve chloride reductions.
The implementation status of each SRM will be detailed in the Annual Progress Reports due January 31 of each year from 2022 through 2026. The Final Annual Progress Report, due January 31, 2026, will describe the SRMs implemented and their corresponding impact to chloride concentrations and mass in the influent to the WWTF and in the WWTF effluent to the land treatment system.

Table 3: Chloride Source Reduction Measures and Schedule

SRM/PMP Activities	1st Year	2nd Year	3rd Year	4th Year	5th Year
1. Educate homeowners, by mailer or online, on salt usage and their ability to investigate rebate programs for voluntary replacement. Provide documentation of this education in the Annual Reports	X	X	X	X	X
2. Conduct softener survey for all homes in Roxbury, by mailer or online, and keep up to date records of this survey. Provide survey documentation in Annual Reports.		X			
a. Analyze survey results. Update list of softener deficiencies and recommend repair or replacement by sending letters to respective homeowners.			X		
b. Evaluate the potential of subsidies for a reduced-cost residential softener tune-up program.			X	X	X
Actions to Minimize Pollutant Sources					
1. General education for homeowners, provided by mailer in billing statements or online, on the impact of chlorides from residential softeners. Also discuss options available for increasing softener salt efficiency and request voluntary reductions. Provide	X	X	X	X	X

SRM/PMP Activities	1st Year	2nd Year	3rd Year	4th Year	5th Year
documentation of this education in the Annual Reports.					
2. Recommend residential softener tune ups on a voluntary basis. Recommendation to come with educational mailers	X	X	X	X	X
a. Record how many tune-ups are completed each year and document in the Annual Reports.	X	X	X	X	X
3. Develop informational/educational materials concerning operation and maintenance of water softeners.	X				
a. Distribute informational materials by mailer or posting online. Document in the Annual Report.		X			
4. Educate licensed installers and self-installers of softeners on providing optional hard water for outside faucets for residences.	X				
5. Evaluate the Implementation of a softener tune-up program.			X		
a. Determine if Roxbury resources can support a mandated or only a voluntary program. Create a list of users who have softeners. Document in the Annual Report			X		
6. Develop, disseminate, and implement winter road maintenance plan. Plan is to detail who is responsible for winter road maintenance. If this is not done by the municipality, address how Roxbury will work with the County or contractor to accomplish this.	X				
a. Disseminate the winter road maintenance plan and provide training on smart salting practices (Salt Wise Certified).		X			
b. Implement the winter road maintenance plan.			X	X	X

needed.

Section I: General Information

A. Name of Permittee: Roxbury Sanitary District #1

B. Facility Name: Roxbury Sanitary District #1 Wastewater Treatment Facility (WWTF)

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Phosphorus **Date completed:** June 17, 2025

E. Permit #: WI-0028975-10-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** October 1, 2025 **End Date:** September 30, 2030

G. Date of Variance Application: February 12, 2024

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:

Roxbury Creek is listed as a warm water sport fish (WWSF) community, non-public water supply. The WQC for rivers like Roxbury Creek is 0.075 mg/L and the phosphorus WQBEL calculation formula is cited in s. NR 217.13 (2)(a), Wis. Adm. Code. The calculated phosphorus WQBELs are 0.075 mg/L and 0.016 lbs/day as 6-month averages and 0.225 mg/L as a monthly average. Given the small size of this facility, a technology-based phosphorus limitation is not warranted. The Roxbury Sanitary District #1 was first issued a WPDES permit containing the phosphorus WQBEL on July 1, 2013. During the previous permit term, Roxbury evaluated their compliance options and determined that water quality trading, adaptive management and facility upgrades are not economically viable compliance options.

The monthly average effluent phosphorus concentration for this discharge is currently 4.8 mg/L (October 2019 to August 2024). This phosphorus concentration reflects on-site phosphorus optimization measures that occurred during the previous permit term. The proposed permit includes requirements to implement on-site phosphorus optimization measures along with an interim limit of 4.8 mg/L, expressed as a monthly average.

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

Name	Email	Phone	Contribution
Sarah Donoughe	Sarah.Donoughe@Wisconsin.gov	920-366-6076	Permit Drafter
Jordan Main	Jordan.Main@Wisconsin.gov	608-535-0368	Compliance Engineer
Sarah Luck	Sarah.Luck@Wisconsin.gov	608-843-3876	Limit Calculator

Section II: Criteria and Variance Information

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

B. List other criteria likely to be affected by variance: None.

C. Source of Substance: Roxbury Sanitary District #1 discharges to Roxbury Creek in the Roxbury Creek Watershed which is 20 mi^2. Landcover is primarily agricultural (66%), forest (27%), followed by urban (6%) and wetlands (2%). According to the Pollutant Load Ratio Estimation Tool (PRESTO) model, 96% of the phosphorus comes from nonpoint sources.

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: 0.166 mg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation.

The Surface Water Integrated Monitoring System (SWIMS) database was searched for phosphorus data on Roxbury Creek near the discharge from Roxbury WWTF. A monitoring station (SWIMS ID# 10031636) at STH 78 in Roxbury

Creek had 4 samples taken between June 14, 2018 and September 18, 2018. The average value of these results was 0.307 mg/L, and the median was 0.166 mg/L.

F. **Average effluent discharge rate:** 0.026 MGD (average 10/1/19-8/31/24) **Maximum effluent discharge rate:** 0.636 MGD (peak daily reported flow from 10/1/19-8/31/24)

G. **Effluent Substance Concentration:** 1-day P_{99} = 10.0 mg/L; 4-day P_{99} = 6.6 mg/L; 30-day P_{99} = 4.8 mg/L; Average = 3.9 mg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. **If measured or estimated, what was the basis? Include Citation.** Effluent concentration data collected from October 2019 through August 2024.

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 at commencement of this variance is 4.8 mg/L, which reflects the greatest phosphorus reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's Phosphorus PMP. The current effluent condition is reflective of on-site optimization measure that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for Roxbury WWTF 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:** 4.8 mg/L, equal to the current permit limit

L. **Level currently achievable (LCA):** The 30-day P_{99} is 4.8 mg/L. The 4-day P_{99} is 6.6 mg/L. The current permit has a phosphorus limit of 4.8 mg/L as a monthly average. Based on data collected during the current permit term (October 2019 through August 2024), the current limit of 4.8 mg/L was exceeded 164 times (out of 512 samples, or 32%), mostly in 2021 (69 times) and 2022 (63 times). The limit was exceeded 4 times in 2020, 28 times in 2023 and 0 times in 2024 (looking at data through August 2024). Roxbury WWTF was approved by the Department on 3/13/24 for a long-term pilot study for Neo Water FX, a phosphorus removal chemical, for a max of two years. A period of trial and error is expected as the dosage is assessed, and the efficacy of chemical phosphorus removal in the system is unknown at this time. Therefore, the current effluent limit of 4.8 mg/L is considered the level currently achievable.

M. **What data were used to calculate the LCA, and how was the LCA derived? (***Immediate compliance with LCA is required.)*
The LCA of 4.8 mg/L was originally based on the 30-day P_{99} of 11 samples collected from 06/26/11 to 12/04/11 and has been continued since. Concentrations of effluent phosphorus data submitted since 2019 are more representative of current operations, and the LCA is also equal to the 30-day P_{99} of 512 samples collected from October 2019 through August 2024.

N. **Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.**
The variance limit is typically set at the concentration the permittee is able to meet without investing in additional "temporary" treatment. The calculated 30-day P_{99} using the data from October 2019 through August 2024 is equal to the current interim limit of 4.8 mg/L. Therefore, the current interim limit of 4.8 mg/L should remain as the variance limit.

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**

Roxbury has been successful in reducing effluent phosphorus concentrations during the five years of the permit term through optimization to the greatest extent possible without upgrading the treatment plant. It is believed that Roxbury can maintain these successes but additional optimization such as chemical addition is not economically feasible. The recirculating sand filters minimally treat effluent total phosphorus. Roxbury evaluated other systems including disk filtration and ultrafiltration. However, these technologies are not cost-effective for the Sanitary District, as all major upgrades would increase the user rates to >2% of the median household income (MHI).

Given the long-term effects of phosphorus pollution, an interim monthly average limit of 4.8 mg/L is recommended along with implementation of the phosphorus Pollutant Minimization Program (PMP) plan and continued exploration of potential economically feasible phosphorus compliance options.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Dane

B. Receiving waterbody at discharge point: Roxbury Creek

C. Flows into which stream/river? Wisconsin River **How many miles downstream?** 4 miles

D. Coordinates of discharge point (UTM or Lat/Long): Lat: 43.25512º N / Long: 89.68092º W

E. What are the designated uses associated with this waterbody?
Warm Water Sport Fish (WWSF), non-public water supply

F. Describe downstream waters:
The Surface Water Integrated Monitoring System (SWIMS) database was searched for phosphorus data on Roxbury Creek taken in the last 10 years (2015-2025). A total of 4 applicable in-stream phosphorus results which meet the criteria in ch. NR 217, Wis. Adm. Code, were available. The median of these samples is 0.166 mg/L. Consistent with the fact that Roxbury Creek is listed as impaired for phosphorus at the point of discharge and the phosphorus concentrations in Roxbury Creek exceed criteria, no assimilative capacity is available at the point of discharge. Approximately four miles downstream of the outfall location, Roxbury Creek empties into the Wisconsin River.

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?
~ 4 miles

H. Provide the equation used to calculate that distance.
N/A – Roxbury Creek is on the 303(d) list as impaired for phosphorus; however, the downstream receiving water, Wisconsin River, is an Exceptional Resource Water (ERW) and not currently impaired for phosphorus at the confluence. Additionally, available data for the Wisconsin River demonstrates that the in-stream phosphorus concentrations both upstream and downstream of the confluence are below criteria (0.1 mg/L).

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: None.

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.
See attached map (Roxbury WWTF - Current Outfall Variances).

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
Roxbury Creek (0-4)	Total Phosphorus	Degraded Biological Community

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.
N/A

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: June 26, 2025 **Date of hearing:** August 11, 2025

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: N/A

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: Warm Water Sport Fish (WWSF)

B. Applicable criteria affected by variance: 0.075 mg/L

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:
Roxbury Creek was assessed during the 2018 listing cycle; available information indicates at least one designated use is not met and a TMDL is needed. Phosphorus PMPs will help ensure that further degradation of the environment will not occur with this variance. Continued phosphorus reduction measures will be implemented to improve water quality and minimize environmental impacts.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:
The following list contains the Federally Endangered and Threatened Species in Dane County, Wisconsin, from U.S. Fish & Wildlife Service, Region 3, March 2025.

BIRDS
Piping Clover (E)
CLAMS
Higgins Eye (E)
Sheepnose Mussel (E)
Snuffbox Mussel (E)
Spectaclecase (mussel) (E)
Winged Mapleleaf (E)
MAMMALS
Indiana bat (E)
Norther Long-eared Bat (E)
REPTILES
Eastern Massasauga (T)
SNAILS
Iowa Pleistocene snail (E)
INSECTS
Hine's emerald dragonfly (E)
Karner Blue Butterfly (E)
Poweshiek skipperling (E)
Rusty Patched Bumble Bee (E)
FLOWERING PLANTS
Dwarf lake iris (T)
Eastern prairie fringed orchid (T)
Fassett's locoweed (T)
Mead's Milkweed (T)
Northern wild monkswood (T)
Pitcher's thistle (T)

Prairie Bush Clover (T)

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technologies (treatment processes):
Phosphorus is currently removed from the wastewater through the settling of phosphorus containing solids in the septic tanks. The recirculating sand filters minimally treat effluent phosphorus.

Treatment consists of primary settling using two trains of septic tanks followed by a dosing chamber that flows to a combination of any of the four bed recirculating sand filters. Much of the effluent from the recirculating sand filter beds is returned to the dosing chamber and is re-applied to the sand filter beds. The flow that is not returned to the sand filter beds is discharged to the east bank of Roxbury Creek.

B. What modifications would be necessary to comply with the current limits? List additional treatment processes and/or technologies available. Include any citations.
Phosphorus chemical addition, potentially combined with additional solids removal steps in the treatment train, or some tertiary filtration or polishing technology prior to discharge.

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**

The Sanitary District investigated adding chemical to treat for phosphorus, however due to the flocs formed during chemical addition they risked clogging the sand filters and it would not result in effluent meeting the final WQBELs. The Sanitary District has also evaluated other systems including disk filtration and ultrafiltration. However, these technologies are not cost-effective and would result in user rates exceeding 2% of the MHI. The Sanitary District will continue to investigate potential phosphorus treatment technologies. Traditional (chemical and biological) phosphorus treatments and other compliance measures (water quality trading and adaptive management) are also economically infeasible to implement at this time. The current treatment facility has deficiencies that need to be addressed in order to maintain current operations. These projects alone will increase user rates to >2% of the MHI.

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

Technology options, plant upgrades, water quality trading, and adaptive management are economically infeasible at this time (see updated Compliance Alternatives Plan).

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

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:
The Sanitary District considered mechanical alternatives including spray irrigation, disk filtration and ultrafiltration, and proprietary media filters, as well as nonpoint alternatives including water quality trading and adaptive management. All the considered compliance options were rejected because the costs would increase user rates above 2% of the MHI.

Citation: Wastewater Facilities Plan: 4th Year Report, dated June 2018, MSA Professional Services, Inc.

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

Economic Factor		Source
MHI	$70,625	http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml
Calculated preliminary screener	3.44%	Updated Facility Compliance Alternatives Plan (FCAP)
Secondary score value	0	MDV Guidance – Appendix 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: 0

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: Roxbury Sanitary District #1 does not qualify for the MDV because they are in a county that is not eligible; additionally, Roxbury is unable to meet the MDV interim limits.

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.

In 2019 and 2020 the Sanitary District completed the planning, design, and construction of a collection system upgrade within the Sanitary District to reduce inflow and infiltration (I/I) throughout the system and in turn, reduced the amount of flow to the WWTF. The reduction of influent flow has resulted in a decrease in effluent phosphorus loadings (lbs/year).

Throughout 2022, the Sanitary District continued its Fats, Oils, and Grease (FOG) and Recirculating Sand Filter (RSF) maintenance programs aimed at controlling effluent phosphorus.

In 2022, the Sanitary District replaced their effluent filters as discussed in the PMP.

In 2024, the Sanitary District installed a different style effluent filter with the intent of improved maintenance capabilities.

Water Quality Trading (WQT) was also evaluated throughout the permit term. MSA, on behalf of Roxbury, conducted a phone call with representatives of Dane County Land Conservation Department in 2022 and 2023 to discuss the types of WQT projects the County is currently working on in upcoming years or is planning to implement near the Roxbury Sanitary District.

Although not originally in the PMP, a long-term pilot study for chemical phosphorus removal pilot test is in progress following approval by the DNR in March of 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.

As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation (b) implement the phosphorus pollutant minimization measures specified in the Pollutant Minimization Program (PMP) Plan dated June 2025, and (c) perform the actions listed in the schedule section of the permit.

The PMP Plan proposes the following actions:

1. Economic Evaluations
    a. Evaluate budget annually for potential increases to accommodate non-point actions and phosphorus compliance at the outfall.

i. Evaluate sewer user rates and other revenues to determine financial sustainability and the need for additional revenue.
ii. Provide documentation of the annual budget review and results of the evaluation.
iii. Investigate annually other sources of funding for compliance, including grants, loans, or other private funding.
iv. Provide documentation of the investigation results.

b. If seeking an additional variance term, with the year 5 report, re-evaluate eligibility using an updated MHI from the most recent census.

2. Wastewater Treatment Facility Upgrades
   a. Continue to assess the need for sand filter media rehabilitation or replacement that was postponed in the previous permit term.
   b. Implement Long Term Pilot for chemical phosphorus removal using rare earth chemical.
      i. Report on the effectiveness of phosphorus chemical addition as observed during the pilot period.
   c. Investigate filter technologies for improved phosphorus removal.
      i. Provide the investigation results.
      ii. Evaluate the feasibility of the investigated technologies on a cost and performance basis.
   d. Implement chosen phosphorus upgrade based on feasibility evaluation.
3. Non-point Reductions
   - Engage annually with the surrounding community to educate nonpoint contributors (including farmers, landowners, or other identified stakeholders) on nutrient loss reduction strategies. Engagement may be completed by the District or with assistance from local county groups.
   - Provide documentation of community engagement activities.
   - Contact WI Water Quality Trading Clearinghouse and evaluate potential partners for nonpoint source phosphorus reduction projects.
   - In addition to the Clearinghouse, the District shall engage local partners in pursuit of trading opportunities.
   - Provide documentation of these communications with conclusions identified, including the feasibility of trades.
   - Provide WQT Plan to the Department.*
   - Upon approval, implement the WQT Plan.*

   *The completion, submittal, and implementation of a Water Quality Trading Plan is contingent upon the feasible opportunities available to the District, as discussed earlier in this document.
4. Continue Standard Operating Procedure (SOP)
5. Collection System Rehabilitation
   a. Provide updated Sanitary Sewer Evaluation Study (SSES).
   b. Perform the actions identified in the updated SSES.

Citation: Section 2.2.1.4 of the proposed permit and the Roxbury SD #1 PMP Plan dated June 2025

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

A. Date of previous submittal: July 29, 2019 **Date of EPA Approval:** September 19, 2019

B. Previous Permit #: WI-0028975-09-0 **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: 4.8 mg/L (Oct 2019 – Aug 2024) **Variance Limit:** 4.8 mg/L

D. Target Value(s): N/A **Achieved?** ☒ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in

See "Roxbury Annual PMP Report 2024" for details on the incomplete previous PMP items.

Condition of Previous Variance	Compliance
1.a. Evaluate WQT – Contact/coordinate with DNR & County	☒ **Yes** ☐ **No**
1.b. Evaluate WQT – Evaluate User Rates to allocate budget towards non-point BMPs	☒ **Yes** ☐ **No**
2.a. SOP – Develop SOP	☒ **Yes** ☐ **No**
2.b. SOP – Implement SOP	☒ **Yes** ☐ **No**
3.a. Collection System Rehabilitation – SSES	☒ **Yes** ☐ **No**

3.a. Collection System Rehabilitation – Implement actions from SSES	☒ **Yes** ☐ **No**
4.a. WWTF Upgrades – install non-potable well	☐ **Yes** ☒ **No**
4.b. WWTF Upgrades – replace septic tank effluent filters	☐ **Yes** ☒ **No**
4.c. WWTF Upgrades – replace RSF fine media	☐ **Yes** ☒ **No**
4.d. WWTF Upgrades – septic tank improvements (baffling, tank repair, splitter box)	☐ **Yes** ☒ **No**

Action Items

1) Economic Evaluations
   a) The District completes an annual review of their budget each fall with formal approval in November. The budget will be evaluated annually for potential increases to accommodate non-point actions and phosphorus compliance at the outfall.
      i) Evaluate sewer user rates and other revenues to determine financial sustainability and the need for additional revenue
      ii) Provide documentation of the annual budget review and results of the evaluation.
      iii) Investigate annually other sources of funding for compliance, including grants, loans, or other private funding.
      iv) Provide documentation of the investigation results
   b) If seeking an additional variance term, with the year 5 report, re-evaluate eligibility using an updated MHI from the most recent census.

2) Non-point reductions
   a) Engage annually with the surrounding community to educate nonpoint contributors (including farmers, landowners, or other identified stakeholders) on nutrient loss reduction strategies. Engagement may be completed by the District or with assistance from local county groups.
   b) Provide documentation of community engagement activities.
   c) Contact WI Water Quality Trading Clearinghouse and evaluate potential partners for nonpoint source phosphorus reduction projects.
   d) In addition to the Clearinghouse, the District shall engage local partners in pursuit of trading opportunities.
   e) Provide documentation of these communications with conclusions identified.
   f) If potential trade projects are identified, Roxbury will provide a WQT Plan and NOI to the Department.
   g) Upon approval, Roxbury will implement the WQT Plan.
   h) The District is intent to pursue Water Quality Trading Credits for implementation to offset the stringent effluent Phosphorus level.
   i) If insufficient trades are available, the Economic Variance may still be applicable.

3) Wastewater Treatment Facility Upgrades
   a) Continue to assess the need for sand filter media rehabilitation or replacement that was postponed in the previous permit term.
   b) Implement Long Term Pilot for chemical phosphorus removal using rare earth chemical. Conditional approval for pilot study was provided by the DNR in March 2024, valid for two years.
      i) Report on the effectiveness of phosphorus chemical addition as observed during the pilot period.
   c) Investigate filter technologies for improved phosphorus removal.
      i) Provide the investigation results
      ii) Evaluate the feasibility of the investigated technologies on a cost and performance basis.
   d) Implement chosen phosphorus upgrade based on feasibility evaluation

4) Continue Standard Operating Procedure (SOP)
   The District will continue the Standard Operating Procedures developed in the previous permit term for properly maintaining the main lift station and wastewater treatment facility. The SOP will included following operational changes. These changes have been implemented in the past permit term and are referenced below.
   a) The District will annually remove Fats, Oils, and Grease (FOG) from the main lift station, and requires proof of grease trap cleaning by the major restaurants within the District on a quarterly basis. This helps minimize FOG on the RSF beds and maximize treatment performance.
   b) Remove vegetation from RSF beds to minimize ponding.
   c) Rake/Till RSF beds if vegetation becomes excessive.
   d) Annual solids removal and cleaning of influent septic tanks. Regular removal of primary solids will prevent solids carryover to the RSF beds.

e) Regular cleaning and flushing of distribution piping on RSF beds to prevent plugging of piping.
f) Operational adjustments in response to changes in flows & temperature by adjusting the number of filter beds online and adjusting recycle ratios.
g) Provide continual visual inspection of RSF beds. Visual inspection to include frequency of ponding at bed(s) surface and for presence of solids.

5) Collection System Rehabilitation
Continued minimization of I/I will have the greatest benefit to the performance of the WWTF.
a) District will provide an update on the 2018 Sanitary Sewer Evaluation Study (SSES) to identify and prioritize defects in manholes, sewer main, and laterals.
b) Perform the actions identified in the updated SSES to correct the defects.

Action Items	Year 1	Year 2	Year 3	Year 4	Year 5
1. Economic Evaluations					
a) Evaluate budget annually for potential increases to accommodate non-point actions and phosphorus compliance at the outfall.		X	X	X	X
i) Evaluate sewer user rates and other revenues to determine financial sustainability and the need for additional revenue		X	X	X	X
ii) Provide documentation of the annual budget review and results of the evaluation.		X	X	X	X
iii) Investigate annually other sources of funding for compliance, including grants, loans, or other private funding.		X	X	X	X
iv) Provide documentation of the investigation results		X	X	X	X
b) If seeking an additional variance term, with the year 5 report, re-evaluate eligibility using an updated MHI from the most recent census.					X

2. Wastewater Treatment Facility Upgrades					
a) Continue to assess the need for sand filter media rehabilitation or replacement that was postponed in the previous permit term.	X	X	X	X	X
b) Implement Long Term Pilot for chemical phosphorus removal using rare earth chemical.	X	X			
i) Report on the effectiveness of phosphorus chemical addition as observed during the pilot period.			X		
c) Investigate filter technologies for improved phosphorus removal.		X	X		
i) Provide the investigation results			X		
ii) Evaluate the feasibility of the investigated technologies on a cost and performance basis.			X		
d) Implement chosen phosphorus upgrade based on feasibility evaluation				X	X

3. Non-point Reductions					
Engage annually with the surrounding community to educate nonpoint contributors (including farmers, landowners, or other identified stakeholders) on nutrient loss reduction strategies. Engagement may be			X	X	X

completed by the District or with assistance from local county groups.					
Provide documentation of community engagement activities.			X	X	X
Contact WI Water Quality Trading Clearinghouse and evaluate potential partners for nonpoint source phosphorus reduction projects.	X	X	X		
In addition to the Clearinghouse, the District shall engage local partners in pursuit of trading opportunities.	X	X	X		
Provide documentation of these communications with conclusions identified, including the feasibility of trades.	X	X	X		
Provide WQT Plan to the Department*			X		
Upon approval, implement the WQT Plan*			X	X	X

4. Continue Standard Operating Procedure (SOP)	X	X	X	X	X

5. Collection System Rehabilitation					
a) Provide updated SSES	X	X			
b) Perform the actions identified in the updated SSES			X	X	X

*The completion, submittal, and implementation of a Water Quality Trading Plan is contingent upon the feasible opportunities available to the District, as discussed earlier in this document.