

# Permit Fact Sheet

## General Information

Permit Number:	WI-0049964-05-0
Permittee Name:	Fish, Crystal and Mud Lake Rehabilitation District
Address:	W12367 Padley Road
City/State/Zip:	Lodi WI 53555
Discharge Location:	See facility description
Receiving Water:	From Crystal Lake to Roxbury Creek and from Fish Lake to the Wisconsin River – Roxbury Creek Watershed (LW18) in Dane County
StreamFlow (Q <sub>7,10</sub> ):	Roxbury Creek – 0.03 cfs, Wisconsin River – 2200 cfs
Stream Classification:	Both are Warm Water Sport Fish community and the Wisconsin River is an Exceptional Resource Water.
Discharge Type:	Existing, Intermittent

## Facility Description

Fish, Crystal, and Mud Lake Rehabilitation District operates one pump to lower the water level to the Ordinary High-Water Mark (OHWM) in Crystal Lake. The Fish Lake pump system has been underwater since 2019 and is currently inoperable. The Lake District Board has no current plans for Fish and Mud Lake but is looking into other alternatives. The intake pump for Fish Lake is located at Dane County Fish Lake Park and used to pump approximately 540 gallons per minute (gpm) into a wet well and discharge 2.5 miles away to an outfall (Outfall 001) on the east bank of the Wisconsin River. Discharge from Fish Lake occurred intermittently from October through June. The intake pump for Crystal Lake is approximately 850 feet east of the Mussen and Crystal Road intersection. The intake structure consists of a collection area filled with stone which drain into a 12-inch pipe. The pipe collects the lake water in a wet well, the lake water is then pumped through a forcemain to the outfall. The outfall (Outfall 002) is located 2.7 miles away at Roxbury Creek, about 1,200 feet east of County Highway Y. The pump for Crystal Lake was replaced in March 2024, the pump capacity is approximately 1,000 gpm. Discharge from Crystal Lake occurs intermittently until the lake reaches the OHWM.

## Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, compliance schedule items, and a site visit on May 4, 2023, this facility has been found to be in substantial compliance with their current permit.

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
001	0.75 MGD (Average October 2018 – September 2019)	Drawdown discharge from Fish Lake in Dane County to the Wisconsin River via 2.5 miles of piping. Samples may be taken from the pipeline tap after the pump, prior to the outfall structure on the river.
004	1.2 MGD (Average October 2018 – January 2024)	Drawdown discharge from Crystal Lake in Dane County to Roxbury Creek. Samples of the Crystal Lake water effluent shall be collected from the pipeline tap after the pump or at the outfall prior to mixing with Roxbury Creek. Flow is measured by a mechanical

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
		propeller meter located in the pump house.

## 1 Surface Water - Monitoring and Limitations

### Sample Point Number: 001- Fish Lake Drawdown

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate	Daily Max	1.5 MGD	Daily	Calculated	
Water Level	Daily Min	858.7 feet MSL	Monthly	Gauge Station	See section 'Pumping Shall Cease When Lake Level Reached OHWM.'
BOD5, Total	Weekly Avg	20 mg/L	Monthly	Grab	Effective October through June each year.
BOD5, Total	Weekly Avg	20 mg/L	1/ 2 Weeks	Grab	Effective July through September each year.
Suspended Solids, Total	Weekly Avg	40 mg/L	Monthly	Grab	Effective October through June each year.
Suspended Solids, Total	Weekly Avg	40 mg/L	1/ 2 Weeks	Grab	Effective July through September each year.
Dissolved Oxygen	Daily Min	7.0 mg/L	Monthly	Grab	Effective October through June each year.
Dissolved Oxygen	Daily Min	7.0 mg/L	1/ 2 Weeks	Grab	Effective July through September each year.
pH Field	Daily Max	9.0 su	Monthly	Grab	
pH Field	Daily Min	6.0 su	Monthly	Grab	
Phosphorus, Total		mg/L	Monthly	Grab	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	Grab	

### Changes from Previous Permit

Discharge has not occurred at this outfall since 2019.

**Flow:** The total monthly reporting of flow rate has been removed.

### Explanation of Limits and Monitoring Requirements

Please refer to the Water Quality Based Effluent Limits memo for the Fish, Crystal, and Mud Lake Rehabilitation District prepared by Sarah Luck, dated April 2, 2024, and used for this reissuance.

**BOD<sub>5</sub>, Total Suspended Solids (TSS), pH, and Dissolved Oxygen (DO):** No changes are recommended in the permit limitations for BOD<sub>5</sub>, TSS, pH, and DO. Because the water quality criteria, 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.

**Water Level:** Pump operations must cease if the lake level is below the OHWM of 858.70 feet MSL.

**Phosphorus:** To determine reasonable potential at the next permit reissuance, monitoring shall occur if discharge occurs.

**Ammonia:** To determine reasonable potential at the next permit reissuance, monitoring shall occur if discharge occurs.

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

### Sample Point Number: 004- Crystal Lake Drawdown

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate	Daily Max	1.5 MGD	Daily	Calculated	
Water Level	Daily Min	868.22 feet MSL	Monthly	Gauge Station	
WLA Previous Day River Flow		cfs	Weekly	Gauge Station	Stream flow for Roxbury Creek receiving water.
BOD <sub>5</sub> , Total		mg/L	Weekly	Grab	Effective May through September.
BOD <sub>5</sub> , Total	Weekly Avg - Variable	mg/L	Weekly	Grab	Effective May through September until 2026. Report the BOD concentration result (mg/L) in the BOD <sub>5</sub> , Total column of the eDMR. See Table 1.
BOD <sub>5</sub> , Total	Weekly Avg - Variable	lbs/day	Weekly	Grab	Effective May through September starting in 2026. Report the BOD mass result (lbs/day) in the BOD <sub>5</sub> , Total column of the eDMR. See Table 3.
BOD <sub>5</sub> , Variable Limit		mg/L	Weekly	See Table	Effective May through September until 2026. Look up the variable BOD <sub>5</sub> limit

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
					from Table 1. and report the variable limit in the BOD <sub>5</sub> Variable Limit column on the eDMR.
BOD <sub>5</sub> , Variable Limit		lbs/day	Weekly	See Table	Effective May through September starting 2026. Look up the variable BOD <sub>5</sub> limit from Table 3. and report the variable limit in the BOD <sub>5</sub> Variable Limit column on the eDMR.
BOD <sub>5</sub> , Total		mg/L	Monthly	Grab	Effective October through April.
BOD <sub>5</sub> , Total	Weekly Avg - Variable	mg/L	Monthly	Grab	Effective October through April each year. Report the BOD concentration result (mg/L) in the BOD <sub>5</sub> , Total column of the eDMR. See Table 2.
BOD <sub>5</sub> , Variable Limit		mg/L	Monthly	See Table	Effective October through April. Look up the variable BOD <sub>5</sub> limit from Table 2. and report the variable limit in the BOD <sub>5</sub> Variable Limit column on the eDMR.
Suspended Solids, Total	Weekly Avg	13 mg/L	Monthly	Grab	Effective October through April each year.
Suspended Solids, Total	Weekly Avg	13 mg/L	Weekly	Grab	Effective May through September each year.
Temperature Maximum		deg F	3/Week	Estimated	Reporting of INFOS gauge data is only required August through September in 2024.
Temperature Maximum		deg F	Daily	Continuous	Continuous monitoring is required starting 05/01/2025.
Temperature Maximum	Daily Max	82 deg F	Daily	Continuous	Effective September.
Temperature Maximum	Weekly Avg	73 deg F	Daily	Continuous	Effective September.

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Temperature Maximum	Weekly Avg	65 deg F	Daily	Continuous	Effective May.
Dissolved Oxygen	Daily Min	8.0 mg/L	Monthly	Grab	Effective October through April.
Dissolved Oxygen	Daily Min	8.0 mg/L	Weekly	Grab	Effective May through September.
pH Field	Daily Max	9.0 su	Monthly	Grab	
pH Field	Daily Min	6.0 su	Monthly	Grab	
Phosphorus, Total	Monthly Avg	0.225 mg/L	Monthly	Grab	Effective October through April.
Phosphorus, Total	6-Month Avg	0.075 mg/L	Monthly	Grab	Effective October through April.
Phosphorus, Total	Monthly Avg	0.225 mg/L	2/Month	Grab	Effective May through September.
Phosphorus, Total	6-Month Avg	0.95 lbs/day	1/ 6 Months	Calculated	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	Grab	Monitoring year-round in 2028.

### Changes from Previous Permit

**Flow:** The total monthly reporting of flow rate has been removed.

**BOD<sub>5</sub>:** Interim concentration limits for the months of May through September have been included.

**Temperature:** The monitoring frequency and type for August through September of 2024 is 3/Week and Measure because the permittee is reporting INFOS gauge data. With the installation of a representative temperature probe in accordance with the compliance schedule, the monitoring frequency and type have changed to daily and continuous, respectively, for eDMR reporting purposes. There are limits for the months of May and September. Continuous monitoring is required starting May 01, 2025.

### Explanation of Limits and Monitoring Requirements

Please refer to the Water Quality Based Effluent Limits memo for the Fish, Crystal, and Mud Lake Rehabilitation District prepared by Sarah Luck, dated April 2, 2024, and used for this reissuance.

**BOD<sub>5</sub>, Total Suspended Solids (TSS), pH, and Dissolved Oxygen (DO):** No changes are recommended in the permit limitations for BOD<sub>5</sub>, TSS, pH, and DO. Because the water quality criteria, 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.

**BOD<sub>5</sub> Interim Concentration and Mass Limits and WLA Previous Day River Flow:** Installation of equipment to accurately measure flow in Roxbury Creek is required prior to use of the BOD<sub>5</sub> Mass Variable Limits, to ensure the waste load allocation BOD limits are met. Concentration limits are effective upon permit reissuance and will remain in effect until flow in Roxbury Creek can be accurately measured. Stream flow monitoring for Roxbury Creek is needed to collect the flow value for the creek to determine the BOD<sub>5</sub> Mass Variable Limit for the discharge.

**Water Level:** Pump operations must cease if the lake level is below the OHWM of 868.22 feet MSL.

**Thermal:** Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. Thermal discharges must meet the Public Health criterion of 120 degrees F and the Fish & Aquatic Life criteria which are established to protect aquatic communities from lethal and sub-lethal thermal effects. Reasonable potential was shown for a weekly average temperature limit in May, and daily maximum and weekly average limits are required in September since there is no data available, in accordance with s. NR 106.56(12), Wis. Adm. Code. During permit fact check, it was stated by the permittee that previously collected temperature data is not believed to be representative of the effluent discharged to Roxbury Creek since it is collected near the water surface of Crystal Lake. After installation of the new temperature monitoring probe, continuous monitoring is required.

**Phosphorus:** Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. WQBELs for phosphorus are needed whenever the discharge contains phosphorus at concentrations or loadings that will cause or contribute to an exceedance of the water quality standards.

For the reasons explained in the April 30, 2012 paper entitled ‘Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin’, WDNR has determined that it is impracticable to express the phosphorus WQBEL for the permittee as a maximum daily, weekly or monthly values. The final effluent limit for phosphorus is expressed as a six-month average. It is also expressed as a monthly average equal to three times the derived WQBEL. This final effluent limit was derived from and complies with the applicable water quality criterion.

The WQBELs for phosphorus are already in effect and will be retained to prevent backsliding.

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

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

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

## 2 Schedules

### 2.1 Roxbury Creek Stream Flow Measurements

A gauge station shall be installed to measure the stream flow values prior to using the May through September BOD Mass Limits.

Required Action	Due Date
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<b>Install Gauge Station:</b> Work with USGS to arrange for installation of the gauge station. The gauge station shall be installed in a location that will accurately measure the representative flow of Roxbury Creek. The gauge station installation shall be completed by the Due Date and the department will be notified upon completion.	04/30/2025
<b>Initiate Gauge Station Calibration Measurements:</b> A total of seven baseflow measurements shall be taken every 2-3 weeks during May through September of 2025. These baseflow measurements shall be used to calibrate the gauge station. Notify the department when the first baseflow measurement has been taken.	05/01/2025
<b>Report Data:</b> Submit to the department a summary of the data collected and a description of the project.	10/31/2025
<b>Limits Effective:</b> BOD <sub>5</sub> concentration limits are effective until department approval for the use of BOD <sub>5</sub> mass limit is given.	05/01/2026

### Explanation of Schedule

The Fish, Mud and Crystal Lake Rehabilitation District (FMCL) requested loading limits for BOD based on the stream flow of Roxbury Creek during the previous permit term for the months of May through September for the discharge of excess waters from Crystal Lake to Roxbury Creek via pipeline. The Roxbury Creek Stream Flow Measurements compliance schedule in the previous permit was not completed; the WLA Previous Day River Flow for Roxbury Creek (cfs) was estimated and the BOD<sub>5</sub>, Variable Limit was incorrectly used. Installation of equipment to accurately measure flow in Roxbury Creek is required prior to use of the BOD<sub>5</sub> Mass Variable Limits, to ensure the waste load allocation BOD limits are met.

## 2.2 Outfall 004 Temperature Probe Installation

Required Action	Due Date
<b>Temperature Probe Plans and Specifications Submittal:</b> The permittee shall submit plans and specifications for department approval for the installation of a temperature probe in accordance with ch. NR 108, Wis. Adm. Code. The temperature probe should be installed at a location representative of the discharge from Outfall 004 in accordance with ss. NR 218.07 and 218.11, Wis. Adm. Code. This submittal shall include a signed Wastewater Systems Approval Request form (3400-205), information about the chosen temperature probe, and the proposed location.	12/31/2024
<b>Complete Temperature Probe Installation:</b> The permittee shall complete installation of the temperature probe and submit proof of installation to the department by the Due Date.	04/30/2025

### Explanation of Schedule

During permit fact check, the permittee notified the department current and previously collected temperature data is not believed to be representative of the effluent discharged to Roxbury Creek since the Integrated Nowcast/Forecast Operation System for Yahara Lakes gauge is collected near the water surface of Crystal Lake.

## Special Reporting Requirements

None.

## Other Comments:

None.

## **Attachments:**

Water Quality Based Effluent Limits, dated April 2, 2024

## **Expiration Date:**

June 30, 2029

## **Justification Of Any Waivers From Permit Application Requirements**

Toxic monitoring was not required for either of the Fish Lake or Crystal Lake discharges since the discharges are water transfers from lakes and are not expected to contain toxics at levels of concern. The Rehabilitation District may once again be exempt from collecting samples for the next permit application.

**Prepared By:** BetsyJo Howe, Wastewater Specialist

**Date:** 5/29/2024

Updated (based on fact check comments): Editorial changes for clarity. Outfall 004 Temperature Probe Upgrade schedule included, along with continuous temperature monitoring after probe installation. 6/24/2024

Updated (based on public notice comments):



DATE: April 2, 2024

TO: BetsyJo Howe – SCR/Fitchburg

FROM: Sarah Luck – SCR/Fitchburg

SUBJECT: Water Quality-Based Effluent Limitations for the Fish, Crystal, and Mud Lake Rehabilitation District  
 WPDES Permit No. WI-0049964-05-0

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 Fish, Crystal, and Mud Lake Rehabilitation District in Dane County. The Rehabilitation District discharges to Roxbury Creek and the Wisconsin River via two outfalls, both located in the Roxbury Creek Watershed in the Lower Wisconsin River Basin. The Wisconsin River TMDL is upstream of the discharge locations and does not impact the 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:

**Outfall 001: Fish Lake Drawdown**

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate	1.5 MGD				1
BOD <sub>5</sub>			20 mg/L		1
TSS			40 mg/L		1
Dissolved Oxygen		7.0 mg/L			1
pH	9.0 s.u.	6.0 s.u.			1
Water Level		858.7 ft MSL			2
Phosphorus					3
Ammonia Nitrogen					3

Footnotes:

1. These limitations are not being evaluated as part of this review. Since 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. The daily flow limit is included to control mass discharged for BOD, TSS and phosphorus.
2. Pump operation must cease if the lake level is below the OHWM of 858.70 feet MSL.
3. Monitoring if discharge occurs.

**Outfall 004: Crystal Lake Drawdown**

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate	1.5 MGD					1
BOD <sub>5</sub>						2
TSS			13 mg/L			1
Dissolved Oxygen		8.0 mg/L				1
pH	9.0 s.u.	6.0 s.u.				1

Water Level		868.22 ft MSL				3
Phosphorus				0.225 mg/L	0.075 mg/L 0.95 lbs/day	-
Ammonia Nitrogen						4
Temperature						5
May	-		65°F			
September	82°F		73°F			

Footnotes:

1. These limitations are not being evaluated as part of this review. Since 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.
2. The table with mass limits requires the installation of equipment to accurately measure flow in Roxbury Creek to ensure that the wasteload allocations are being met.

For BOD Limits (mg/L) based on month of the discharge and daily flow

Daily Flow Limit	MGD	MGD	MGD	MGD	MGD	MGD	MGD	MGD	MGD
	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7
Month									
Jan	5.3	5.3	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Feb	5.2	5.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mar	4.9	4.9	4.9	6.0	6.0	6.0	6.0	6.0	6.0
Apr	4.2	4.2	5.0	6.0	6.0	6.0	6.0	6.0	6.0
May	Wasteload Allocation BOD Limits for May 1 to September 30 are based on the flow in Roxbury Creek and are expressed as lbs/day (table below).								
Jun									
Jul									
Aug									
Sep									
Oct	3.9	4.0	4.0	5.0	5.0	6.0	6.0	6.0	6.0
Nov	4.7	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Dec	5.2	5.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0

BOD<sub>5</sub> Limitations (lbs/day – weekly average limit – effluent DO of 8 mg/L):

Flow in Roxbury Creek (cfs)	Month				
	May	June	July	August	September
<0.99	42	36	34	35	40
1.00 - 1.49	59	51	48	50	57
1.50 - 1.99	65	56	53	55	63
2.00 - 2.49	71	61	58	60	69
2.50 - 2.99	77	66	63	65	74
3.00 - 3.49	83	72	68	70	80
3.50 - 3.99	89	77	73	75	86
4.00 - 4.49	95	82	77	80	92
4.50 - 4.99	101	87	82	85	97
5.00 - 5.49	107	92	87	90	103
5.50 - 5.99	113	97	92	95	109
6.00 - 6.49	119	102	97	100	114



**Water Quality-Based Effluent Limitations for  
Fish, Crystal, and Mud Lake Rehabilitation District**

**WPDES Permit No. WI-0049964-05-0**

**PART 1 – BACKGROUND INFORMATION**

**Facility Description**

Fish, Crystal, and Mud Lake Rehabilitation District operates one pump to lower the water level to the Ordinary High-Water Mark (OHWM) in Crystal Lake. The Fish Lake pump system has been underwater since 2019 and is currently inoperable. The Lake Districts Board has no current plans to operate it again but is looking into other alternatives. The pump for Fish Lake is located at Dane County Fish Lake Park and used to pump approximately 540 gallons per minute (gpm) into a wet well and discharge 2.5 miles away to an outfall on the east bank of the Wisconsin River. Discharge from Fish Lake occurred intermittently from October through June. The intake pump for Crystal Lake is approximately 850ft east of the Mussen and Crystal Lake Road intersection (43.28590° N 89.63022° W) and the outfall is located 2.7 miles away at Roxbury Creek, about 1200 feet east of County Highway Y (43.25146° N 89.65579° W). The pump was replaced the week of March 11, 2024 with a pump capacity of 1000 gpm or more. Discharge from Crystal Lake occurs intermittently until the lake reaches the OHWM.

Attachment #2 is a map of the area showing the approximate location of Outfalls 001 and 004.

**Existing Permit Limitations**

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

Outfall 001: Fish Lake Drawdown

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate	1.5 MGD				1
BOD <sub>5</sub>			20 mg/L		1
TSS			40 mg/L		1
Dissolved Oxygen		7.0 mg/L			1
pH	9.0 s.u.	6.0 s.u.			1
Water Level		858.7 ft MSL			2
Phosphorus					3
Ammonia Nitrogen					3

Footnotes:

1. These limitations are not being evaluated as part of this review. Since 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.
2. Pump operation must cease if the lake level is below the OHWM of 858.70 feet MSL.
3. Monitoring only.

Attachment #1

Outfall 004: Crystal Lake Drawdown

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate	1.5 MGD					1
BOD <sub>5</sub>						2
TSS			13 mg/L			1
Dissolved Oxygen		8.0 mg/L				1
pH	9.0 s.u.	6.0 s.u.				1
Water Level		868.22 ft MSL				3
Phosphorus				0.225 mg/L	0.075 mg/L 0.95 lbs/day	-
Ammonia Nitrogen						4
Temperature						5

Footnotes:

1. These limitations are not being evaluated as part of this review. Since 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.
2. The Rehabilitation District requested BOD limits from May to September be changed from concentration limits to mass limits based on stream flow in Roxbury Creek. An attached email in the Fact Sheet for WPDES permit WI 0049964-04-1 states USGS walked the creek and found a suitable location for a staff gauge on 5/16/2019. Permit section 2.1 includes the compliance schedule for installing a gauge in Roxbury Creek prior to using the May through September variable BOD limits. It appears the staff gauge was never installed and the WLA Previous Day River Flow for Roxbury Creek (cfs) has been estimated for eDMRs.

BOD Limits (mg/L) based on month of the discharge and daily flow:

Daily Flow Limit	MGD	MGD	MGD	MGD	MGD	MGD	MGD	MGD	MGD
	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7
Month									
Jan	5.3	5.3	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Feb	5.2	5.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mar	4.9	4.9	4.9	6.0	6.0	6.0	6.0	6.0	6.0
Apr	4.2	4.2	5.0	6.0	6.0	6.0	6.0	6.0	6.0
May	Wasteload Allocation BOD Limits for May 1 to September 30 are based on the flow in Roxbury Creek and are expressed as lbs/day (table below).								
Jun									
Jul									
Aug									
Sep									
Oct	3.9	4.0	4.0	5.0	5.0	6.0	6.0	6.0	6.0
Nov	4.7	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Dec	5.2	5.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0

Attachment #1

BOD<sub>5</sub> Limitations (lbs/day – weekly average limit – effluent DO of 8 mg/L):

Flow in Roxbury Creek (cfs)	Month				
	May	June	July	August	September
<0.99	42	36	34	35	40
1.00 - 1.49	59	51	48	50	57
1.50 - 1.99	65	56	53	55	63
2.00 - 2.49	71	61	58	60	69
2.50 - 2.99	77	66	63	65	74
3.00 - 3.49	83	72	68	70	80
3.50 - 3.99	89	77	73	75	86
4.00 - 4.49	95	82	77	80	92
4.50 - 4.99	101	87	82	85	97
5.00 - 5.49	107	92	87	90	103
5.50 - 5.99	113	97	92	95	109
6.00 - 6.49	119	102	97	100	114
6.50 and greater	125	107	102	105	120

3. Pump operation must cease if the lake level is below the OHWM of 868.22 feet MSL.
4. Monitoring only.
5. Temperature limits are as follows:

Month	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
MAY	65	83
JUN	76	84
JUL	81	85
AUG	81	84
SEP	73	82

**Receiving Water Information**

**Outfall 001 (Fish Lake drawdown)**

- Name: Wisconsin River
- Waterbody Identification Code (WBIC): 1179900
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q<sub>10</sub> and 7-Q<sub>2</sub> values are from USGS for the Wisconsin River at Prairie du Sac.
  - 7-Q<sub>10</sub> = 2200 cfs (cubic feet per second)
  - 7-Q<sub>2</sub> = 3200 cfs
  - 90-Q<sub>10</sub> = 2720 cfs
  - Harmonic Mean Flow = 4512 cfs
- Hardness = 111 mg/L as CaCO<sub>3</sub>. This value represents the alkalinity upstream of the Mud Lake

Outfall (SWIMS Station 10031437) collected in 2010.

- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Multiple dischargers: There are several other dischargers to the Wisconsin River. However, they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: The Wisconsin River is impaired for PCBs near the Fish Lake discharge. Fish Lake is listed as impaired for phosphorus; however, phosphorus lake criteria are lower than the phosphorus criterion for the Wisconsin River.

**Outfall 004 (Crystal Lake drawdown)**

- 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.
- Low Flow: The following 7-Q<sub>10</sub> and 7-Q<sub>2</sub> values are from USGS for Roxbury Creek were developed in June 2006.

7-Q<sub>10</sub> = 0.03 cfs (cubic feet per second)

7-Q<sub>2</sub> = 0.14 cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>7-Q<sub>10</sub> (cfs)</b>	0.05	0.04	0.08	0.15	0.09	0.05	0.05	0.04	0.05	0.06	0.07	0.05
<b>7-Q<sub>2</sub> (cfs)</b>	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 = 320 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of WET test results from Roxbury WWTF completed in 2021 and 2023 (n=3).
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Multiple dischargers: The Village of Roxbury Discharges approximately 1.5 miles downstream. Overlapping mixing zones are not considered since the pollutant load from Crystal Lake is very low. Additionally, under low flow conditions, the Crystal Lake discharge would provide more flow to assimilate the Village of Roxbury’s discharge than Roxbury Creek itself.
- Impaired water status: Roxbury Creek is impaired for total phosphorus approximately 1.3 miles downstream of the Crystal Lake discharge near the Roxbury WWTF discharge (stream mile 0.00-4.00) Crystal Lake is listed as impaired for phosphorus; however, phosphorus lake criteria are lower than the phosphorus criterion for Roxbury Creek.

**Effluent Information**

**Outfall 001 (Fish Lake drawdown)**

- Flow rate:  
 Flow limit = 1.5 MGD (Million Gallons per Day)  
 For reference, the actual average flow from October 2018 through September 2019 was 0.75 MGD.
- Hardness = 111 mg/L as CaCO<sub>3</sub>. This value represents what was reported on the 2018 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).
- Additives: None.

**Outfall 004 (Crystal Lake drawdown)**

- Flow rate:  
Annual average = 1.512 MGD (Million Gallons per Day). This was based upon a maximum pumping rate of 1050 gallons per minute from the previous pump. A new pump was installed in 2024 but is still being optimized. This flow rate may need to be updated in the future.  
For reference, the actual average flow from October 2018 through January 2024 was 1.2 MGD.
- Hardness = 157 mg/L as CaCO<sub>3</sub>. This value represents what was reported on the 2018 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).
- Additives: None.

The following table presents the average concentrations and loadings at Outfall 004 from October 2018 through January 2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

**Parameter Averages with Limits**

	Average Measurement	Average Mass Discharged
BOD <sub>5</sub>	2.68 mg/L*	18 lbs/day
TSS	7.7 mg/L	
pH field	7.1 s.u.	
Phosphorus	0.057 mg/L	0.50 lbs/day
Dissolved oxygen	10.86 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**

Toxics monitoring was not required for either of the Fish Lake or Crystal Lake discharges since the discharges are water transfers from lakes and are not expected to contain toxics at levels of concern to the Wisconsin River or Roxbury Creek. No further evaluation will be considered since there is no new data to evaluate.

It should be noted that application data was last collected in 2013 and will be 15 years old at the next permit reissuance. However, given that toxics are not expected to be at levels of concern from either discharge, the Rehabilitation District may once again be **exempt from collecting samples for the next permit application.**

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, **PFOS and PFOA monitoring is not recommended.** The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

**PART 3 – 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).

**No WET testing is recommended for either the Fish Lake or Crystal Lake discharges because of the low risk in effluent toxicity.**

#### **PART 4 – FISH LAKE WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BOD<sub>5</sub>, TSS, DISSOLVED OXYGEN, AND AMMONIA NITROGEN**

**No changes are recommended to the limits for BOD<sub>5</sub>, TSS, or dissolved oxygen** because there have been no changes in the effluent or the receiving water. Discharge has not occurred at this outfall since 2019.

**If discharge occurs at Outfall 001, ammonia nitrogen monitoring is recommended to determine reasonable potential at the next permit reissuance.**

#### **PART 5 – FISH LAKE PHOSPHORUS**

##### **Water Quality-Based Effluent Limits (WQBEL)**

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

Section NR 102.06(3)(a) specifically names reaches of rivers for which a phosphorus criterion of 0.1 mg/l applies. This applies to the Wisconsin River.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Q<sub>s</sub>), effluent flow rate (Q<sub>e</sub>), and upstream phosphorus concentrations (C<sub>s</sub>):

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

Where: WQC = 0.1 mg/L for the Wisconsin River

Q<sub>s</sub> = 100% of the 7-Q<sub>2</sub> of 3200 cfs

C<sub>s</sub> = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Q<sub>e</sub> = effluent flow rate = 1.5 MGD = 2.3 cfs

f = the fraction of effluent withdrawn from the receiving water (typically f = 0)

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

A review of all available in-stream total phosphorus data stored in the Surface Water Integrated Monitoring System database indicates the median background total phosphorus concentration in the Wisconsin River at Sauk City is 0.082 mg/L. No new data are available.

SWIMS Station ID	10029830
Primary Station Name	Wisconsin River -- Sauk City - Access Off Water Street
Waterbody Name	Wisconsin River
Number of Samples	49
First Sample Date	Jun 9, 2010
Last Sample Date	Oct 24, 2013
NR217 Rolling Median Total P (mg/L)	0.082

Substituting a median value of 0.082 mg/L into the limit calculation equation above would result in a calculated limit of 28.8 mg/L.

**Reasonable Potential Determination**

No new data have been collected for phosphorus since 2017 when no reasonable potential was shown. **If discharge occurs at Outfall 001, phosphorus monitoring is recommended to determine reasonable potential at the next permit reissuance.**

**PART 6 –FISH LAKE THERMAL**

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

**No thermal limits or monitoring are required at Outfall 001** since the maximum effluent limit would be 120°F since the Qs:Qe ration is greater than 20:1. One temperature result of 60°F, taken 5/15/2013, was reported on the permit application.

**PART 7 – CRYSTAL LAKE WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BOD<sub>5</sub>, TSS, AND DISSOLVED OXYGEN**

**No changes are recommended to the limits for BOD<sub>5</sub>, TSS, or dissolved oxygen** because there have been no changes in the effluent or the receiving water.

**PART 8 – CRYSTAL LAKE 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. Given the fact that the Crystal Lake discharge does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time.

**Daily Maximum Limits based on Acute Toxicity Criteria (ATC)**

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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:

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

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 58 sample results were reported from November 2018 through January 2024. The maximum reported value was 7.4 s.u. (Standard pH Units). The 1-day P<sub>99</sub>, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.6 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 7.5 s.u. Therefore, a value of 7.5 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 7.5 s.u. into the equation above yields an ATC = 19.9 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 the 1-Q<sub>10</sub> 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<sub>10</sub> (estimated as 80 % of 7-Q<sub>10</sub>) and the 2×ATC approach are shown below.

**Daily Maximum Ammonia Nitrogen Determination**

	Ammonia Nitrogen Limit mg/L
2×ATC	40
1-Q <sub>10</sub>	20

The 1-Q<sub>10</sub> method yields the most stringent limits for the Crystal Lake discharge.

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

Ammonia limits were last calculated August 9, 2013. At that time, the design flow used to calculate limits was 1.872 MGD; the design flow is now 1.512 MGD.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria in ch. NR 105, Wis. Adm. Code. The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warmwater Sport Fish Community is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

$$\text{CTC} = E \times \{ [0.0676 \div (1 + 10^{(7.688 - \text{pH})})] + [2.912 \div (1 + 10^{(\text{pH} - 7.688)})] \} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,  
 E = 0.854,

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C = the minimum of 2.85 or  $1.45 \times 10^{(0.028 \times (25 - T))}$  – (Early Life Stages Present), or  
 C =  $1.45 \times 10^{(0.028 \times (25 - T))}$  – (Early Life Stages Absent), and  
 T = the temperature (°C) of the receiving water – (Early Life Stages Present), or  
 T = the maximum of the actual temperature (°C) and 7 - (Early Life Stages Absent)

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 °C, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in Roxbury Creek, so “ELS Absent” criteria apply from October through March, and “ELS Present” criteria will apply from April through September for a warmwater sport fish classification.

Since minimal ambient data is available, the “default” basin assumed values are used for Temperature, pH and background ammonia concentrations, shown in the table below, with the resulting criteria and effluent limitations.

**Weekly and Monthly Ammonia Nitrogen Limits – WWSF**

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
<b>Effluent Flow</b>	Qe (MGD)	1.512	1.512	1.512
<b>Background Information</b>	7-Q <sub>10</sub> (cfs)	0.03	0.03	0.03
	7-Q <sub>2</sub> (cfs)	0.14	0.14	0.14
	Ammonia (mg/L)	0.06	0.06	0.12
	Temperature (°C)	17	23	3
	pH (s.u.)	8.21	8.21	7.97
	% of Flow used	100	100	25
	Reference Weekly Flow (cfs)	0.03	0.03	0.0075
	Reference Monthly Flow (cfs)	0.12	0.12	0.02975
	<b>Criteria mg/L</b>	4-day Chronic		
Early Life Stages Present		<b>3.76</b>	<b>2.55</b>	6.35
Early Life Stages Absent		3.76	2.55	<b>10.31</b>
30-day Chronic				
Early Life Stages Present		<b>1.50</b>	<b>1.02</b>	2.54
Early Life Stages Absent	1.50	1.02	<b>4.12</b>	
<b>Effluent Limitations mg/L</b>	Weekly Average			
	Early Life Stages Present	<b>3.81</b>	<b>2.59</b>	
	Early Life Stages Absent			<b>10.34</b>
	Monthly Average			
	Early Life Stages Present	<b>1.58</b>	<b>1.07</b>	
Early Life Stages Absent			<b>4.18</b>	

The WQBELs above are calculated using the full available assimilative capacity (AC) of the receiving water and would be considered to cause significant lowering of water quality (SLOWQ). In order to allow SLOWQ, an alternatives analysis would be required as described in s. NR 207.04(1)(d), Wis. Adm. Code, to show that there are no feasible treatment alternatives that would prevent SLOWQ.

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If this demonstration is not made, WQBELs should use one third of the available assimilative capacity (AC) to prevent SLOWQ. The following formula is used to calculate limits based on one third of the assimilative capacity.

$$\frac{1}{3} AC WQBEL = \frac{Full AC WQBEL - WQC}{3} + WQC$$

In conclusion, the following ammonia limitations would be recommended.

		April & May	June – Sept.	Oct. - March
Full AC WQBEL (mg/L)*	Daily Max	20	20	20
	Weekly Average	3.8	2.6	10
	Monthly Average	1.6	1.1	4.2
1/3 AC WQBEL (mg/L)	Daily Max	20	20	20
	Weekly Average	3.8	2.6	10
	Monthly Average	1.5	1.0	4.1

\*These limits only apply if a demonstration under s. NR 207.04(1)(d), Wis. Adm. Code is provided.

**Effluent Data**

The following table evaluates the statistics based upon ammonia data reported from 2017 and 2022, with those results being compared to the calculated 1/3 AC limits to determine the need to include ammonia limits in the Fish, Crystal, and Mud Lake Rehabilitation District permit for the respective month ranges. That need is determined by calculating 99<sup>th</sup> upper percentile (or P<sub>99</sub>) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

**Ammonia Nitrogen Effluent Data**

Sample Date	Ammonia Nitrogen mg/L	Sample Date	Ammonia Nitrogen mg/L
1/11/2017	0.072	1/5/2022	0.049
2/1/2017	0.037	2/2/2022	0.042
3/9/2017	0.053	3/16/2022	0.402
4/26/2017	0.056	4/20/2022	0.17
11/21/2017	0.06	5/11/2022	0.23
12/7/2017	0.05	11/22/2022	0.411
		12/7/2022	0.37
1-day P <sub>99</sub> = 0.73 mg/L			
4-day P <sub>99</sub> = 0.40 mg/L			
30-day P <sub>99</sub> = 0.23 mg/L			

Comparing the calculated 1/3 AC effluent limits to the reported ammonia data, there is no reasonable potential for the discharge to exceed the calculated effluent limits. Therefore, **no effluent limits for ammonia are recommended for the Crystal Lake Discharge. One year of monthly monitoring is recommend in the reissued permit.**

**PART 9 – CRYSTAL LAKE PHOSPHORUS**

**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<sub>2</sub> 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 = 1.512 MGD = 2.3 cfs

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

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall be calculated as a median using the procedures specified in s. NR 102.07(1)(b) to (c), Wis. Code. All representative data from the most recent 5 years shall be used, but data from the most recent 10 years may be used if representative of current conditions.

A previous evaluation in 2013 resulted in a WQBEL of 0.075 mg/L using a median in-stream 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. No data upstream of the discharge is available, but additional data from SWIMS Station #10031636 were considered in estimating the background phosphorus concentration.

Four additional data points, collected in 2018, stored in the Surface Water Integrated Monitoring System database, indicates the median background total phosphorus concentration in Roxbury Creek, located approximately 3.8 miles downstream of the outfall, is 0.166 mg/L.

SWIMS Station ID	10031636
Primary Station Name	Roxbury Creek at STH 78
Waterbody Name	Roxbury Creek
Number of Samples	4
First Sample Date	June 14, 2018
Last Sample Date	September 18, 2018
NR217 Rolling Median Total P (mg/L)	0.166

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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 QBEL 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 Rehabilitation District may opt to sample the receiving water upstream of the outfall to determine the background phosphorus concentration. The QBEL may be amended if background phosphorus stream data, collected during the period of May – October and with regards to other stipulations laid out in s. NR 217.13(2)(d), Wis. Adm. Code, is submitted to the department that shows the upstream concentration of total phosphorus is in fact less than the applicable criterion. For informational purposes only, the following table shows a range of limits based on possible background concentrations. This calculation is based on effluent flow 1.512 MGD and stream flow (7-Q<sub>2</sub>) of 0.14 cfs at the criterion of 0.075 mg/L in accordance with s. NR 217.13(2), Wis. Adm. Code.

**Total Phosphorus Background Concentrations & Limits**

Upstream 'Concentrations' (mg/L)	Corresponding P Limit (mg/L)
0.02	0.078
0.03	0.078
0.04	0.077
0.05	0.076
0.06	0.076
0.07	0.075
> = 0.075	0.075

**Effluent Data**

The following table summarizes effluent total phosphorus monitoring data from October 2018 through January 2024.

**Total Phosphorus Effluent Data**

	Phosphorus mg/L	Phosphorus Lbs/day
1-day P <sub>99</sub>	0.13	1.39
4-day P <sub>99</sub>	0.088	0.88
30-day P <sub>99</sub>	0.067	0.62
Mean	0.057	0.50
Std	0.02	0.26
Sample size	50	20
Range	0.021 - 0.13	0.051 - 1.11

**Reasonable Potential Determination**

The discharge does not have reasonable potential to cause or contribute to an exceedance of the water quality criterion because the 30-day P<sub>99</sub> of reported effluent total phosphorus data is less than the calculated QBEL. However, since a **QBEL is already in effect, the limit should be retained to prevent backsliding.**

**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 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 upstream of a phosphorus-impaired water. **This final mass limit shall be 0.075 mg/L × 8.34 × 1.512 MGD = 0.95 lbs/day expressed as a six-month average.**

**PART 10 – CRYSTAL LAKE THERMAL**

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

In accordance with s. NR 106.53(2)(b), 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), 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 of actual flow reported from October 2019 through January 2024.

The table below summarizes the maximum temperatures reported during monitoring from December 2013-March 2018, and May 2019 through August 2023; no data is available for September.

**Monthly Temperature Effluent Data & Limits**

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	39	39	49	76
FEB	39	41	50	76
MAR	42	42	52	77
APR	41	45	55	80
MAY	71	74	65	82
JUN	73	73	76	84
JUL	79	80	81	85
AUG	77	79	81	84
SEP	No data	No data	73	82



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Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
OCT	42	42	61	80
NOV	43	43	49	77
DEC	40	40	49	76

**Reasonable Potential**

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

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

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. In accordance with s. NR 106.56(12), Wis. Adm. Code, when representative effluent temperature data is not available at the time of permit reissuance, the proposed permit shall include effluent WQBELs for temperature. Based on this analysis, **a daily maximum temperature limit is needed for September and weekly average temperature maximum limits are needed for the months of May and September. Thermal monitoring is recommended for May through September.** The complete thermal table used for calculation can be found in Attachment #3.

The following general options are available for a facility to explore potential relief from the temperature limits:

- Effluent monitoring data: Verification or additional effluent monitoring (flow and/or temperature) may be appropriate if there were questions on the representativeness of the current effluent data.
- Mixing zone studies: A demonstration of rapid and complete mixing may allow for the use of a mixing zone other than the default 25%.
- Collection of site-specific ambient temperature: default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits but only if the site-specific temperatures are lower than the small stream defaults used in the above tables.

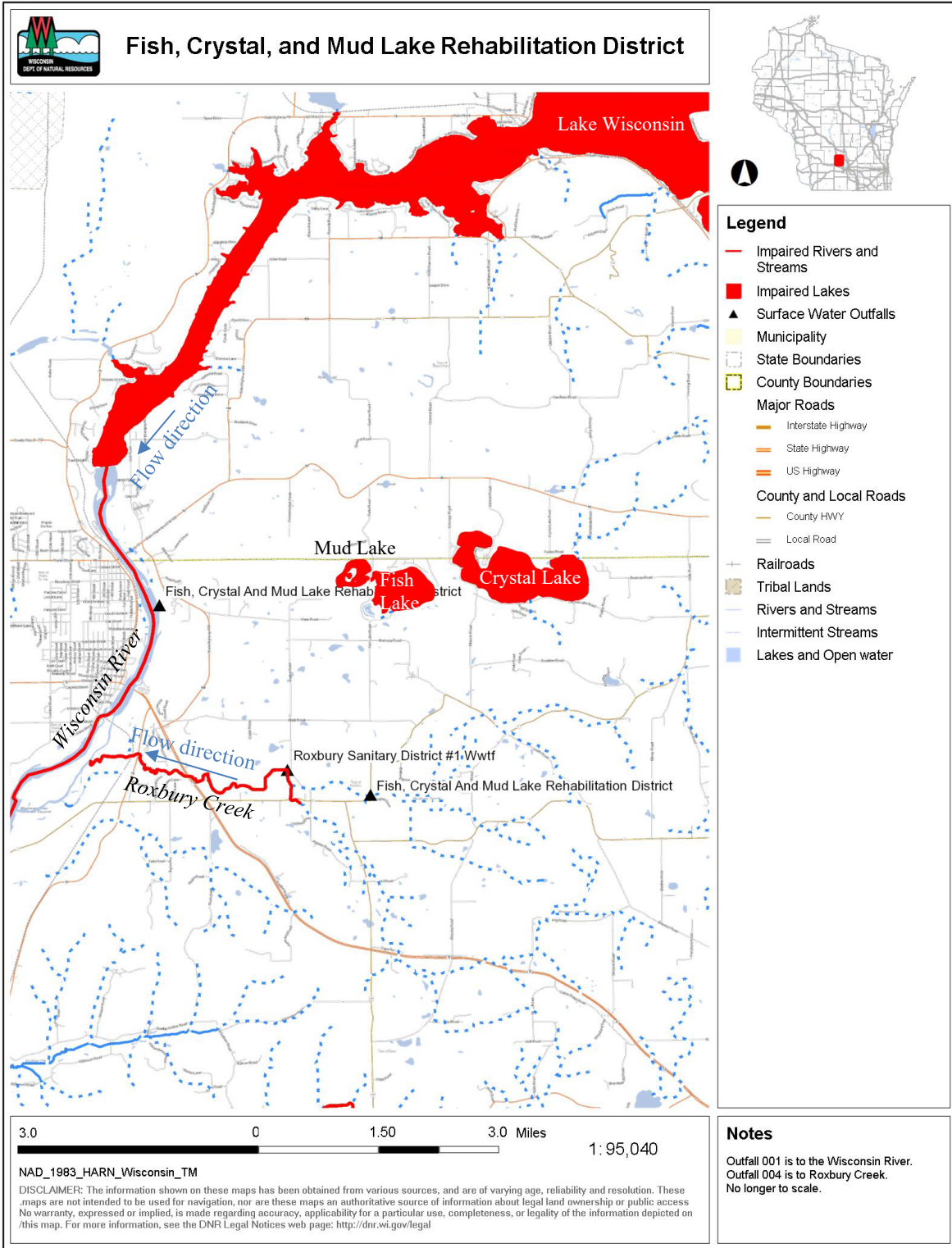
Attachment #1

- A variance to the water quality standard: This is typically considered to be the least preferable and most complex option as it requires the evaluation of the other alternatives.

These options are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*

<https://dnr.wisconsin.gov/topic/Wastewater/Thermal.html>.

Attachment #2  
Site Map



### Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

<b>Facility:</b>	Fish, Crystal, and Mud Lake Rehabilitation District	<b>7-Q<sub>10</sub>:</b>	0.03 cfs	<b>Temp Dates</b>	<b>Flow Dates</b>
<b>Outfall:</b>	004	<b>Dilution:</b>	25%	<b>Start:</b>	12/01/13*
<b>Date Prepared:</b>	3/1/2024	<b>f:</b>	0	<b>End:</b>	05/12/23
<b>Design Flow (Q<sub>e</sub>):</b>	1.512 MGD	<b>Stream type:</b>	Small warm water sport or forage fish		
<b>Storm Sewer Dist.</b>	0 ft	<b>Q<sub>s</sub>:Q<sub>e</sub> ratio:</b>	0.0 :1		
		<b>Calculation Needed?</b>	YES		

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)		7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)		Weekly Average (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	33	49	76	0.05	1.430	1.430	0	49	76	49	76
FEB	34	50	76	0.04	1.430	1.430	0	50	76	50	76
MAR	38	52	77	0.08	1.430	1.430	0	52	77	52	77
APR	48	55	79	0.15	1.340	1.340	0	55	80	55	80
MAY	58	65	82	0.09	1.410	1.410	0	71	74	65	82
JUN	66	76	84	0.05	1.450	1.450	0	73	73	76	84
JUL	69	81	85	0.05	1.180	1.180	0	79	80	81	85
AUG	67	81	84	0.04	1.100	1.100	0	77	79	81	84
SEP	60	73	82	0.05	0.000	0.000	0	No data	No data	73	82
OCT	50	61	80	0.06	1.470	1.470	0	61	80	61	80
NOV	40	49	77	0.07	1.450	1.450	0	49	77	49	77
DEC	35	49	76	0.05	1.470	1.470	0	49	76	49	76

\*Maximum temperatures reported during monitoring from December 2013-March 2018, and May 2019 through August 2023; no data are available for September.