Permit Fact Sheet

General Information

Permit Number:	WI-0023361-10-2 *Modification	
Permittee Name:	VILLAGE OF BELLEVILLE	
Address:	20 River Street Box 79	
City/State/Zip:	Belleville WI 53508	
Discharge Location:	South bank of the Sugar River, 500 feet west of Faheys Bridge on Remy Road. (SE ¼ of SE ¼, Section 34, T5N R8E	
Receiving Water:	Sugar River (Allen Creek/Middle Sugar River Watershed, SP13 – Sugar-Pecatonica River Basin) in Dane County	
Stream Flow ($Q_{7,10}$):	34 cfs	
Stream Classification:	Warm water sport fish (WWSF), non-public water supply	
Design Flow(s)	Daily Maximum	1.659 MGD
	Weekly Maximum	1.063 MGD
	Monthly Maximum	0.696 MGD
	Annual Average	0.346 MGD
Significant Industrial Loading?	None	
Operator at Proper Grade?	Facility is Basic with subclasses A1 – Suspended Growth Processes, B – Solids Separation, C – Biological Solids/Sludges, P – Total Phosphorus, D – Disinfection, L – Laboratory, SS – Sanitary Sewage Collection System. Four operators are certified.	
Approved Pretreatment Program?	N/A	

Facility Description

The Belleville Wastewater Treatment Facility provides secondary treatment to a combination of domestic and commercial wastewater with no significant industrial users. The Village has a population of approximately 2,400 and is served by a public water supply. The current WWTP was upgraded in 2008 with additional modifications (chemical injection point, orthophosphate analyzer, and oxidation ditch effluent pipe replacement) in 2020. The wastewater treatment plant consists of bar screen, grit removal and washing preliminary treatment, secondary treatment with activated sludge oxidation ditches, alum chemical phosphorus treatment and chlorine disinfection and post aeration prior to discharge to the Sugar River. Biosolids are treated with aerobic digestion and either hauled to the Madison Met treatment plant for additional treatment or land application on approved sites by a contractor. The facility has not land applied biosolids on their own department approved fields since 2015.

Permit modification -1 was completed to correct errors in the WQT credits used calculations in Section 2.2.1.4. This section incorrectly listed the mass lbs/day limit value as 3.2 lbs.day. The correct value is the 6-month average mass limit of 0.22 lbs/day. Permit Modification -2 was completed following approval of an updated WQT Plan.

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	0.236 MGD (Feb. 2016 – Feb. 2021 Average)	Representative influent samples shall be collected after the raw pumps and before the Grit tank.
001	0.197 MGD (Feb. 2016 – Feb. 2021 Average)	Representative composite effluent samples shall be collected prior to the chlorine contact tank and grab samples after the chlorine contact tank, prior to discharge to the Sugar River.
002	65 Dry US Tons (2021 Permit Application)	Aerobically digested, Liquid, Class B. Representative sludge samples shall be collected from the sludge storage tank. Sludge is either land applied by the permittee or hauled to Madison Met Sewerage District.

1 Influent - Proposed Monitoring

Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

Changes from Previous Permit:

None.

Explanation of Limits and Monitoring Requirements

Tracking of BOD_5 and Suspended Solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and Section 5.4.6 of the permit. These are standard monitoring requirements for a municipal treatment facility of this size.

2 Surface Water - Proposed Monitoring and Limitations

Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	3/Week	Grab	
pH Field	Daily Min	6.0 su	3/Week	Grab	
Nitrogen, Ammonia (NH3-N) Total	Daily Max	17 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	17 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	17 mg/L	3/Week	24-Hr Flow Prop Comp	
Chlorine, Total Residual	Daily Max	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Weekly Avg	38 ug/L	Daily	Grab	
Chlorine, Total Residual	Monthly Avg	38 ug/L	Daily	Grab	
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Weekly	Grab	Interim limit effective May - September annually until the final E. coli limit goes into effect per the "Effluent Limitations for E. coli" Schedule.
E. coli		#/100 ml	Weekly	Grab	Monitoring only May - September annually until the final limit goes into effect per the "Effluent Limitations for E. coli" Schedule.
E. coli	Geometric	126 #/100 ml	Weekly	Grab	Limit Effective May -

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
	Mean - Monthly				September annually per the "Effluent Limitations for E. coli" Schedule.
E. coli	% Exceedance	10 Percent	Weekly	Grab	Limit Effective May - September annually per the "Effluent Limitations for E. coli" Schedule. See the "E. coli Percent Limit" section in the permit. Enter the result in the DMR on the last day of the month.
Phosphorus, Total	Monthly Avg	0.8 mg/L	3/Week	24-Hr Flow Prop Comp	Effective upon reissuance, this limit is retained to prevent backsliding and is not an interim limit.
Phosphorus, Total		lbs/day	3/Week	Calculated	Report daily mass discharged using Equation 1a. in the "Water Quality Trading (WQT)" section in the permit.
WQT Credits Used (TP)		lbs/month	Monthly	Calculated	Report WQT TP Credits used per month using Equation 2c. in the "Water Quality Trading (WQT)" section in the permit. Available TP Credits are specified in Table 2 and in the approved Water Quality Trading Plan.
WQT Computed Compliance (TP)	Monthly Avg	0.225 mg/L	Monthly	Calculated	Limit effective upon reissuance.
WQT Computed Compliance (TP)	6-Month Avg	0.075 mg/L	Monthly	Calculated	Limit effective upon reissuance and evaluated every 6 months at the end of June and end of December each year. Value entered on the last day of the month.
WQT Computed Compliance (TP)	6-Month Avg	0.22 lbs/day	Monthly	Calculated	Limit effective upon reissuance and evaluated every 6 months at the end of June and end of December each year. Use

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Equation 4b in the Water Quality Trading subsection in the permit. Value entered on the last day of the month.
Previous years Annual Total limit removed.					
WQT Credits Used (TP)	Annual Total	199.2 lbs/yr	Annual	Calculated	Effective for calendar years 2025 - 2026. The sum of total monthly credits used may not exceed Table 2 values listed in the permit.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section in the permit.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section in the permit.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring section in the permit. 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 subsection 2.2.1.9 in the permit for Whole Effluent Toxicity (WET) Testing monitoring dates and WET requirements.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See subsection 2.2.1.9 in the permit for Whole Effluent Toxicity (WET) Testing monitoring dates and WET requirements.

Changes from Previous Permit

Permit Modification: Section 2.2.1.4 'Demonstrating Compliance with TP WQBELs Using Water Quality Trading' incorrectly listed the lbs/day as 3.2 lbs/day. The correct value for this calculation is 0.22 lbs/day. Two equations were updated with this modification. Permit Modification -2: updated WQT annual credits.

Fecal coliform monitoring and limits have been replaced with *Escherechia coli* (*E. coli*) monitoring and limits. *E. coli* monitoring is required at the permit effective date. An interim fecal coliform limit of 400 #/100 ml as a monthly geometric mean will apply from the permit effective date through the end of a compliance schedule. At the end of the compliance schedule, *E. coli* limits of 126 #/100 ml as a monthly geometric mean that may never 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.

Total Nitrogen Monitoring (TKN, N02+N03 and Total N): Annual monitoring in rotating quarters throughout the permit term was added to the proposed permit.

New Weekly and Monthly Nitrogen Ammonia limits of 17 mg/L have been added to the permit for this term. Rotating quarterly monitoring for Chronic WET has been added. Weekly and Monthly Residual Chlorine limits of 38 ug/L for the disinfection season have been added. Monitoring requirements for water quality trading and the final phosphorus limits have been added as the permittee is pursuing water quality trading for phosphorus compliance.

Explanation of Limits and Monitoring Requirements

Please refer to the Water Quality Based Effluent Limits memo prepared by Sarah Luck, dated January 25, 2021, for explanation and the detailed calculations.

> Note: Throughout this fact sheet all citations of administrative code for example, s. NR 102.06, Wis. Adm. Code, will be referenced as s. NR 102.06, and reflect current Wisconsin Administrative Code.

Categorical Limits

BOD_5, pH, Total Suspended Solids (TSS), Fecal Coliform – Standard municipal wastewater requirements for BOD_5, pH, TSS, and Fecal Coliform are included based on NR 210 'Sewage Treatment Works' requirements for discharges to limited aquatic life streams. Chapter NR 102 'Water Quality Standards for Surface Waters' also specifies requirements for pH for fish and aquatic life streams.

Regulatory changes to s. NR 205.065, became effective September 1, 2016 and require limits in this permit to be expressed as weekly average and monthly average limits whenever practicable. These changes are based on 40 CFR 122.45(d). Minor changes have been made to fecal coliform, ammonia nitrogen, and chlorine residual limitations from the previous permit in order to comply with this regulation.

Water Quality Based Limits and WET Requirements

Phosphorus – Phosphorus requirements are based on the Phosphorus Rules that became effective December 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. Currently in NR 217 Wis. Adm. Code there are two methods used to determine if a phosphorus limit is needed: a technology based effluent limit (TBEL) and a water quality based effluent limit (WQBEL). In this case, the WQBEL is 0.225 mg/L (monthly average), 0.075 mg/L & 0.22 lbs/day (6-month average). 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 value. 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 (which equates to 0.3 mg/L). This final effluent limit was derived from and complies with the applicable water quality criterion. A phosphorus concentration limit is necessary to prevent backsliding during the term of the permit. A limit of 0.8 mg/L will be retained throughout the permit term.

The wastewater treatment facility is not able to meet the WQBEL. This permit authorizes the use of trading as a tool to demonstrate compliance with the phosphorus WQBELs. This permit includes terms and conditions related to the Water Quality Trading Plan (WQT-2024-0022) or approved amendments thereof. The total 'WQT TP Credits' available are designated in the approved WQT Plan. The Village implemented a variety of management practices including streambank stabilization and cropping practices. The WQT Plan proposes the generation of 199.2 pounds of phosphorus credits for the next five years.

Additional WQT subsections in the permit provide information on compliance determinations, annual reporting and re-opening of the permit.

Total Residual Chlorine – Chlorine is used by the facility for disinfection during the recreation season so effluent limits are recommended to ensure proper de-chlorination. Per NR 210.06(2)(b) Wis. Adm. Code, the total discharge of chlorine must be less than 0.10 mg/L. Revisions to s. NR 106.07(2) and NR 205.065(7), Wis. Adm. Code, have also resulted in the removal of effluent mass limits and the addition of a monthly average limit.

E. Coli – Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying *E. coli* WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for *E. coli* while facilities are disinfecting during the recreation period and establish effluent limitations for *E. coli* established in s. NR 210.06 (2), Wis. Adm Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to *E. coli* to protect recreation in ch. NR 102, Wis. Adm. Code.; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code.; revised permit requirements for publicly and privately owned sewage treatment works in ch. NR 210, Wis. Adm. Code.; and, updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code.

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.

Total Nitrogen Monitoring (NO2+NO3, TKN and Total N) – The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under ss 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the "Guidance for Total Nitrogen Monitoring in Wastewater Permits" dated October 1, 2019. Annual tests are scheduled in the following rotating quarters: **October – December 2021; January – March 2022; April – June 2023; July – September 2024; October – December 2025**

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

3 Land Application - Proposed Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
002	B	Liquid	Fecal Coliform		Land Application	Sludge Hauled to another facility
Does sludge management demonstrate compliance? **Yes**						

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
Is additional sludge storage required? **No**						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? **No** If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in land applying sludge from this facility						
Is a priority pollutant scan required? **No**, design flow is less than 5 MGD. (0.346 MGD) Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

Sample Point Number: 002- SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Jan. 1, 2022 - Dec. 31, 2022
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Jan. 1, 2022 - Dec. 31, 2022
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	

Changes from Previous Permit:

New timeframe for monitoring PCBs is now calendar year 2022.

Explanation of Limits and Monitoring Requirements

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

Water Extractable Phosphorus – Water extractable phosphorus (WEP) is the coefficient for determining plant available phosphorus from measured total phosphorus. In Wisconsin, the Penn State Method is utilized and is expressed in percent. While a total P may be significant, the WEP may show that only a small percentage of the P is available to plants because of factors such as treatment processes and chemical addition that "tie-up" phosphorus limiting the amount of phosphorus that is plant available. As part of the Wisconsin's nutrient management plan (NMP) requirements, the accounting of all fertilizers must be included over the NMP cycle. The fertilizer value of the waste needs to be communicated to the farmer and accounted for in the NMP.

4 Compliance Schedules

4.1 Effluent Limitations for E. coli

The permittee shall 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 the notification

Required Action	Due Date
Status Update: The permittee shall submit information within the discharge monitoring report (DMR) comment section documenting the steps taken in preparation for properly monitoring and testing for E. coli including, but not limited to, selected test method and location of sampling.	08/21/2021
Operational Evaluation Report: The permittee shall prepare and submit an Operational Evaluation Report to the Department for review and approval. The report shall include an evaluation of collected effluent data and proposed operational improvements that will optimize efficacy of disinfection at the treatment plant during the period prior to complying with final E. coli limitations and, to the extent	07/31/2022

possible, enable compliance with the final E. coli limitations. The report shall include a plan and schedule for implementation of the operational improvements. These improvements shall occur as soon as possible, but not later than January 31, 2023. The report shall state whether the operational improvements are expected to result in compliance with the final E. coli limitations. The permittee shall implement the operational improvements in accordance with the approved plan and schedule specified in the Operational Evaluation Report and in no case later than January 31, 2023. If the Operational Evaluation Report concludes that the operational improvements are expected to result in compliance with the final E. coli limitations, the permittee shall comply with the final E. coli limitations by January 31, 2023 and the permittee is not required to comply with subsequent milestones identified below in this compliance schedule ('Submit Facility Plan', 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet Limitations', 'Construction Upgrade Progress Report', 'Complete Construction', 'Achieve Compliance'). FACILITY PLAN - If the Operational Evaluation Report concludes that operational improvements alone are not expected to result in compliance with the final E. coli limitations, the permittee shall initiate development of a facility plan for meeting final E. coli limitations and comply with the remaining required actions in this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final E. coli limitations using the existing treatment system with only operational improvements, the Department may reopen and modify the permit to include an implementation schedule for achieving the final E. coli limitations sooner than April 30, 2026.	
Submit Facility Plan: If the Operational Evaluation Report concluded that the permittee cannot achieve final E. coli limitations with operational improvements alone, the permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	01/31/2023
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 E. coli limitations and a schedule for completing construction of the upgrades by the complete construction date specified below.	01/31/2024
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.	07/31/2024
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	07/31/2025
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	01/31/2026
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	04/30/2026

4.1.1 Explanation of 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 effluent *E. coli* water quality-based effluent limits while coming into compliance with the limits as soon as reasonably possible.

4.2 Annual Water Quality Trading (WQT) Report

Required Action	Due Date
Annual WQT Report: Submit an annual WQT report that shall cover July 1, 2021 – December 31, 2021. The WQT Report shall include: The number of pollutant reduction credits (lbs/month) used each month of the previous year to demonstrate compliance; The source of each month's pollutant reduction credits by identifying the approved water quality trading plan that details the source; A summary of the annual inspection of each nonpoint source management practice that generated any of the pollutant reduction credits used during the previous year; and Identification of noncompliance or failure to implement any terms or conditions of this permit with respect to water quality trading that have not been reported in discharge monitoring reports.	01/31/2022
Annual WQT Report #2: Submit an annual WQT report that shall cover the previous year.	01/31/2023
Annual WQT Report #3: Submit an annual WQT report that shall cover the previous year.	01/31/2024
Annual WQT Report #4: Submit an annual WQT report that shall cover the previous year.	01/31/2025
Annual WQT Report #5: Submit the 5th annual WQT report. If the permittee wishes to continue to comply with phosphorus limits through WQT in subsequent permit terms, the permittee shall submit a revised WQT plan including a demonstration of credit need, compliance record of the existing WQT, and any additional practices needed to maintain compliance over time.	01/31/2026
Annual WQT Report Required After Permit Expiration: In the event that this permit is not reissued by the expiration date, the permittee shall continue to submit annual WQT reports by January 31 each year covering the total number of pollutant credits used, the source of the pollution reduction credits, a summary of annual inspection reports performed, and identification of noncompliance or failure to implement any terms or conditions of the approved water quality trading plan for the previous calendar year.	

4.2.1 Explanation of Annual Water Quality Trading (WQT) Report

Annual Water Quality Trading (WQT) Reports - Reports are required, starting in 2022, that include the following information:

- Verification that site inspections occurred;
- Brief summary of site inspection findings;
- Identification of noncompliance or failure to implement any terms or conditions of the permit or trading plan that have not been reported in discharge monitoring reports;
- Any applicable notices of termination or management practice registration; and

A summary of credits used each month over the calendar year

Attachments:

Substantial Compliance Determination

Map(s)

WET Checklist Summary

Public Notice

Proposed Expiration Date:

A permit term of five years is proposed in this reissuance with an expiration date of June 30, 2026.

Justification of Any Waivers from Permit Application Requirements

No waivers were requested from permit application requirements.

Prepared By:

Sean Spencer – Wastewater Specialist

Date: 5/3/2021

cc: Nathan Wells

Modification Prepared by: Jennifer Jerich, Wastewater Specialis**t**

Dated: 12/8/2023

Modification #2 Prepared by: Jennifer Jerich, Wastewater Specialist

Dated: 10/11/2024

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
3911 Fish Hatchery Road
Fitchburg, WI 53711

Tony Evers, Governor

Telephone 608-266-2621
FAX 608-267-3579
TTY Access via relay - 711

WISCONSIN
DEPT. OF NATURAL RESOURCES

September 06, 2024

Gabe Altenbernd
Village Administrator/Clerk
24 W. Main St
Belleville, WI 53508

Subject: Belleville Wastewater Treatment Facility - WPDES Permit WI-0023361
Water Quality Trading Plan – CONDITIONAL APPROVAL

Dear Gabe Altenbernd:

The Department recently received a water quality trading plan (WQT Plan) for compliance with phosphorus effluent limits at the Belleville Wastewater Treatment Facility. The Belleville WQT Plan (WQT-2021-0007) was conditionally approved by the Department of Natural Resources (department) in a letter dated April 5, 2021. The approved WQT Plan proposed credit generation by installation of barnyard practices, streambank stabilization, and cover crop practices on agricultural lands. The Water Quality Trading Plan (WQT-2021-007) was not implemented as approved. The Village of Belleville has submitted an updated WQT Plan that reflects implemented water quality trading projects and credit generation. Based on WDNR review, the final WQT Plan (dated August 2024) is in general conformance with the WDNR Water Quality Trading Guidance and Section 283.84 of the Wisconsin Statutes. The WQT plan proposes to utilize streambank stabilization and whole field management practices on agricultural lands. The timeline for practice installation, as set forth in the WQT plan, indicates all practices have been implemented. Credits generated from approved practices result in available credit quantities shown in Table 1. These credits will be incorporated into the modified WPDES permit and will be used to demonstrate compliance with final phosphorus effluent limits.

Table 1: Total Phosphorus Credits Available per WQT-2024-0022

Year	Available Credits (lbs/yr) – Total
2021	98.4
2022	98.4
2023	134.3
2024	166.8
2025	199.2
2026	199.2

The Department conditionally approves the WQT Plan as a basis for water quality trading during the WPDES permit term. The Department has assigned the WQT plan a tracking number of WQT-2024-0022 and will be referenced as such in the draft WPDES permit. The final WQT plan will be included as part of the public notice

package for permit reissuance. The draft WPDES permit will include a requirement for an annual trading report and effluent monitoring for total phosphorus.

If you have any questions or comments, please contact me at 608-419-4155 or at betsyjo.howe@wisconsin.gov

Thank You,

BetsyJo Howe

BetsyJo Howe
Wastewater Specialist
Wisconsin Department of Natural Resources

e-CC:

Jeff Larson, Belleville Village President
David Magnussen, Operator
Mackenzie Phillips, MSA Professional Services, Inc.
Matt Claucherty, WDNR
Kenzie Ostien, WDNR

Water Quality Trading Plan

Village of Belleville
Dane County, WI
Revised August 2024

Prepared by:

MSA Professional Services, Inc.
1702 Pankratz Street
Madison, WI 53704
Phone: 218-722-3915
www.msa-ps.com

Project No. 00372101

Water Quality Trading Plan
Village of Belleville

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Abbreviations

Organization Abbreviations:

DOA	=	Wisconsin Department of Administration
DNR	=	Wisconsin Department of Natural Resources
LCD	=	Dane County Land Conservation Division
MSA	=	MSA Professional Services, Inc.
NRCS	=	Natural Resources Conservation Service
USRWA	=	Upper Sugar River Watershed Association

Technical Abbreviations:

BMP	=	Best Management Practice
EQIP	=	NRCS Environmental Quality Incentives Program
HUC	=	Hydrologic Unit Code (i.e. watershed identification code)
NMP	=	Nutrient Management Plan
PI	=	Phosphorus Index [lbs/acre/year]
T	=	Annual Tolerable Soil Loss [tons/acre/year]
TMDL	=	Total Maximum Daily Load
TP	=	Total Phosphorus
WPDES	=	Wisconsin Pollutant Discharge Elimination System
WQBEL	=	Water Quality Based Effluent Limit
WQT	=	Water Quality Trading
WWTF	=	Wastewater Treatment Facility

Unit Abbreviations:

ac	=	Acre
gpd	=	Gallons per Day
gpcd	=	Gallons per Capita per Day
lb	=	Pound Mass
MGD	=	Million Gallons per Day
mg/L	=	Milligrams per Liter
ppm	=	Parts per Million [mass basis]

Water Quality Model Abbreviations:

APLE-Lots	=	Annual Phosphorus Loss Estimator for Outdoor Cattle Lots
BARNY	=	Wisconsin Barnyard Runoff Model
EVAAL	=	Erosion Vulnerability Assessment for Agricultural Lands
SnapPlus	=	Soil Nutrient Application Planner
SPARROW	=	Spatially Referenced Regression On Watershed Attributes

EXECUTIVE SUMMARY

Need for Project:

The Village of Belleville (Village) owns and operates a mechanical wastewater treatment facility (WWTF) that is required to meet new stringent water quality-based effluent limits (WQBELs) for total phosphorus. The Village's current Wisconsin Pollutant Discharge Elimination System (WPDES) permit, which was reissued on April 1, 2016, includes a compliance schedule for meeting future phosphorus WQBELs of 0.225 mg/L (monthly average) and 0.075 mg/L (6-month average). The new WQBELs are intended to protect the water quality of the Sugar River and other downstream surface waters. The proposed WQBELs cannot be achieved with the existing biological and chemical treatment processes utilized by the Village. Therefore, the Village of Belleville must upgrade the existing WWTF to meet the proposed WQBELs or consider other feasible means of compliance. Based on the Village's *Preliminary Phosphorus Compliance Alternatives Plan* (MSA, 2019), the most cost-effective method for complying with the new phosphorus limits is via Water Quality Trading.

Water Quality Trading:

Water Quality Trading (WQT) is a phosphorus compliance alternative that allows wastewater permittees to implement best management practices (BMPs) within eligible watersheds in lieu of constructing WWTF upgrades to comply with the proposed phosphorus WQBELs. WQT requires that the permittee offset the amount of phosphorus discharged by the WWTF in excess of the applicable WQBEL for phosphorus, including uncertainty factors known as "trade ratios" to promote water quality improvements. Phosphorus offsets are made by implementing trades with other point source dischargers of phosphorus or by implementing urban stormwater and/or agricultural BMPs within the watershed of the receiving water. WQT is only allowed if a permittee can develop a binding written agreement with another permittee, person, and/or entity to reduce discharges of the traded pollutant and improve water quality.

Based on the analysis provided in this *Water Quality Trading Plan*, it has been determined that the Village needs to generate approximately 200 pounds of phosphorus credit per year in order to comply with their permit requirements. This assumes the WWTF can consistently achieve a phosphorus effluent concentration of 0.28 mg/L, which is the long-term average effluent concentration from 2013 through 2019. The total long-term credit goal of 200 lbs/yr for future increases in influent flow due to projected population and industrial growth over the next 20 years and includes a safety factor to allow for inherent variability in influent loadings and wastewater treatment performance.

Recommended Plan:

A map of the Village's proposed Water Quality Trading Action Area is shown in **Figure 1**. The Village has identified three (3) private landowners within the upstream Action Area who have been willing to establish legally binding 10-year agreements to reduce nonpoint sources of phosphorus. For the purposes of this *Water Quality Trading Plan*, landowner names are referred to Landowner D, E, and F. Landowners A and G included in the initial 2020 version of the WQT Plan have been removed from the proposed projects, which is reflected in this WQT Plan revision. A brief description of each project site is listed below:

1. **Landowner A**
   Landowner A is a livestock producer who owns property along Primrose Branch, a Class 2 trout stream in Dane County. The originally proposed projects for generating phosphorus credits consisted of implementing streambank stabilization practices and barnyard improvements. Ownership of the property changed after these projects were designed, and this would have caused re-drafting of the landowner agreement, revisiting of the designed projects, and re-permitting for construction for the projects to move forward. Due to this effort and the status of Village's phosphorus credit needs, the Village of Belleville opted to remove these projects from the WQT Plan.

2. **Landowner D**
   Landowner D is a rural landowner who owns approximately 51 acres of crop land near the headwaters of Milum Creek, a phosphorus impaired stream in Dane County. Credits are planned to be generated by converting the crop land from annual row crop production to perennial grass hay for a minimum of 10 years. Landowner will be paid an annual rental payment and will be provided an upfront cost share to establish the grass hay cover crop. Additional grass waterways are planned to be constructed to reduce the potential for gully erosion in the existing crop fields. The landowner will be allowed and encouraged to harvest the grass hay to draw down phosphorus levels in the soil. The landowner will be required to have a Nutrient Management Plan. No manure or phosphorus fertilizer will be allowed to be applied to the crop fields until soil testing confirms phosphorus concentrations are no longer excessively high (<30 ppm).

3. **Landowner E**
   Landowner E is a rural landowner who owns and farms approximately 40 acres of crop land near the headwaters of Milum Creek. Credits are planned to be generated by converting the crop land from annual row crop production to perennial grass hay, similar to Landowner D. Credits are also planned to be generated by repairing eroding streambanks along approximately 0.3 miles of Milum Creek. 29 streambanks are planned to be stabilized, including the installation of in-stream structures for aquatic habitat improvement.

4. **Landowner F**
   Landowner F is a livestock producer, primarily dairy, who owns crop land along approximately 0.5 miles of Milum Creek. Credits are planned to be generated by stabilizing 25 eroding streambanks and by installing in-stream structures to improve habitat conditions for aquatic and terrestrial species.

5. **Landowner G**
   Agricultural producer who owns property along approximately 0.45 miles of the Sugar River, a phosphorus impaired Class 2 trout stream and wadeable warm water smallmouth bass fishery, near Paoli. Credits were planned to be generated by stabilizing 7 eroding streambanks and by installing in-stream aquatic habitat structures. Due to complications during the landowner agreement drafting process, an agreement was not completed between Landowner G and the Village of Belleville, and the project is therefore being removed from the WQT Plan.

The updated number of credits anticipated to be generated by working with Landowners D, E, and F during the Village's first permit term of WQT are shown in **Table 1**. Credits for Landowner A and G have been removed. The crop land improvements were completed and registered to generate credits beginning in 2023 for Landowner D and in 2021 for Landowner E. The streambank stabilization projects for Landowners E and F began generating credits in July 2024 after the completion of site restoration. The amount of credits generated, approximately 200 lbs/yr, meets the Village's long-term goal of 200 lbs/yr. It is noted that the performance of the WWTF will continue to be monitored into future permit terms to determine if additional credits are needed for the Village.

Table 1: Updated total amount of phosphorus credits generated in Permit Term #1 of WQT

Landowner ID	**Phosphorus Credits Generated (lbs/yr)**				
	2021[1]	2022[1]	2023[1]	2024[2]	2025[2]
Landowner D - Whole Field Management			35.9	35.9	35.9
Landowner E - Streambank Stabilization				17.2[3]	34.3
Landowner E - Whole Field Management	98.4	98.4	98.4	98.4	98.4
Landowner F - Streambank Stabilization				15.3[3]	30.6
Total	**98.4**	**98.4**	**134.3**	**166.8**	**199.2**

[1] Number of phosphorus credits actually generated.

[2] Minimum number of credits expected to be generated assuming revised project schedule is adhered to.

[3] Project annual totals adjusted to account for the six-month post final construction period when credits are available (July – December 2024).

Estimated Implementation Costs and Potential External Funding Sources:

The estimated costs of implementing the improvements recommended in this *Water Quality Trading Plan* based on updated values are summarized in **Table 2**. As shown, the total capital cost for the project is estimated to be $959,500, including engineering. The total annual operation and maintenance (O&M) cost is estimated to be $58,200 per year. This results in a total 20-year present worth of approximately $1.8 million. The 20-year present worth costs assume that annual O&M is sufficient to extend the design life of all trades up to 20 years. O&M costs include funding to repair and/or replace BMPs. Capital and 20-year present worth costs also assume no external funding is provided and that the participating landowners bear no costs.

Table 2: Updated estimated costs of implementing the Water Quality Trading Plan

Landowner ID	Capital Cost	Annual O&M	20-yr Present Worth	Unit Cost ($/credit)
Landowner D - Whole Field Management	$24,000	$23,600	$369,000	$514
Landowner E - Streambank Stabilization	$190,000	$7,000	$292,000	$426
Landowner E - Whole Field Management	$6,000	$18,600	$278,000	$141
Landowner F - Streambank Stabilization	$236,000	$9,000	$367,000	$600
Engineering	$489,500	--	$489,500	--
Permits, Archeology Review, Road Bonds	$14,000	--	$14,000	--
Total:	**$959,500**	**$58,200**	**$1,809,500**	**$454**

Based on review of eligible financial aid programs for Water Quality Trading, MSA recommends the Village consider supplemental funding for each landowner through the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP), especially for barnyard improvements recommended for Landowner A. NRCS EQIP provides financial assistance to agricultural producers to help implement conservation practices that address natural resource concerns and improve soil, water, plant, animal, air, and related resources on agricultural land. Generally, this is the only program that can be used to provide supplemental funding for Water Quality Trading projects without major limitations. MSA has successfully secured NRCS EQIP funding for barnyard improvements in the past. Landowner A has already started the application process with NRCS. The streambank stabilization projects may also be worth pursuing if the landowners are eligible.

The Village may also consider financing the project through DNR's Clean Water Fund Pilot Projects program. Interest rates for a 20-year loan as low as 1.65% are currently available. However, it is recommended that the Village speak with its financial advisors to determine the appropriate loan term, as legal agreements with the participating landowners are currently only anticipated to extend 10 years, with the option for 5 year renewals at the end of each agreement period. The Village should also consider that construction costs may increase if a loan through Clean Water Fund is pursued, due to the additional regulatory and administrative costs passed on to the prospective contractors. Therefore, financing options should be carefully considered prior to project implementation.

Project Schedule:

The anticipated implementation schedule for this *Water Quality Trading Plan* is summarized in **Table 3**. The implementation schedule shown below has changed from that of the 2020 WQT Plan. At this point in time, construction has been completed for the Landowner D, E, and F projects. Management practice registration forms have been submitted for the Landowner D and E Whole Field Management projects and are being submitted for the Landowner E and F streambank projects in mid-2024 along with this WQT plan revision. With the submission and approval of this WQT Plan revision, the Village of Belleville is expected to be in compliance with Water Quality Trading. In order to accommodate this project schedule, the Village of Belleville should budget expenses for the next five years as shown in the cash flow summary presented in **Table 4**. Capital costs have been removed from this cash flow, since these have been paid for by the Village. Annual O&M costs for the remaining years of the permit term are inclusive of the Landowner D, E, and F

projects that have been completed. Budgeting for these annual costs will be beneficial to the Village for planning of annual incentive payments and future repairs of management practices.

Table 3: Anticipated project implementation

Proposed Action	Approximate Date
Submit Water Quality Trading Plan to DNR	December 2020
Establishment of Trade Agreements with Landowners A, D, E, and F	December 2020
Submit Water Quality Trading Plan Revisions to DNR	January 2021
Initiate Crop Land Conversion Projects with Landowners D and E	April 2021
Submit Management Practice Registration Form for Landowner E to DNR	June 2021
Submit Management Practice Registration Form for Landowner D to DNR	January 2023
Approval of Engineering Plans, Specs, and Permits for Landowners A, E, and F	September 2023
Initiate Construction for Landowners E and F Streambank Stabilization	October 2023
Finish Construction for Landowners E and F Streambank Stabilization	May 2024
Submit Revised WQT Plan for Removal of Landowners A and G Projects	June 2024
Submit Revised WQT Plan with DNR Comments Addressed	July 2024
Submit Management Practice Registration Forms for Landowners E and F to DNR	July 2024
Achieve Compliance with Water Quality Trading	August 2024

Note: Project implementation schedule subject to change based on timing of DNR approval of the Water Quality Trading Plan and reissuance of the Village of Belleville's WPDES Permit.

Table 4: Updated cash flow summary for the 1st WPDES permit term of Water Quality Trading

Year	Annual O&M Costs	Total Annual Cost
2021	$42,000	$42,000
2022	$42,000	$42,000
2023	$42,000	$42,000
2024	$58,200	$58,200
2025	$58,200	$58,200

Figure 1: Final Village of Belleville Water Quality Trading Action Area Overview Map

CHAPTER 1 – INTRODUCTION

1.1 BACKGROUND

The Village of Belleville (approximate population 2,500) is located along State Highways 69 and 92 near the southern border of Dane County, Wisconsin. The Village owns and operates a wastewater treatment facility (WWTF) that serves residential, commercial, industrial, and public authority users of the Village's sanitary sewer system. Treatment units consist of a mechanical fine screen, grit removal tank, an activated sludge oxidation ditch, two (2) final clarifiers, chemical phosphorus treatment, chlorine disinfection/dechlorination, and post aeration. The existing WWTF is located at 105 Remy Road, Belleville, Wisconsin in the SE ¼ of SE ¼ of Section 34, T5N, R8E, Montrose Township. **Figure 1-1** depicts the location of the Village and the existing WWTF.

The existing WWTF continuously discharges treated effluent to the Sugar River (Allen Creek/Middle Sugar River Watershed, SP13 – Sugar-Pecatonica River Basin). The Village's current Wisconsin Pollutant Discharge Elimination System (WPDES) permit, which was reissued on April 1, 2016, includes a compliance schedule for meeting future water quality based effluent limits (WQBELs) of 0.075 mg/L (6-month average) and 0.225 mg/L (monthly average) for total phosphorus. The new WQBELs are intended to protect the water quality in the Sugar River and other downstream surface waters. The proposed WQBELs are significantly more stringent than the WWTF's current interim phosphorus limit of 0.8 mg/L (monthly average), and the existing WWTF cannot comply with the WQBELs without significant treatment process upgrades. Therefore, the Village of Belleville must upgrade the existing WWTF to meet the proposed WQBELs or must consider other means of compliance. Based on the findings presented in the Village of Belleville's *Preliminary Compliance Alternatives Plan* (2019), it has been determined that the most cost-effective means of complying the proposed phosphorus limits is to pursue Water Quality Trading (WQT).

WQT is a phosphorus compliance alternative described in Wisconsin Statute 283.84, which allows a permittee to implement best management practices (BMPs) within eligible watersheds that are hydrologically connected to a permittee's wastewater outfall in lieu of constructing costly phosphorus removal upgrades (e.g., tertiary filtration or equivalent) at the WWTF to comply with the proposed WQBELs. WQT requires that the permittee offset the amount of phosphorus discharged by the WWTF in excess of the most stringent WQBEL (0.075 mg/L) for phosphorus. Phosphorus offsets are made by implementing trades with other point source dischargers of phosphorus or by implementing urban stormwater and/or agricultural BMPs within the watershed of the receiving water. Urban BMP options include stormwater infiltration practices, detention basins, and grassed swales. Rural/agricultural BMPs can include both hard practices (e.g., barnyard improvements such as clean water diversions and heavy use protection areas) and soft practices (e.g., nutrient management, reduced tillage, and filter strips).

WQT trading is only allowed if a permittee can develop a binding written agreement with another permittee, person, and/or entity to reduce discharges of the traded pollutant (e.g. phosphorus) and improve water quality. In order to promote the potential for improving water quality, an uncertainty factor known as a "trade ratio" is applied to the amount of phosphorus that must be offset by the discharger. The applicable trade ratios typically vary from 1.1 to 4 times the amount of phosphorus that would need to be removed at the WWTF to meet the WQBEL for phosphorus. Even though more phosphorus is required to be offset in order to comply with WQT, in many cases, such as for the Village of Belleville, BMP implementation is less costly than upgrading the WWTF to achieve compliance with stringent WQBELs for phosphorus.

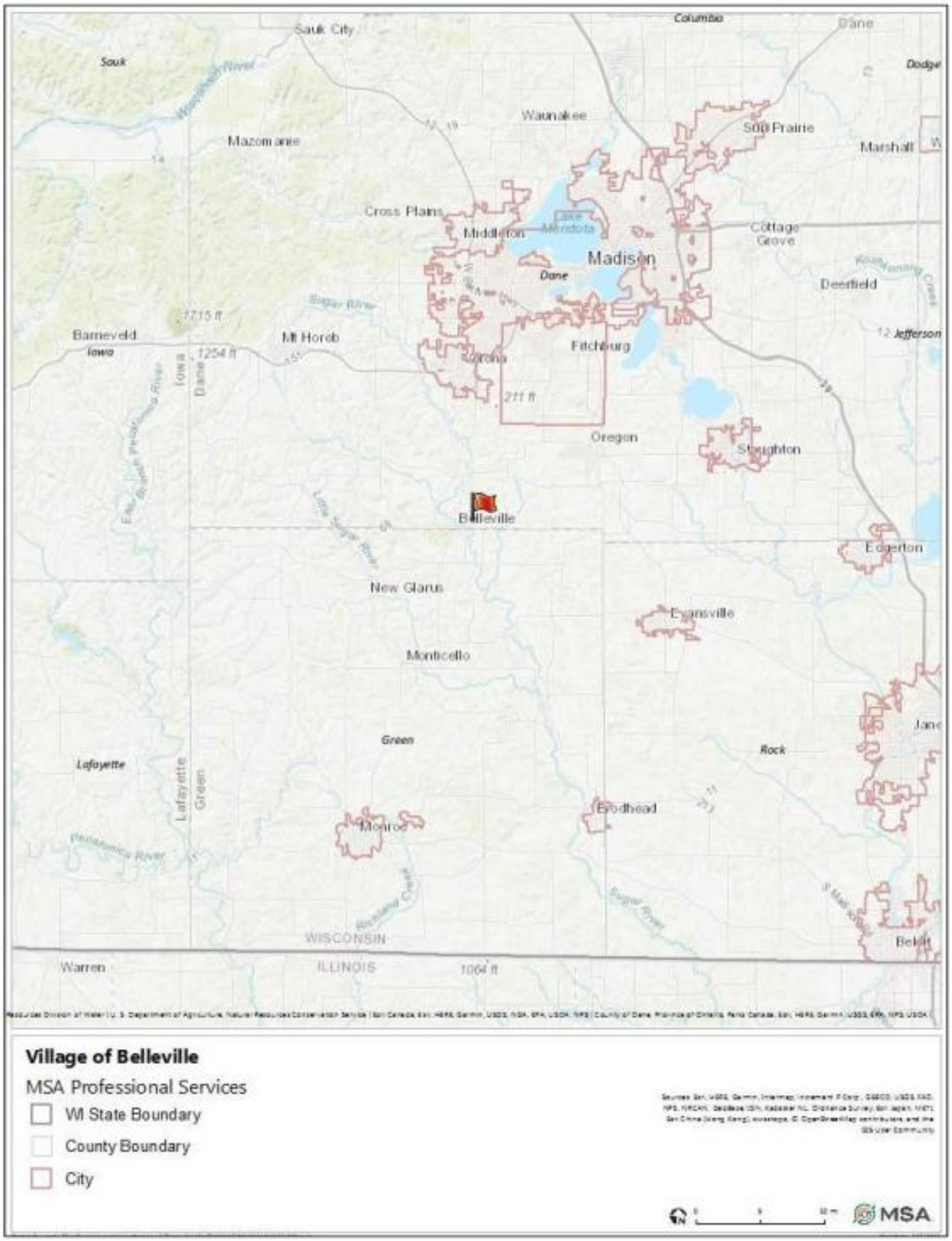

Figure 1-1: Belleville Wastewater Treatment Facility location map

1.2 PURPOSE AND SCOPE

The purpose of this WQT Plan is to identify locations within the Sugar River Basin where BMPs can be implemented by the Village of Belleville to sufficiently offset the environmental impacts of phosphorus discharged by the Belleville Wastewater Treatment Facility. The objectives of this WQT Plan are:

- to characterize the Village of Belleville's WPDES permit requirements for phosphorus and rational for selecting WQT for phosphorus compliance
- to determine the minimum phosphorus load reductions needed for the Village of Belleville to comply with WQT
- to identify eligible watersheds where BMPs can be implemented by the Village of Belleville and areas where improvements are needed most
- to identify partners who will be involved with the implementation of the Village of Belleville's WQT Plan and to establish the roles and responsibilities of each partner
- to identify BMPs that will be implemented by the Village of Belleville and to quantify phosphorus load reductions and implementation costs
- to establish processes the Village of Belleville will implement to inspect installed BMPs and repair failing BMPs
- to evaluate the overall financial impacts of WQT on the Village of Belleville and to identify eligible outside funding sources to offset costs of implementing BMPs
- to establish a schedule for BMP implementation that allows the Village of Belleville to comply with WPDES permit requirements

1.3 WASTEWATER FACILITY DESCRIPTION

The WWTF received an annual average 0.227 MGD of flow between 2013 and 2019. The Village of Belleville owns and operates a WWTF that treats residential, commercial, industrial, and public authority wastewater generated by users of the Village's sanitary sewer system. In addition, the WWTF accepts waste from two industrial point sources, Federal Industries and Capital Finishing LLC. The facility's wastewater treatment processes include preliminary treatment (fine screen and grit removal), secondary treatment (activated sludge oxidation ditch and final clarification), chemical phosphorus treatment, chlorine disinfection/dechlorination, and post aeration.

The existing biological and chemical treatment processes are capable of achieving effluent phosphorus concentrations of 0.8 mg/L or less. Between 2013 and 2019, the WWTF achieved an average effluent phosphorus concentration of 0.28 mg/L. The existing chemical feed system can feed aluminum sulfate (alum) to two different locations: 1) the oxidation ditch mixed liquor suspended solids (MLSS) prior to the final clarifiers and/or 2) the return activated sludge (RAS) pipe. Waste sludge produced by the wastewater treatment process is stored in an aerated storage tank. Minimal sludge storage is available on site, so sludge is regularly hauled to the Madison Metropolitan Sewerage District WWTF for additional treatment or land applied on DNR approved

agricultural fields. Overall the existing WWTF is in good condition and is able to maintain substantial compliance with the existing WPDES permit limits.

1.4 WPDES PERMIT REQUIREMENTS

The current WPDES permit for the Village of Belleville Wastewater Treatment Facility was reissued on April 1, 2016. The current permit will expire on March 31, 2021. A copy of the current WPDES permit is included in **Appendix A**. Current and future effluent phosphorus limits are summarized in **Table 1-1**. As shown, the current interim limit for total phosphorus is 0.8 mg/L. The final WQBEL limits become effective on March 31, 2025. As stated in Section 2.2.1.2 of the Village's WPDES permit, the WWTF does not have to be upgraded to comply with the proposed WQBELs if the Village chooses to comply with phosphorus requirements via WQT. Since a major wastewater facility upgrade will not be completed if the Village pursues WQT, the length of the phosphorus compliance schedule will likely be shortened to March 31, 2023.

Table 1-1: Summary of Current and Future Effluent Phosphorus Limits for the Belleville WWTF

Phosphorus Limit	Limit Type	Limit and Units	Notes
Interim Limit	Monthly Avg.	0.8 mg/L	Currently Effective
Final WQBEL	Monthly Avg.	0.225 mg/L	Effective March 31, 2025*
Final WQBEL	6-Month Avg.	0.075 mg/L	Effective March 31, 2025*

*If the Village pursues WQT without a major facility upgrade, the phosphorus compliance schedule will likely be shortened to March 31, 2023.

1.5 SELECTION OF WATER QUALITY TRADING

In 2019, the Village of Belleville completed a *Preliminary Compliance Alternatives Plan* to determine the most cost-effective and environmentally beneficial alternative that could be implemented to achieve compliance with the proposed WQBELs for phosphorus. This report evaluated several possible compliance alternatives including:

1. Regional wastewater treatment with a nearby community
2. Wastewater treatment and groundwater discharge
3. WWTF Tertiary Phosphorus Removal Upgrade
4. Adaptive Management
5. Water Quality Trading
6. Alternative Site-Specific Limits
7. Statewide "Multi-Discharger" Variance (Act 378)
8. Economic Variance

Based on the evaluation of the above alternatives, only a WWTF tertiary phosphorus removal upgrade (Alternative #3) and Water Quality Trading (Alternative #5) were determined to be feasible options for the Village of Belleville. The preliminary cost estimates for both of these alternatives, as presented in the *Preliminary Compliance Alternatives Plan*, are summarized in **Table 1-2**. As

shown, after preliminary analysis, WQT was determined to be significantly less costly than upgrading the existing WWTF to achieve compliance with the stringent WQBEL of 0.075 mg/L. Due to the anticipated cost savings, the Village of Belleville has elected to implement WQT to comply with WDPES permit requirements for phosphorus. A copy of the *Notice of Intent to Conduct Water Quality Trading* is included in **Appendix B** of this report.

Table 1-2: Estimated Costs of Phosphorus Compliance for the Village of Belleville (MSA, 2019)

Alternative	Capital Costs	O&M Costs	20-year Present Worth
Tertiary Upgrade	$4,500,000 - $5,000,000	$80,000 - $115,000	$5,000,000 - $6,100,000
Water Quality Trading	$600,000 - $1,100,000	$40,000 - $90,000	$1,400,000 - $2,900,000

CHAPTER 2 – LOAD REDUCTION REQUIREMENTS

2.1 GENERAL

This chapter describes existing and projected wastewater loading conditions at the Belleville Wastewater Treatment Facility and estimates minimum phosphorus reductions needed for the Village of Belleville to comply with WQT. Much of this information was previously provided in the Village of Belleville *Preliminary Compliance Alternatives Plan* (MSA, 2019). For additional detail, refer to the *Preliminary Compliance Alternatives Plan*.

2.2 EXISTING CONDITIONS

This section describes historical influent and effluent wastewater loadings at the Belleville Wastewater Treatment Facility. **Table 2-1** summarizes the WWTF's average annual influent and effluent flows and effluent total phosphorus concentrations and mass loads from 2013 through 2019. As shown, the average influent and effluent flows during the seven-year timeframe were 0.227 MGD and 0.201 MGD, respectively. Average effluent phosphorus concentrations and mass loads were 0.28 mg/L and 0.47 lbs/day, respectively.

Table 2-1: Belleville WWTF Annual Wastewater and Phosphorus Loads (2013-2019)

Year	Avg. Influent Flow (MGD)	Avg. Effluent Flow (MGD)	Avg. Effluent TP Conc. (mg/L)	Avg. Effluent TP Load (lbs/day)
2013	0.241	0.278	0.35	0.85
2014	0.189	0.162	0.26	0.35
2015	0.177	0.153	0.28	0.36
2016	0.198	0.169	0.31	0.45
2017	0.222	0.193	0.29	0.46
2018	0.273	0.223	0.25	0.41
2019	0.286	0.228	0.19	0.41
Avg.	**0.227**	**0.201**	**0.28**	**0.47**

It is important to note that the Village of Belleville has attempted to optimize phosphorus removal from the existing WWTF since the Village's WPDES permit was reissued in 2016. Optimization has included influent phosphorus source control as well as biological and chemical treatment optimization. As shown in **Table 2-1** and in **Figure 2-1**, annual average effluent phosphorus loads have generally decreased throughout the analysis period. In fact, effluent phosphorus loads have been reduced by approximately 52% since 2013. The Village is currently completing minor upgrades to the WWTF to include a new ortho-phosphorus analyzer, a new chemical feed point, and new pumps and controls. These upgrades will further optimize the phosphorus removal processes.

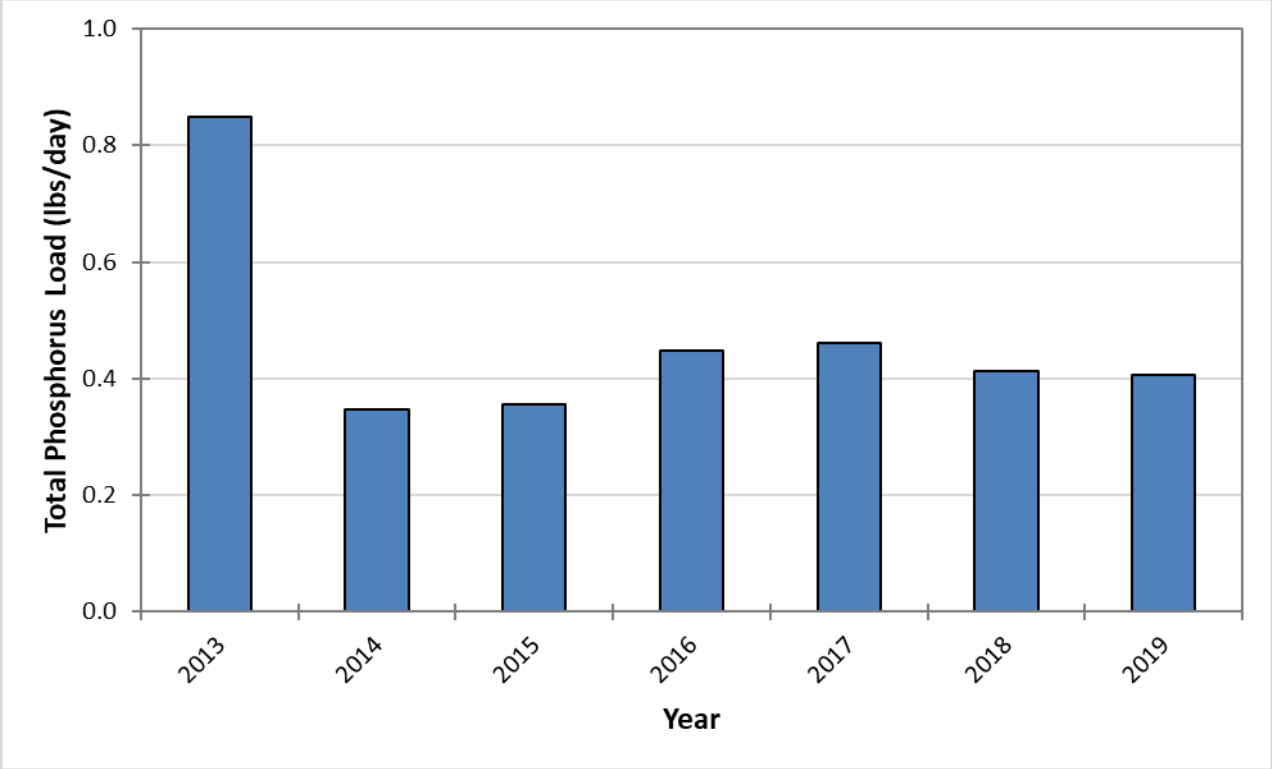

Figure 2-1: Belleville WWTF Average Annual Effluent Total Phosphorus Loads (2013-2019)

2.3 POPULATION FORECASTING

The future population for the Village of Belleville was estimated by reviewing historical census data and population projections published by the State of Wisconsin Department of Administration (DOA) Demographics Service Center. As shown in **Table 2-2** and **Figure 2-2**, population projections by the DOA suggest that the Village population will increase to 2,870 people by 2040. The WQT Plan projections represent an increase of 330 people (13%) above the current estimated population of 2,540 for 2020.

Table 2-2: Village of Belleville Population Projections

Year	Historical Population (U.S. Census)	2013 DOA Projections	WQT Plan Projections
1970	1,063	-	-
1980	1,302	-	-
1990	1,456	-	-
2000	1,908	-	-
2010	2,385	-	-
2015	-	2,420	2,420
2020	-	2,540	2,540
2025	-	2,655	2,655
2030	-	2,755	2,755
2035	-	2,825	2,825
2040	-	2,870	2,870

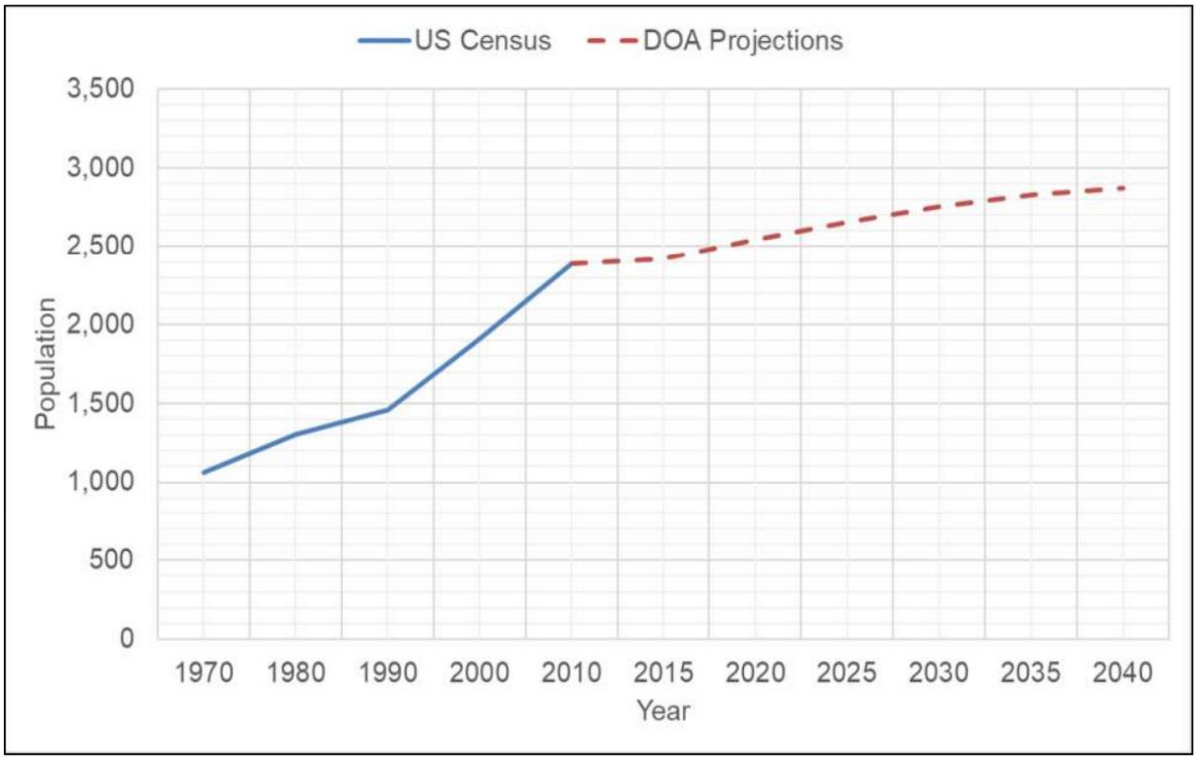

Figure 2-2: Village of Belleville 20-year population projections

2.4 DESIGN FLOW PROJECTIONS

Average annual influent flows for the Belleville WWTF were estimated for 2021, the start of WQT compliance in year 2023, and for maximum design conditions in year 2040. Design flows were estimated based upon historical influent flow data, population projections, and future development plans. As shown in **Table 2-3** and **Table 2-4**, the projected average annual design flows were estimated using the historical average domestic (residential and commercial) per capita wastewater baseflow of 47 gpcd and the projected population. Population estimates for the years not included in the DOA predictions from 2013 were based on linear interpolation of the WQT Plan population projections in **Table 2-2**. Additional allowances were made to account for historical public authority and industrial baseflows, historical infiltration and inflow, and unplanned future industrial growth. Unplanned future industrial growth is projected to increase proportionally with population growth.

Table 2-3: Belleville WWTF average annual design flow calculation for the start of WQT compliance (2023)

2023 Design Population		2,609
Per Capita Domestic Baseflow (gpcd)	x	47
Domestic Baseflow (gpd)		122,248
Industrial & Public Authority (gpd)	+	6,468
Future Baseflow (without I/I or future industrial growth)		128,716
Average Annual I/I (gpd)	+	96,672
Average Daily Flow (gpd)		225,388
4.1% Unplanned Industrial Growth (gpd)	+	9,241
Average Annual Design Flow (gpd)		**234,629**

Table 2-4: Belleville WWTF average annual design flow calculations at design conditions (2040)

2040 Design Population		2,870
Per Capita Domestic Baseflow (gpcd)	x	47
Domestic Baseflow (gpd)		134,477
Industrial & Public Authority (gpd)	+	6,468
Future Baseflow (without I/I or future industrial growth)		140,945
Average Annual I/I (gpd)	+	96,672
Average Daily Flow (gpd)		237,617
10% Unplanned Industrial Growth (gpd)	+	23,762
Average Annual Design Flow (gpd)		**261,379**

As shown **Table 2-3** and **Table 2-4**, the projected average annual design flow for 2023 is approximately 0.235 MGD (235,000 gpd) and for 2040 is approximately 0.261 MGD (261,000 gpd).

Although the above design flows are reasonable estimates of future flow conditions, additional conservatism is recommended when estimating the minimum number of phosphorus credits that are needed by the Village of Belleville for WQT compliance. One risk of WQT is that unforeseen events could significantly impact the amount of phosphorus credits that are needed for the Village to comply. For example, extreme precipitation events could lead to unexpected increases in effluent flow at the WWTF, treatment upsets could occur, and/or flooding could damage installed BMPs. Therefore, it is recommended that a safety factor be provided to account for unforeseen years of elevated flow. Based on the influent and effluent flow data in **Table 2-1**, the peak annual effluent flow of 0.278 MGD occurred in 2013. Comparing this with the historical average annual influent flow of 0.227 MGD, a peaking factor of 1.22 can be calculated (see **Equation 2-1**). It is recommended that this peaking factor be used as a safety factor when determining the minimum amount of phosphorus offsets needed by the Village of Belleville to comply with WQT.

Equation 2-1:

$$Safety\ Factor = \frac{Peak\ Avg.\ Annual\ Effluent\ Flow}{Avg.\ Annual\ Influent\ Flow} = \frac{0.278\ MGD}{0.227\ MGD} = 1.22$$

2.5 MAXIMUM PHOSPHORUS REMOVAL CAPABILITIES OF BELLEVILLE WWTF

On April 27, 2018, the Village submitted a *Compliance Alternatives, Source Reduction, Improvements, & Modifications Status Report* which evaluated chemical phosphorus removal via aluminum sulfate (alum) and rare earth metals (RE-300). Below is a summary of the chemical phosphorus removal study:

- The study began on November 8, 2017. Two types of chemicals were used: aluminum sulfate (alum) and rare earth metal (RE-300).
- Alum Testing
    - Historical chemical usage is approximately 23 gallons of alum per day (to the MLSS prior to the final clarifier splitter box). For the study, the alum dosage was increased to 46 gallons per day.
    - The data indicates that alum addition alone will not be able to meet the six-month average limit of 0.075 mg/L.
    - The alum study proved that concentrations below 0.2 mg/L could be achieved.
- RE-300 Testing
    - Chemical was added to the inner channel of the oxidation ditch to ensure proper mixing of the chemical.
    - RE-300 was added at an approximate rate of 35 gallons per day.
    - The data indicates that RE-300 addition along will not be able to meet the six-month average limit of 0.075 mg/L.
    - During the RE-300 study, the WWTF achieved an average effluent phosphorus concentration of 0.23 mg/L.

Overall, the pilot testing suggests that it is reasonable to assume the WWTF can consistently achieve phosphorus concentrations of less than 0.2 mg/L with proper operation. This is corroborated by the fact that the average annual effluent phosphorus concentration discharged by the WWTF in 2019 was 0.19 mg/L, even though influent flows were elevated approximately 59,000 gpd (26%) above average conditions. Based on the results of this pilot study, it can be assumed that the minimum effluent total phosphorus concentration that can be consistently achieved by the

existing WWTF is 0.19 mg/L. However, for the purposes of this report, trading goals will conservatively be based on a target concentration of 0.28 mg/L.

2.6 CURRENT & FUTURE PHOSPHORUS OFFSET REQUIREMENTS

Based on the projected design flows and historical phosphorus removal capabilities of the WWTF, the minimum amount of phosphorus credits that the Village of Belleville would need to generate to comply with WQT can be estimated. Using **Equation 2-2** below, the minimum number of credits needed by the Village at the start of WQT compliance in 2023 and at maximum design conditions in 2040 were estimated. As shown, it is estimated that 179 lbs credit/year is needed at the start of WQT compliance and 199 lbs credit/year is needed at maximum design conditions. Since the long term phosphorus removal goal of 199 lbs credit/yr is equal to the number of anticipated credits for the Village to generate by the end of Permit Term #1 after the project revisions, it is recommended the Village of Belleville continue to monitor the status of population growth and WWTF performance into the future and compare to the estimations in this plan to determine if additional credits will be needed.

Equation 2-2:

$$TP_{min} = Q_{avg.} \times (C_{target} - C_{WQBEL}) \times 8.34 \times \frac{365\ days}{year} \times SF$$

Where:

TP_{min}	=	minimum phosphorus credits required	$\left[\frac{lb}{year}\right]$
$Q_{avg.}$	=	projected average annual influent design flow	[MGD]
C_{target}	=	target effluent phosphorus concentration	$\left[\frac{mg}{L}\right]$
C_{WQBEL}	=	water quality based effluent limit for phosphorus	$\left[\frac{mg}{L}\right]$
SF	=	safety factor	

Minimum Phosphorus Credits Required at Start of WQT Compliance (2023):

$$TP_{min} = Q_{avg.} \times (C_{target} - C_{WQBEL}) \times 8.34 \times \frac{365\ days}{year} \times SF$$

$$= 0.235 \times \left(0.28\ \frac{mg}{L} - 0.075\ \frac{mg}{L}\right) \times 8.34 \times 365 \frac{days}{year} \times 1.22$$

$$= 179\ \frac{lbs}{year}$$

Minimum Phosphorus Credits Required at Design Conditions (2040):

$$\boldsymbol{TP_{min} = Q_{avg.} \times (C_{target} - C_{WQBEL}) \times 8.34 \times \frac{365\ days}{year} \times SF}$$

$$= 0.261 \times \left(0.28\ \frac{mg}{L} - 0.075\ \frac{mg}{L}\right) \times 8.34 \times 365 \frac{days}{year} \times 1.22$$

$$= 199\ \frac{lbs}{year}$$

It is important to note that the minimum number of phosphorus credits needed for the Village of Belleville to comply with WQT, as calculated above, assumes compliance with WQT for an entire calendar year or 12-month period. However, the Village will only be required to comply with WQT for nine months in the year 2023 (April through December) since the final compliance date for WQT for the Village is March 31, 2023. Therefore, the estimated number of credits needed in the year 2023 can be reduced to 135 lbs/yr as shown below:

Minimum Phosphorus Credits Required April Through December 2023:

$$\boldsymbol{TP_{min} = Q_{avg.} \times (C_{target} - C_{WQBEL}) \times 8.34 \times \frac{\#\ days}{year} \times SF}$$

$$= 0.235 \times \left(0.28\ \frac{mg}{L} - 0.075\ \frac{mg}{L}\right) \times 8.34 \times 275 \frac{days}{year} \times 1.22$$

$$= 135\ \frac{lbs}{year}$$

Using **Equation 2-2** and the design flow methodology presented in Section 2.4, the number of phosphorus credits needed by the Village in each year of WQT compliance for the next 20 years have been estimated as shown in **Table 2-5**. These estimates are provided for informational purposes only, as final numbers will have to be recalculated in future years based on actual phosphorus loadings discharged by the WWTF.

Table 2-5: Projected annual amount of phosphorus credits needed by the Village of Belleville (2023 - 2040)

Permit Term	Year	Projected Population	Projected Flow (MGD)	Phosphorus Credits Needed[1] (lbs/year)
#1	2021	2,563	0.230	-
	2022	2,586	0.232	-
	2023	2,609	0.235	135[2]
	2024	2,632	0.237	180
	2025	2,655	0.239	182
#2	2026	2,675	0.241	184
	2027	2,695	0.243	185
	2028	2,715	0.245	187
	2029	2,735	0.247	188
	2030	2,755	0.249	190
#3	2031	2,769	0.251	191
	2032	2,783	0.252	192
	2033	2,797	0.254	193
	2034	2,811	0.255	194
	2035	2,825	0.257	195
#4	2036	2,834	0.258	196
	2037	2,843	0.259	197
	2038	2,852	0.259	198
	2039	2,861	0.260	198
	2040	2,870	0.261	199

[1]Assumes WWTF can consistently achieve effluent phosphorus concentration of 0.28 mg/L and safety factor of 1.22.
[2] WQT becomes effective March 31, 2023, which will only require 9 months of trading compliance during 2023.

CHAPTER 3 – WATERSHED INVENTORY

3.1 INITIAL STAKEHOLDER MEETINGS & PUBLIC OUTREACH

Prior to meeting with private landowners to develop partnerships to reduce phosphorus discharges, the Village and MSA participated in a public outreach event to determine which areas of the upper Sugar River Basin were in greatest need for water quality improvements. The meeting was held with local stakeholders on June 5, 2019. A list of the groups who participated in this stakeholder meeting is presented below:

- Village of Belleville Public Works Department & Village Administrator
- MSA Professional Services, Inc. (MSA)
- Dane County Land Conservation Division (LCD)
- Wisconsin Department of Natural Resources (DNR)
- Upper Sugar River Watershed Association (USRWA)
- Farmers for the Upper Sugar River
- Local Landowners

At this meeting, stakeholders discussed previous experience in the upstream watershed and worked to identify partners who would be involved during the implementation of the WQT Plan.

MSA staff participated in additional public outreach events with the Upper Sugar River Watershed Association and Farmers for the Upper Sugar River to generate landowner interest in the project. Meetings and correspondence with staff from the Dane County Land Conservation Division were also critical in identifying potential landowner partners.

3.2 INITIAL LANDOWNER MEETINGS

Based on initial discussions with local stakeholders and a basic desktop survey, letter/flyers were mailed to over 28 landowners upstream of the Belleville WWTF. This resulted in 11 site visits with interested landowners. Site visits were all completed within the Primrose Branch-West Branch Sugar River subwatershed (HUC 070900040102), West Branch Sugar River subwatershed (HUC 070900040103), and Paoli-Sugar River subwatershed (HUC 070900040203). Of the 11 landowners who initially expressed interest, five (5) appeared to have viable projects for the Village to participate in.

3.3 ESTABLISHMENT OF THE FINAL WATER QUALITY TRADING ACTION AREA

Based on successful meetings with landowners, the Village and MSA determined that the final action area of the WQT Plan will be the Primrose Branch-West Branch Sugar River subwatershed (HUC 070900040102), West Branch Sugar River subwatershed (HUC 070900040103), and Paoli-Sugar River subwatershed (HUC 070900040203). The originally proposed trades were planned to be implemented within these three identified HUC 12 subwatersheds. The Landowner A and G projects removed from the plan are located in the Primrose Branch-West Branch Sugar River subwatershed (HUC 070900040102) and Paoli-Sugar River subwatershed (HUC 070900040203), respectively. The implemented Landowner D, E, and F projects are all located in the West Branch Sugar River subwatershed (HUC 070900040103). Other subwatersheds may be considered in future WPDES permit terms as the WQT plan continues to be implemented.

A general overview map of the proposed final WQT action area is shown in **Figure 3-1**. This map identifies portions of the action area which are located upstream and downstream of the Village's WWTF outfall. Notable water bodies in the action area are also listed on the map, including the Sugar River, West Branch Sugar River, Primrose Branch, Milum Creek, and Flynn Creek. Each of these surface waters is hydrologically connected to the Belleville WWTF outfall, and each is briefly described below.

3.3.1 SUGAR RIVER

The Sugar River is classified as an exceptional resource water by the DNR and is known as a diverse warm water sport fishery (http://dnr.wi.gov/water/waterDetail.aspx?WBIC=875300). The section of the river in the Water Quality Trading Action Area is classified as a Class II trout stream and a wadable smallmouth bass stream. Riparian backwaters and wetlands are common along the Sugar River, providing valuable habitat for aquatic species and waterfowl. Despite adequate habitat conditions, many sections of the river, including the sections located within the Action Area, are registered on Wisconsin's impaired waters 303d list due to excessive levels of phosphorus. Phosphorus impairments in the Sugar River are likely due to a combination of wastewater discharges and non-point source loadings from agriculture and urban development.

3.3.2 WEST BRANCH SUGAR RIVER

The West Branch of the Sugar River is considered a cold water fishery (Class II trout water). The West Branch of the Sugar River is considered impaired due to nonpoint source and point source impacts from phosphorus and mercury and is registered on Wisconsin's 303d list (https://dnr.wi.gov/water/waterDetail.aspx?key=13659).

3.3.3 PRIMROSE BRANCH

Primrose Branch is a tributary to the West Branch of the Sugar River. The stream is considered a cold (Class II trout) water. The stream is considered to be in good condition (https://dnr.wi.gov/water/waterDetail.aspx?key=13667).

3.3.4 MILUM CREEK

Milum Creek, an exceptional resource water (ERW), is considered to be a cold water forage fishery. Historically, redside dace, a rare aquatic species, has been identified in the stream. The stream is classified as impaired and is registered on Wisconsin's 303d list due to phosphorus (https://dnr.wi.gov/water/waterDetail.aspx?key=13660).

3.3.5 FLYNN CREEK

Flynn Creek, an exceptional resource water (ERW), is a tributary to the West Branch of the Sugar River and is classified as a cold (Class II trout) water. While the stream is considered to be in good condition, runoff from croplands and pastures causes siltation in the stream and potentially affects the in-stream habitat of the creek (https://dnr.wi.gov/water/waterDetail.aspx?key=13661).

Additional maps of the proposed final WQT action area are shown in **Figure 3-2** and **Figure 3-3**. These figures were created to help identify areas of the action area that might be prone to runoff and erosion. **Figure 3-2** is a topographic map of the action area which depicts the steep ridgelines

that define and separate the Primrose Branch-West Branch Sugar River subwatershed, West Branch Sugar River subwatershed, and Paoli-Sugar River subwatershed. Land use in the action area is depicted in **Figure 3-3**. As shown, the primary land use in the three subwatersheds is agriculture (e.g. cultivated crops and hay/pasture), especially in the less steep areas of the action area. The map also depicts the large number of wetlands and natural areas located along the main branch of the Sugar River and the forested ridges that separate the subwatersheds.

Figure 3-1: Final Village of Belleville WQT Action Area Overview Map

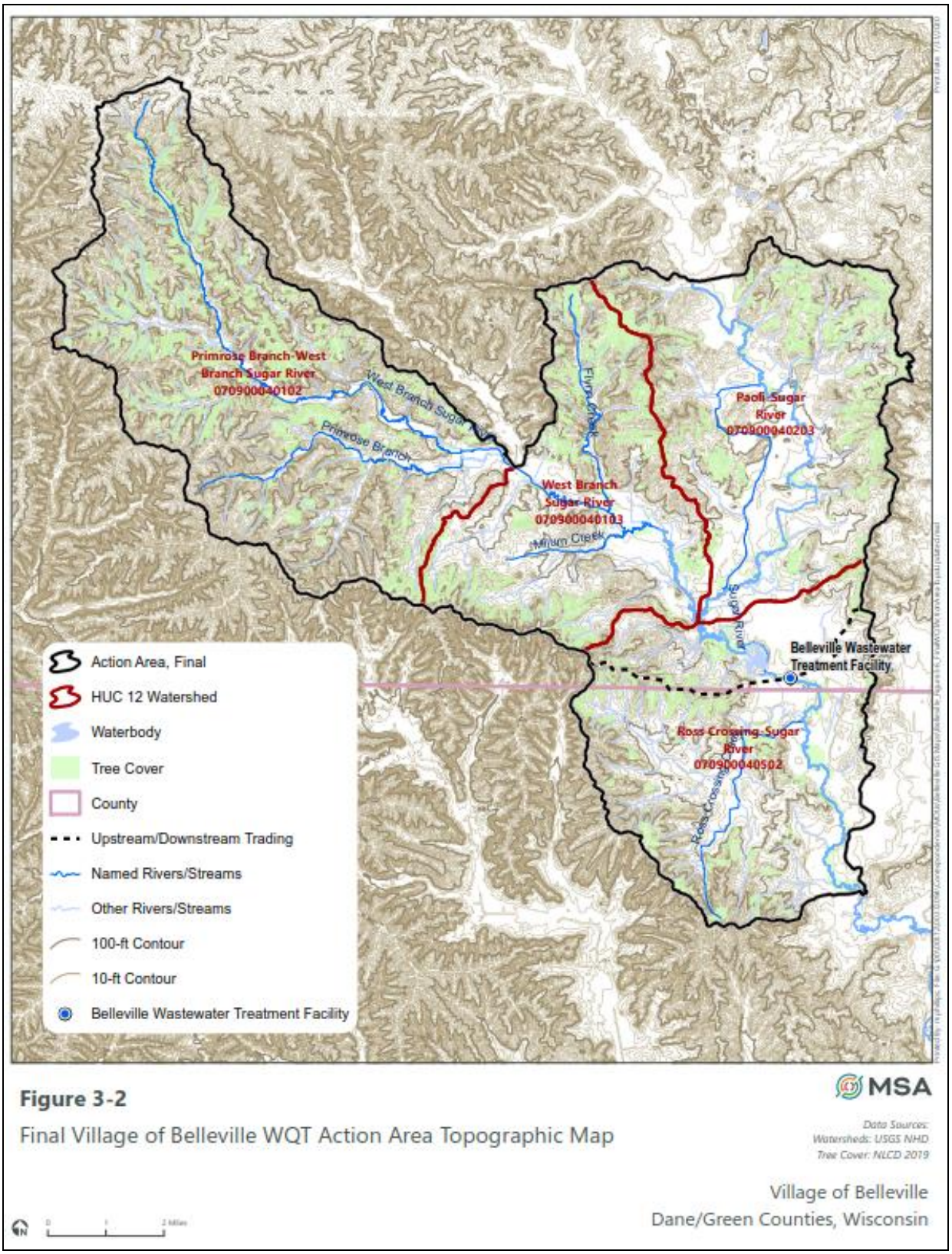

Figure 3-2: Final Village of Belleville WQT Action Area Topographic Map

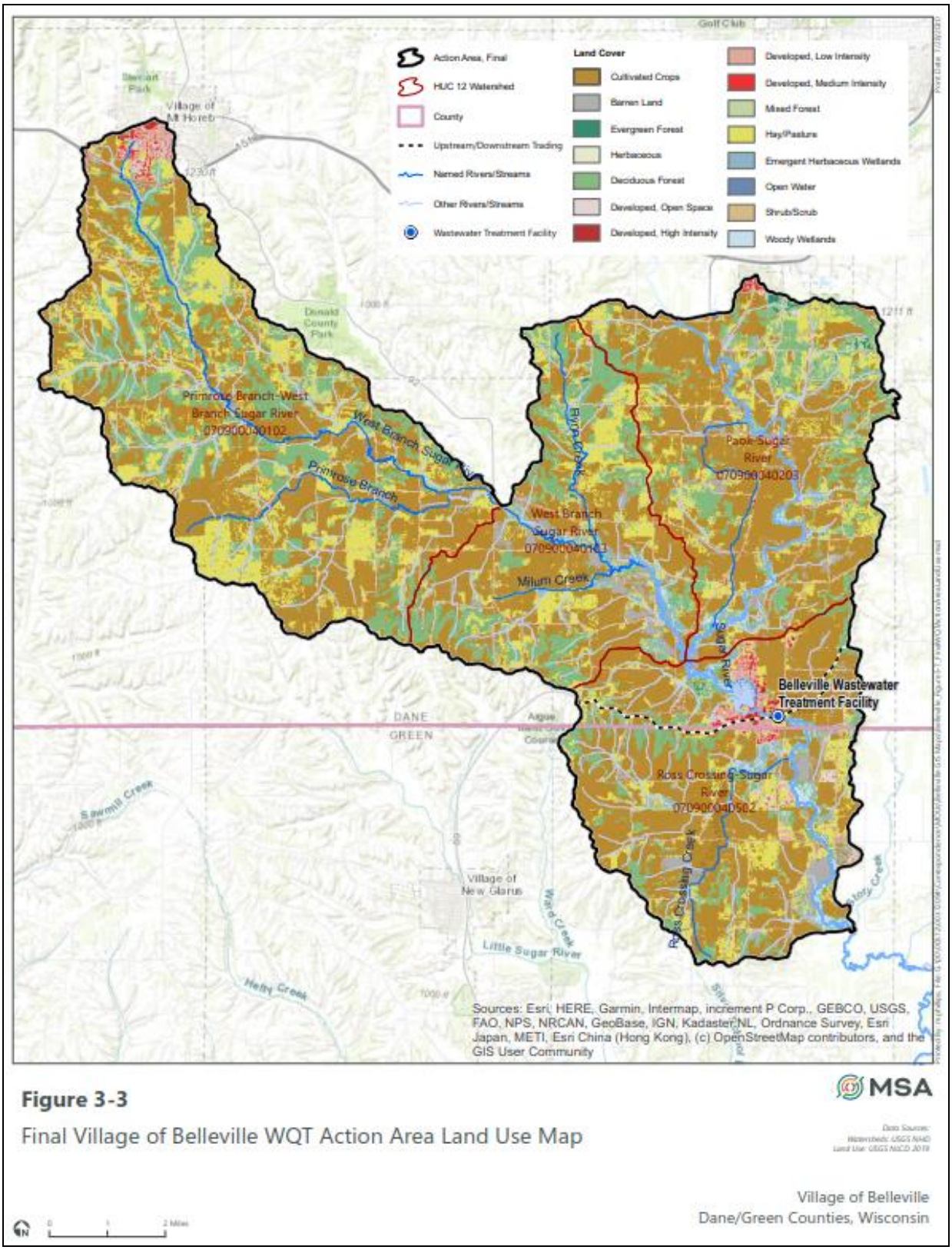

Figure 3-3: Final Village of Belleville WQT Action Area Land Use Map

CHAPTER 4 – TRADING STRATEGY

4.1 ROLES AND RESPONSIBILITIES

Identifying the roles and responsibilities of partners is important to the success of this WQT Plan. As stated in Chapter 3, many local groups are actively interested in water quality improvements in the Belleville WQT action area. Tapping into local knowledge, coordinating with governmental agencies, and reaching out to public and non-profit groups will improve relationships with local landowners and better leverage all the available assets these groups have to offer. More importantly, a significant amount of coordination between consultants, regulatory agencies, and other partners will be needed for the Village to successfully implement the WQT Plan. All proposed improvements must ultimately be designed, reviewed, permitted, funded, and constructed before phosphorus credits can be generated. Therefore, it is important to define which groups will be responsible for providing technical assistance, funding, and regulatory oversite for future projects. **Table 4-1** below summarizes the roles and responsibilities of all partners who are anticipated to participate in the implementation of the Belleville WQT Plan.

Table 4-1: Belleville WQT Plan partner roles and responsibilities

Partner	Roles & Responsibilities
Village of Belleville	The Village will be the lead partner in the Water Quality Trading project. All major project related decisions will be made or reviewed by the Village. The Village will provide the majority of all financial assistance for the project related to technical assistance, BMP implementation, and BMP operational costs. The Village will work with other partners to best leverage external funding sources, establish timelines for proposed projects, and identify possible opportunities for phosphorus reductions in the WQT action area.
MSA Professional Services, Inc. (MSA)	MSA will provide technical assistance to the Village of Belleville. Technical assistance will include services related to the operation of the Village's wastewater treatment facility, engineering services related to BMP implementation and the quantification of phosphorus credits, annual reporting and inspections, and funding assistance as it pertains to grant proposals and cost-share applications.
Dane County Land & Water Resources Department – Land Conservation Division (LCD)	Dane County LCD has been supportive of the WQT planning efforts and will be an essential partner in the implementation of the WQT Plan. Dane County LCD will provide regulatory oversight for the project. All BMPs that are implemented within Dane County related to Belleville's WQT Plan will be reviewed by Dane County LCD. The Dane County LCD will be relied on for making determinations regarding landowner compliance with Wisconsin's agricultural performance standards and manure management prohibitions, which are listed in NR 151, and for reviewing future landowner compliance with these rules.

Table 4-1 (continued): Belleville WQT Plan partner roles and responsibilities

Partner	Roles & Responsibilities
Natural Resources Conservation Service (NRCS)	NRCS may provide financial assistance for implementation of the WQT Plan. NRCS programs such as the Environmental Quality Incentives Program (EQIP) will be considered on a project by project basis to provide funding to landowners who implement BMPs as part of the WQT Plan.
Wisconsin Department of Natural Resources (DNR)	The Wisconsin DNR will provide regulatory oversight for the WQT Plan. DNR will coordinate directly with the Village regarding compliance with effluent limits at the wastewater treatment facility and progress with implementing the WQT Plan. Fisheries and water resources staff should be contacted regarding permitting and design of projects that may impact navigable water bodies in the WQT Action Area.

4.2 TRADE RATIO CALCULATIONS

The effectiveness of all phosphorus trades are to some level uncertain, and thus, a "trade ratio" (i.e. safety factor) is needed to ensure that water quality improvements occur as a result of a trade. When calculating the number of phosphorus credits that are generated by a specific BMP, the amount of phosphorus which is removed by the BMP is divided by the applicable trade ratio as shown in **Equation 4-1**.

Equation 4-1:

$$\text{Phosphorus Credits } \left[\frac{\text{lbs}}{\text{yr}}\right] = \frac{\text{Phosphorus Removed by BMP } \left[\frac{\text{lbs}}{\text{yr}}\right]}{\text{Trade Ratio}}$$

The magnitude of a trade ratio is site specific and depends on a number of factors, such as the relative location of the trade in comparison to the wastewater treatment facility outfall, the perceived uncertainty of the BMP that is implemented, and if the implemented BMP provides any benefit to aquatic or wildlife habitat. In general, BMPs that are implemented upstream and within close vicinity of the wastewater outfall and which are perceived to be highly effective practices are assigned lower trade ratios. The general equation used to estimate the trade ratio for a given BMP is shown below:

Equation 4-2:

$$\text{Trade Ratio} = \text{Delivery} + \text{Downstream} + \text{Equivalency} + \text{Uncertainty}$$

A detailed description of each factor in **Equation 4-2** can be found in DNR's *Guidance for Implementing Water Quality Trading in WPDES Permits* (2020). It is important to note that the minimum trade ratio for point to point source trades is 1.1:1 and the minimum trade ratio for point to nonpoint source trades is 1.2:1. Once a trade ratio is calculated using **Equation 4-2,** it must be compared to these minimum trade ratios.

For the purposes of this WQT Plan, all trades are expected to occur upstream of the wastewater treatment facility outfall. Since no trades are planned to be installed downstream of the outfall, the downstream factor is zero. An equivalency factor is also unnecessary since the traded pollutant is phosphorus. Thus, for the purposes of this WQT Plan, **Equation 4-2** can be simplified to only include the delivery factor and uncertainty factor (see **Equation 4-3**).

Equation 4-3:

$$\text{Trade Ratio} = \text{Delivery} + \text{Uncertainty}$$

The delivery factor is needed whenever a trade is generated in a different HUC 12 watershed than the permittee's wastewater outfall or when a lake or reservoir is located between the credit user and generator. In the case of Belleville's WQT action area (see **Figure 3-1**), a delivery factor is needed for all trades that are located the Primrose Branch-West Branch Sugar River subwatershed (HUC 070900040102), West Branch Sugar River subwatershed (HUC 070900040103), and Paoli - Sugar River subwatershed (HUC 070900040203). All trades located upstream of the Village's WWTF outfall in the Ross Crossing – Sugar River subwatershed (HUC 07900040502) would have a delivery factor of zero.

In the absence of a U.S. EPA approved TMDL for the receiving water, the delivery factor is calculated using the phosphorus "delivery fraction" from the USGS SPARROW model as shown in **Equation 4-4**.

Equation 4-4:

$$\text{Delivery Factor} = \left(\frac{1}{\text{SPARROW Delivery Fraction}}\right) - 1$$

The SPARROW Delivery Fraction can be calculated by comparing the delivery fraction for the specific SPARROW catchment for the credit generator and the credit user (see **Equation 4-5**).

Equation 4-5:

$$\text{SPARROW Delivery Fraction} = 1 - \left(\frac{\textit{Credit User Del. Fraction} - \textit{Generator Del. Fraction}}{\textit{Credit User Del. Fraction}}\right)$$

Figure 4-1 displays the SPARROW catchment delivery fraction values and compares them to the location of the existing HUC 12 boundaries of the WQT Action Area. Using **Equation 4-4** and **4-5** the delivery factor for each of these portions of the WQT Action Area were calculated. **Table 4-2** summarizes delivery factors for all possible upstream trade locations in the Belleville WQT action area.

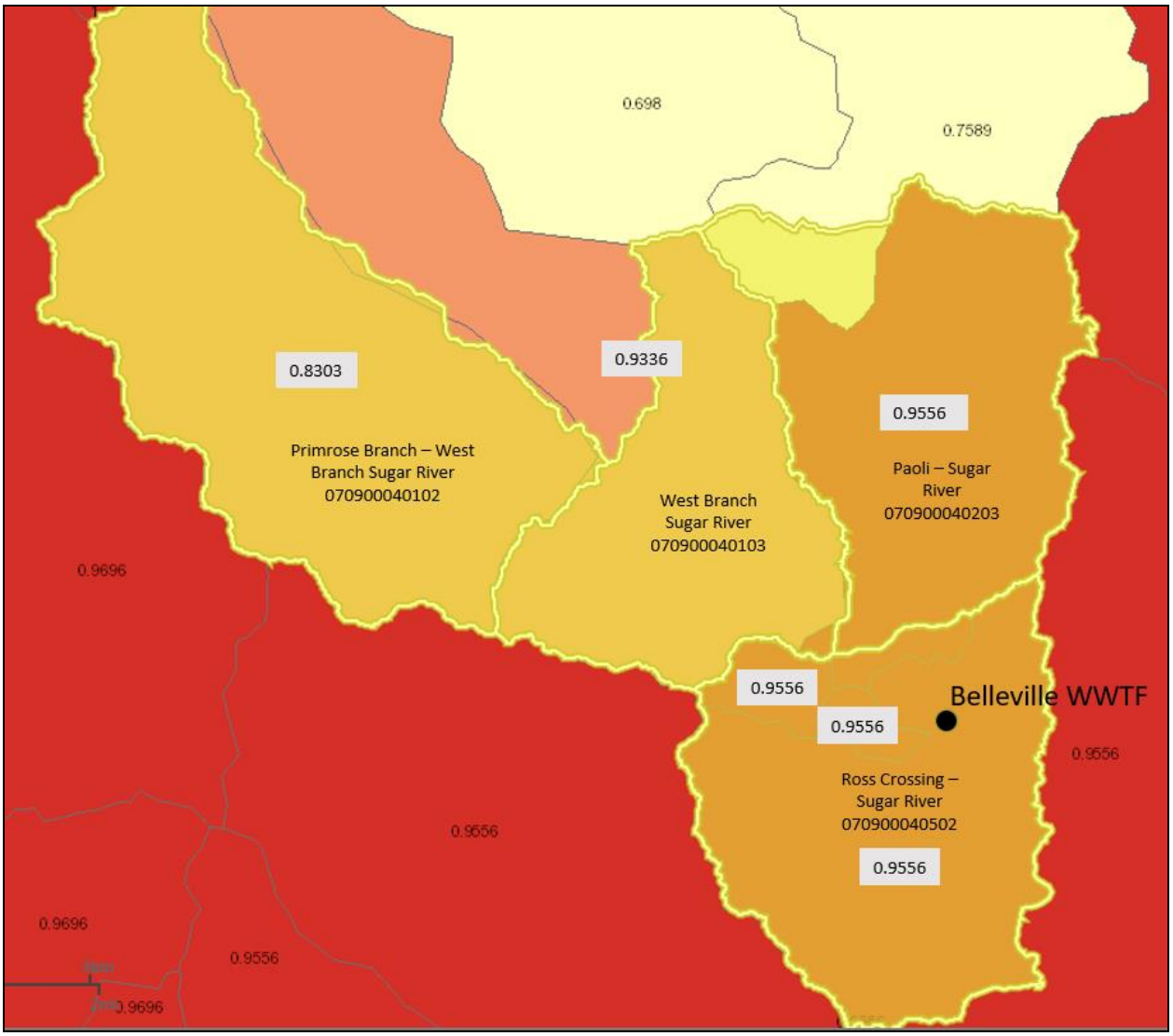

Figure 4-1: SPARROW Delivery Fraction Values for Corresponding HUC 12 Watersheds

Table 4-2: Possible Delivery Factors for Upstream Trade Locations in Belleville WQT Action Area

HUC 12	SPARROW Catch. Delivery Fraction	Calculated Delivery Fraction	Delivery Factor
Primrose Branch – West Branch Sugar River	0.8303	0.8689	0.15
West Branch Sugar River	0.9336	0.9770	0.02
Paoli – Sugar River	0.9556	1.0000	0.00
Ross Crossing – Sugar River	0.9556	1.0000	0.00

The uncertainty factor is needed for all point to nonpoint source trades. The uncertainty factor accounts for inaccuracies in water quality models that are used to quantify phosphorus load reductions from a given management practice. Uncertainty factors for various management practices are listed in Appendix H of DNR's *Guidance for Implementing Water Quality Trading in WPDES Permits* (2020). Management practices and associated uncertainty factors that are currently expected to be incorporated in the WQT Plan are listed in **Table 4-3**.

Table 4-3: Uncertainty Factors

Management Practice	Uncertainty Factor
Whole Field Management	1.0
Nutrient Management and Supporting Practice w/o Grassed Waterways[1]	2.0 or 3.0
Nutrient Management and Supporting Practice w/ Grassed Waterways	1.5
Production Area Diversion	2.0
Production Area Roof Runoff Structure	2.0
Streambank Stabilization w/o Habitat Adjustment	3.0
Streambank Stabilization w/ Habitat Adjustment[2]	2.0 or 3.0

[1]*The uncertainty factor for nutrient management and supporting practices is 3.0 and can be lowered to 2.0 if documentation can be provided to DNR to demonstrate the credit generator's adherence to the nutrient management plan.*
[2]*The uncertainty factor for streambank stabilization with habitat restoration is 2.0 if the improvements are made to a stream which is listed as impaired for phosphorus and the habitat improvement plan is approved by DNR. If streambank stabilization and habitat improvements are made to a stream which is not impaired, the uncertainty factor is 3.0.*

In summary, trade ratios for the management practices proposed in this WQT Plan can be estimated using **Equation 4-3** and the delivery factors and uncertainty factors listed in **Table 4-2** and **Table 4-3**, respectively. As previously mentioned, no trade ratios can be lower than the minimum allowable trade ratios for point to point (1.1:1) and point to nonpoint trades (1.2:1).

4.3 CREDIT THRESHOLDS

As per DNR's *Guidance for Implementing Water Quality Trading in WPDES Permits* (2020), there are two types of credits which can be generated under a trading program: 1) interim credits and 2) long-term credits. Interim credits are only available for a short time period (≤ 10 years), and long term credits are available in perpetuity as long as the implemented practice is maintained. Whether an interim or long-term credit is generated by a management practice is dependent on the defined "credit thresholds" in the watershed where the management practice is implemented. The "credit threshold" is the amount of phosphorus reduction which must be removed before a "long-term" credit can be generated. Credit thresholds for phosphorus typically only apply in watersheds with an approved TMDL for phosphorus. Since there is not an approved TMDL for phosphorus in any of the streams located within the Belleville WQT Action Area, credit thresholds currently do not apply to the management practices recommended by this WQT Plan. Therefore, all trades that reduce nonpoint source loads below the current level that are implemented by the Village of Belleville will be considered "long-term" credits and will generate credits throughout the maintained life of the management practice.

4.4 RECOMMENDED PROJECTS

Compliance with WQT can involve the procurement of phosphorus credits with a number of different credit generators. For example, trading is allowed between point sources (i.e. trading with another upstream wastewater permittee) and nonpoint sources (i.e. trading with agricultural producers, private landowners, or municipal stormwater utilities). For the purposes of this WQT Plan, point to point source trading and urban stormwater management improvements have been determined to be infeasible and/or not cost effective. As described in Section 3.2 of this report, the Village and MSA have identified three (3) private landowners located upstream of the Belleville WWTF who have been willing to establish legal agreements to become credit generators for the Village. For the purposes of protecting landowner privacy, these landowners will be referred hereinafter in this report as Landowner A, Landowner D, Landowner E, Landowner F, and Landowner G. Projects with each landowners were determined to be feasible and cost effective during the 2020 WQT Plan development. Therefore, projects with all landowners were recommended for implementation to generate phosphorus credits for the Village of Belleville. As described previously, the Landowner A and G projects have been removed as part of this plan revision due to changes in ownership and complications with the landowner agreement process.

The following section of this report summarizes each project site, management practices that are planned to be implemented with each landowner, and the amount of credits that are estimated to be generated. All practices will be designed and maintained according to NRCS standards and design documents for all proposed practices will be sent to applicable regulatory agencies for review prior to implementation (e.g., Dane County LCD, NRCS, DNR, etc.).

More detailed credit calculations for each landowner are provided in **Appendix C**, **D**, and **E**.

Landowner A

History of Project Site:

Landowner A is a relatively small livestock producer (<100 animal units), who owns property along Primrose Branch, a Class 2 trout stream in Dane County. The original proposed project included plans to repair eroding streambanks along the property, provide adequate fencing/buffers between the animal production area and adjacent water resources, and complete barnyard upgrades with proper clean water diversions to the nearby waterway. After the completion of design and prior to beginning construction of the projects, the property changed ownership. This would have resulted in additional efforts to re-draft the landowner agreement, potentially revise the design, and re-permit the projects for construction. Based on the Village's status of credits needed and generated, as well as these additional efforts required to move the projects forward, the Village of Belleville decided to not proceed with these Landowner A projects and remove them from the WQT Plan. Therefore, subsequent project information and credit calculations for Landowner A included in the original WQT Plan have been deleted from this version.

Landowner D

History of Project Site:

Landowner D owns approximately 50 acres of crop fields near the headwaters of Milum Creek, a small stream impaired for phosphorus in Dane County. The farm has no livestock and has not had livestock for many years. The crop fields are annually rented to a local dairy. The fields have been planted as continuous corn for approximately 10 years. Generally the crop is harvested as corn grain. However, the crop was harvested as corn silage in 2019 and 2020. Tillage is completed annually with a chisel plow. Manure (primarily dairy solids) is annually hauled on the fields, though the amount is not certain. All fields test excessively high for phosphorus (>30 ppm).

The crop fields are located in a topographic bowl, down gradient from steep forested and cropped ridges. A large amount of water passes through the farm before it forms the start of Milum Creek. The owner has installed several large waterways to collect and pass the water downstream. Additionally, all of the fields are tiled. No active gullies were identified in the existing crop fields, but signs of washing/deposition are apparent. Additional waterways will be installed to address specific problem areas.

Project Location:

The project site is located in the West Branch Sugar River subwatershed (HUC 070900040103) in Dane County, Wisconsin. The site is approximately 9.5 stream miles upstream from the Belleville WWTF. Maps of the crop fields owned by Landowner D are shown in **Figure 4-2**. The three (3) fields identified represent all of the fields that the landowner owns, rents, or otherwise controls cropping practices.

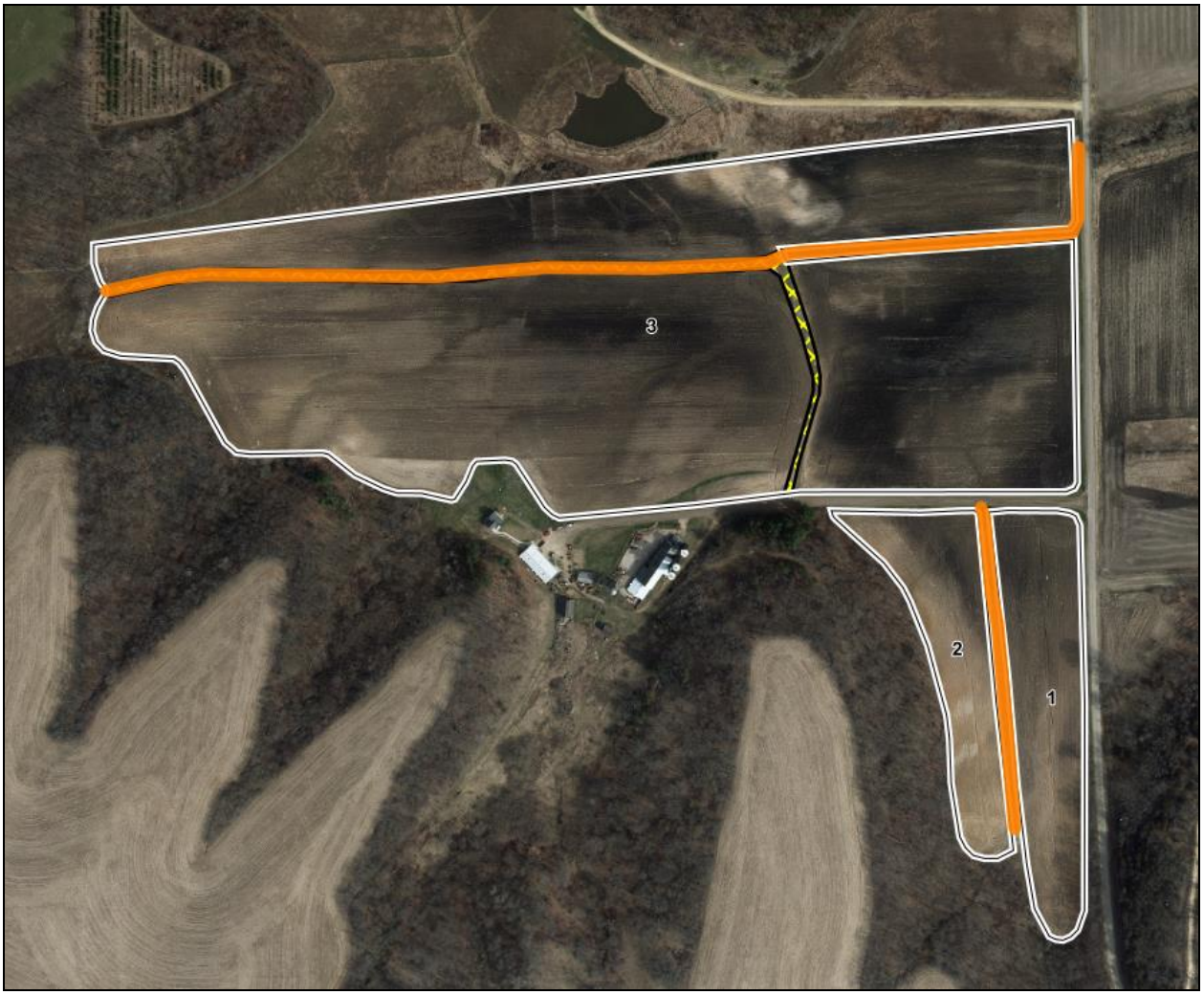

Figure 4-2: Map of Crop Fields Owned by Landowner D (50.9 acres)

Orange lines indicate the location of existing grassed waterways.
Yellow crosshatching indicates the location of an existing field road.

Proposed BMPs:

Phosphorus credits are planned to be generated with Landowner D by converting the existing 50.9 acres of crop fields from annual row crop production to perennial grass hay for a minimum of 10 years. The landowner will be paid an annual rental payment and will be provided an upfront cost share to establish the grass hay cover crop. Additional grass waterways/diversions are planned to

be constructed (Fields 1 and 3) to reduce the potential for gully erosion in the existing crop fields. The landowner will be allowed and encouraged to harvest the grass hay to draw down phosphorus levels in the soil. The landowner will be required to have a Nutrient Management Plan. No manure or phosphorus fertilizer will be allowed to be applied to the crop fields until soil testing confirms phosphorus concentrations are no longer excessively high. Because the proposed improvements will include a nutrient management plan, supporting conservation practices, a soil test phosphorus draw down strategy, and perennial vegetation, it is believed these practices should meet DNR's expectation for "Whole Field Management."

Whole Field Management:

- Conversion of continuous corn crop rotation on all fields to perennial vegetation (harvestable grass hay) for 10 years.
- Improved Nutrient Management practices
    - Development of an annually updated Nutrient Management Plan
    - No applications of phosphorus containing soil amendments until soil test levels are drawn down to optimum levels.
    - No applications of manure, biosolids, or industrial wastes on snow covered or frozen ground or on fields with high groundwater or tile drainage.
    - Continued maintenance of existing grassed waterways and further implementation of waterways/diversions, as needed, to reduce sheet, rill, and gully erosion.

Applicable Standards:

- NRCS 312 - Diversion
- NRCS 412 - Grassed Waterway
- NRCS 511 - Forage Harvest Management
- NRCS 512 - Forage and Biomass Planting
- NRCS 590 - Nutrient Management

Design Life:

Nutrient management and supporting cropping practices have a design life of 1 year. The Nutrient Management Plan must be updated and approved on an annual basis.

Grassed waterways/diversions have an expected design life of 10 years or more with proper maintenance.

Permitting Requirements:

No permits are anticipated to be required unless grassed waterway construction exceeds 1.0 acre in size. If greater than 1.0 acre is disturbed, a construction site storm water permit will be needed from DNR.

Operation & Maintenance Plan:

Proposed items for the Operation and Maintenance Plan are listed below. Implementation of the Operation and Maintenance Plan for Landowner D will primarily be the landowner's responsibility with the Village providing annual inspections and aid, as needed, for maintenance and/or repairs for deteriorating or failing waterways/diversions or the grass hay cover crop.

For the purposes of this Operation and Maintenance Plan, severe floods are defined as any hydrologic event resulting from a 24-hour cumulative precipitation in excess of 3.5 inches of rainfall (i.e., the 5-year 24-hour precipitation event based on the annual maximum time series as defined for Belleville, WI, by NOAA Atlas 14, Volume 8, Version 2).

Conditions for Perennial Forage and Biomass Planting and Harvest Management:

1. Identified crop fields shall be seeded with a perennial grass or grass/legume mixture. No row crops are allowed to be planted on these fields during the 10-year agreement (i.e., credit generating) period. Identified fields will not be used for livestock grazing.

2. Inspect and calibrate seeding equipment prior to use. Continually monitor the performance of the seeding equipment during planting to achieve proper rate, distribution, and depth of planting material.

3. The growth of desired seedlings shall be monitored and evaluated during the establishment period.

4. Monitor new plantings for water stress. Depending on the severity of drought, water stress may require reducing weeds, early harvest of any companion crops, irrigating when possible, or replanting failed stands.

5. New seedings shall not be harvested until plants have established sufficient root systems to withstand traffic and to recover from removal of top growth.

6. Mowing or herbicide applications shall be used as necessary to control competitive weeds. Mowing should be done before weeds develop matured seed. The residue from mowing shall be uniformly distributed or harvested as necessary to avoid smothering new seedlings.

7. Harvest of the grass hay cover crop is allowed and encouraged to draw down soil test phosphorus concentrations. Minimum stubble height after cutting shall not be less than 4 inches.

8. Reseed and/or add the recommended fertilizer and other necessary soil amendments to maintain sufficient growth and vegetative coverage of the perennial grass hay cover crop.

9. Dispose of the plastic wrap or bags used to store forage in an environmentally sound manner.

Conditions for Nutrient Management Plan:

1. All crop fields that the landowner owns, rents, or apply nutrients must be incorporated into a Nutrient Management Plan consistent with the NRCS 590 standard. All crop field management practices shall be documented using SnapPlus, Wisconsin's NRCS 590 nutrient management planning software. The SnapPlus database and Nutrient Management Plan shall be annually updated to account for planned and actual cropping practices, including crop rotation, tillage practices, manure applications, commercial fertilizer applications, and other field amendments. The Nutrient Management Plan must be approved by a Certified Crop Advisor (CCA) or equivalent and must be annually submitted to Dane County Land Conservation Division and the Village of Belleville for review and record keeping.

2. All fields in the Nutrient Management Plan that the landowner owns, rents, or otherwise controls cropping practices shall have up to date soil testing completed in accordance with University of Wisconsin-Extension document *A2100 Sampling Soils for Testing*.

3. All grassed waterways and other conservation practices supporting the Nutrient Management Plan must be implemented and maintained in accordance with applicable NRCS standards.

4. No application of phosphorus containing fertilizer or other soil amendments are allowed until soil test levels are drawn down to optimum levels per University of Wisconsin-Extension document *A2809 Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin*.

5. No application of manure, biosolids, or industrial wastes is allowed on snow-covered or frozen ground or on fields with high groundwater (soils with less than 12 inches to apparent water table) or tile drainage.

6. If any field is found to be non-compliant with the Nutrient Management Plan during a given crop year, the landowner will be required to repay the annual rental payment for the acreage that was deemed non-compliant for that year. Any fields planted to row crops during the 10-year agreement period that were previously agreed to remain as perennial grass hay will automatically be considered non-compliant with the Nutrient Management Plan and will continue to be deemed non-compliant until the perennial grass hay cover crop is reestablished.

Conditions for Grassed Waterways/Diversions:

1. Protect waterways/channels from concentrated flow during vegetation establishment by diverting runoff or by using mechanical means of stabilization such as silt fences, mulching, hay bale barriers, etc. to stabilize grade.

2. Avoid excessive travel on any portion of a grassed waterway or diversion that will damage or destroy the vegetative cover. Do not use as a roadway or field access road. Avoid crossing with heavy equipment when wet. Avoid using as turn-rows during tillage, cultivation, and harvesting operations. Lift equipment when crossing waterways and turn off chemical application equipment.

3. Installed berms or channels will not be removed without prior approval. Channel side slopes are not to be tilled.

4. Maintain vigorous growth of desirable vegetation. This includes reseeding, fertilization and controlled application of herbicides when necessary. Periodic mowing may also be needed to control height. Mow at least one time per year to control woody vegetation. Control noxious weeds and woody vegetation by hand, chemical, and/or other mechanical means.

5. During the first year of the seeding establishment growing season, waterway vegetation must be clipped by August 1 to allow seeded grasses to compete with weed species.

6. Minimum vegetation height after cutting shall not be less than 4 inches.

7. Install and maintain fences to prevent livestock access when adjacent fields are used for pasture.

8. Chemicals that kill/damage grass will not be sprayed onto or allowed to drain into the waterway.

9. Inspect grassed waterways regularly, especially following significant precipitation or runoff events.

    a. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly. Damaged areas will be filled, compacted, and seeded immediately.

    b. Remove sediment deposits in channels to maintain design capacity.

    c. Remove woody vegetation from berms and/or channels to maintain design capacity.

    d. Remove all foreign debris that may reduce capacity or hinder system operation.

    e. Periodically check the earth fill sections for cracks or settlement and repair damage.

    f. Immediately repair any damage caused by vandalism, vehicular traffic, or livestock access to any earth fills, outlets or other appurtenances.

Modeling Procedures:

Phosphorus reductions from the implementation of whole field management practices were simulated using the “P Trade Report” in SnapPlus. SnapPlus modeling procedures are described in greater detail in **Appendix E**. As discussed above, the landowner plans to convert from an annual corn grain crop rotation to perrenial grass hay rotation thoughout the life of the agreeement with the Village of Belleville. **Table 4-4** summarizes estimated annual phosphorus loss reductions from the crop fields for a 5-year crop rotation beginning in 2021 and ending in 2025. As shown, phosphorus loss is expected to be reduced by an average of **43.0 lbs/yr** (rotation average).

Table 4-4: Phosphorus Reductions Estimated using the SnapPlus "P Trade Report"

Field ID	Acres	Scenario	PTP (lbs/year) Permit Term #1				
			2021	**2022**	**2023**	**2024**	**2025**
1	4.7	Baseline	21.5	7.0	6.5	6.4	6.4
		Whole Field Management	8.8	2.8	2.2	1.7	1.3
		Phosphorus Reduction	**12.7**	**4.2**	**4.3**	**4.8**	**5.2**
2	3.8	Baseline	24.6	6.6	6.0	6.0	6.0
		Whole Field Management	9.9	2.0	1.5	1.1	0.8
		Phosphorus Reduction	**14.7**	**4.6**	**4.6**	**4.9**	**5.2**
3	42.4	Baseline	125.0	50.9	48.1	47.8	47.7
		Whole Field Management	65.4	33.9	28.6	23.0	18.3
		Phosphorus Reduction	**59.6**	**17.0**	**19.5**	**24.7**	**29.4**
Total	50.9	Baseline	171.1	64.4	60.6	60.2	60.1
		Whole Field Management	84.2	38.6	32.3	25.8	20.3
		Phosphorus Reduction	**86.90**	**25.76**	**28.28**	**34.43**	**39.80**
		Avg. Reduction			**43.0**		

Trade Ratios Calculations:

Calculation for Whole Field Management:

$$\text{Trade Ratio} = \text{Delivery} + \text{Uncertainty}$$

$$\text{Delivery Factor} = 0.02 \ (\text{see } \mathbf{Table\ 4-2})$$

$$\text{Uncertainty Factor} = 1.00 \ (\text{see } \mathbf{Table\ 4-3})$$

$$\text{Trade Ratio} = 0.02 + 1.00 = 1.02 \rightarrow 1.20 \ (\text{minimum point to non-point trade ratio})$$

Credit Calculations:

Calculation for Whole Field Management:

$$\text{Phosphorus Credits} \left[\frac{\text{lbs}}{\text{yr}}\right] = \frac{\text{Phosphorus Removed by BMP} \left[\frac{\text{lbs}}{\text{yr}}\right]}{\text{Trade Ratio}}$$

$$= \frac{43.0 \text{ lbs/yr}}{1.20}$$

$$= \mathbf{35.9 \text{ lbs/yr}}$$

Estimated Cost:

The estimated costs for the Village to implement the improvements for Landowner D are shown in **Table 4-5**. These costs assume the Village of Belleville bears all costs. Capital costs include an initial cost share to the landowner to establish the perennial grass hay cover crop and install new grassed waterways/diversions. Annual operation and maintenance costs include annual rental payments to the landowner, annual repair funds to facilitate the maintenance and repair of grassed waterways, and the costs of annual inspections and reporting.

Table 4-5: Village's Estimated Costs for Implementing BMPs for Landowner D

Capital Costs	Annual O&M Costs	20-year Present Worth
$ 33,000	$ 23,400	$ 377,000

Eligible Funding Sources:

No external funding sources are recommended to be pursued for the whole field management practice implementation with Landowner D.

Landowner E

History of Project Site:

Landowner E owns approximately 40 acres of crop fields near the headwaters of Milum Creek, a small stream impaired for phosphorus in Dane County. The landowner is interested in reducing streambank erosion along Milum Creek, which flows through the middle of the existing crop fields. The stream has a sandy bed and silty banks. The stream corridor is heavily wooded with boxelder and other undesirable trees. Twenty-nine (29) eroding banks were identified ranging from moderate to severe erosion. The erosion is likely attributable to high amounts of runoff from the steep surrounding topography and trees that have fallen in the channel, reducing flow capacity. No livestock have access to the steam. Bare eroding banks, vegetative overhang, exposed roots, and fallen trees signify that streambank erosion is a resource concern for the site.

The landowner is also interested in converting existing crop fields to perennial grass hay, similar to what is proposed with Landowner D. The existing crop sequence for this farm consists of a two-year corn-soybean rotation. Fields are chisel plowed in fall following corn harvest and prior to planting soybeans. Corn is then no-tilled in the spring following soybean harvest. Manure is annually spread on corn fields prior to planting. The landowner owns a small herd of beef cattle, approximately 30 head. Manure consists of dry, bedded pack beef manure. Bedding is primarily corn stover. The landowner keeps track of the amount of loads spread on the fields. It is estimated that approximately 224 tons of manure is spread on an annual basis. The landowner does plan to downsize his beef herd as part of the project with the Village, which should result in less manure in future years of implementation. Of the six (6) fields the landowner operates, four (4) currently have excessively high phosphorus levels (>30 ppm). The other fields have optimum soil test phosphorus levels; these fields are located the farthest away from the farm's original animal production area. Two of the fields located directly south of Milum Creek, which have excessively high phosphorus levels, are also tile drained (at least partially). Gully erosion is not a concern for the crop fields, no

gullies were identified during a site walkover, and the landowner has existing surface drainage ditches installed in concentrated flow areas.

Project Location:

The project site is located in the West Branch Sugar River subwatershed (HUC 070900040103) in Dane County, Wisconsin. The site is approximately 9.2 stream miles upstream from the Belleville WWTF. Maps of the locations of eroding streambanks along Milum Creek and the adjacent crop fields owned by Landowner E are shown in **Figure 4-3** and **Figure 4-4**, respectively. The six (6) fields identified represent all of the fields that the landowner owns, rents, or otherwise controls cropping practices. Other fields currently owned by the Landowner E have recently been taken out of production and placed in the conservation reserve program (CRP).

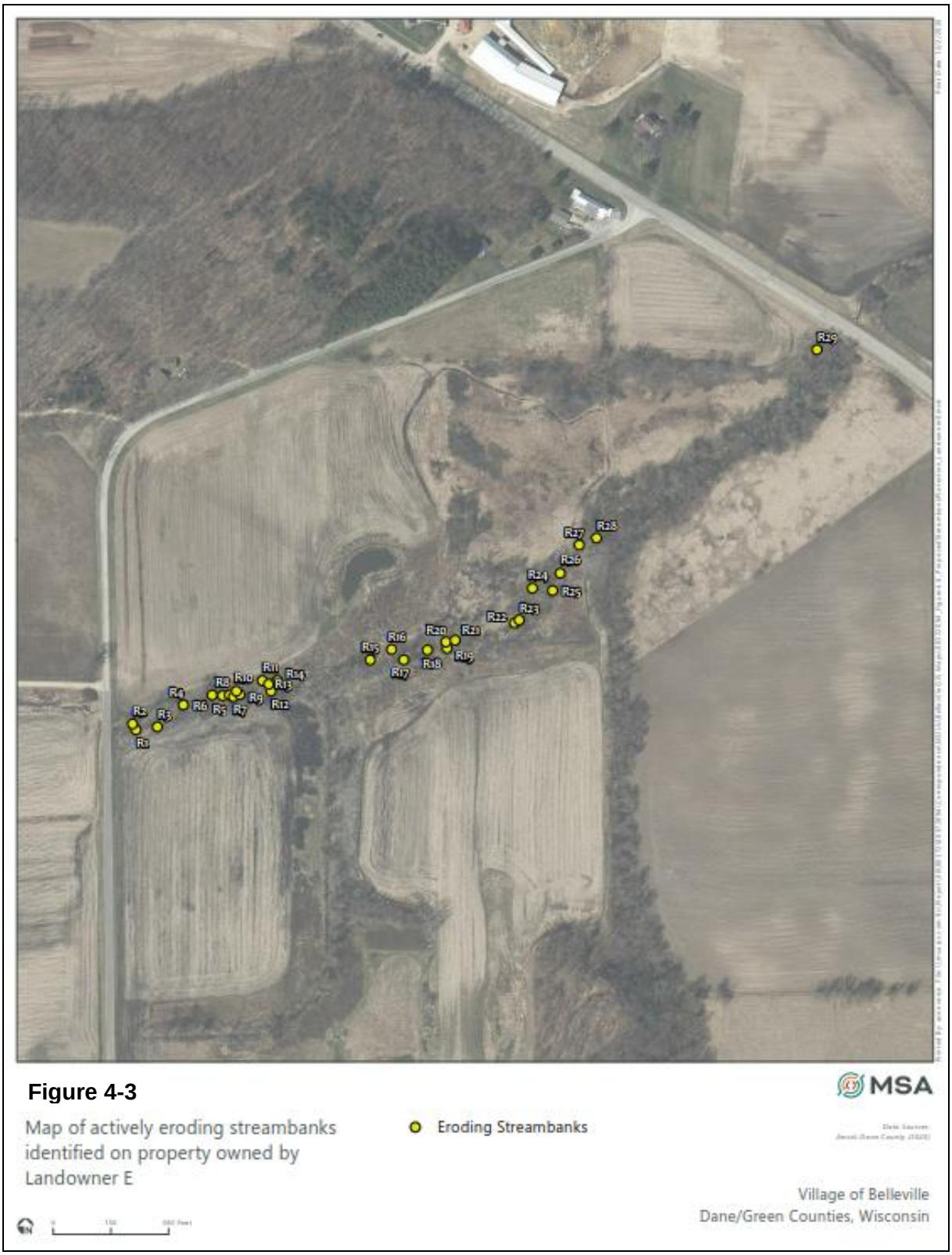

Figure 4-3: Map of Actively Eroding Streambanks Identified on Property Owned by Landowner E

Figure 4-4: Map of Crop Fields Owned by Landowner E (38.9 acres)

Fields 1A, 1B, 2, and 5 tested excessively high for phosphorus. Fields 3 and 4 tested at optimum levels. Fields 1A and 2 have drain tiles installed.

Proposed BMPs:

Phosphorus credits are planned to be generated with Landowner E by stabilizing 29 eroding streambanks and installing aquatic habitat structures along approximately 0.3 miles of Milum Creek. Because Milum Creek is impaired for phosphorus the stream restoration work will be eligible for a "habitat adjustment" of the trade ratio. Credits are also planned to be generated by converting 38.9 acres of crop fields from annual row crop (corn and soybean) production to perennial grass hay for a minimum of 10 years. The landowner will be paid an annual rental payment and will be provided an upfront cost share to establish the grass hay cover crop. The landowner will be allowed and encouraged to harvest the grass hay to draw down phosphorus levels in the soil. The landowner will be required to have a Nutrient Management Plan, and no manure or phosphorus fertilizer will be allowed to be applied to the crop fields unless they test in the optimum range for phosphorus. Because the proposed improvements will include a nutrient management plan, supporting conservation practices, a soil test phosphorus draw down strategy, and perennial vegetation, it is believed the crop land conversion should meet DNR's expectation for "Whole Field Management."

A summary of BMPs that are planned to be implemented as part of this project are listed below:

1. Streambank Stabilization & Habitat Improvements

    - Clearing and Snagging
    - Bank Grading
    - Riprap
    - Soil Bioengineering Treatments
    - Grass Seeding
    - Aquatic Habitat Improvements (see NRCS Riparian Habitat Guide)
        - Backwater Wetlands
        - Cross Channel Logs
        - Escape Logs (Basking Logs)
        - Log Deflectors
        - LUNKER Structures
        - Rock Deflectors
        - Rock Vortex Weirs
        - Tree Top Brush Bundles

2. Whole Field Management

    - Conversion of continuous row crop rotation on all fields to perennial vegetation (harvestable grass hay) for 10 years.

    - Improved Nutrient Management practices
        - Development of an annually updated Nutrient Management Plan

        - No applications of phosphorus containing soil amendments on fields unless soil test levels are drawn down to optimum levels.

        - No applications of manure, biosolids, or industrial wastes on snow covered or frozen ground or on fields with high groundwater or tile drainage.

- Continued maintenance of conservation practices supporting the Nutrient Management Plan

Applicable Standards:

1. Streambank Stabilization & Habitat Improvements

    - NRCS 326 - Clearing and Snagging
    - NRCS 342 - Critical Area Planting
    - NRCS 395 - Stream Habitat Improvement and Management
    - NRCS 572 - Spoil Spreading
    - NRCS 580 - Streambank and Shoreline Protection

2. Whole Field Management

    - NRCS 511 - Forage Harvest Management
    - NRCS 512 - Forage and Biomass Planting
    - NRCS 590 - Nutrient Management

Design Life:

The proposed streambank stabilization and aquatic habitat improvements are expected to have a minimum design life of 10 to 20 years with proper maintenance.

Nutrient management and supporting cropping practices have a design life of 1 year. The Nutrient Management Plan must be updated and approved on an annual basis.

Permitting Requirements:

The streambank stabilization project will require a wetland delineation, DNR streambank erosion control permit, and DNR construction site storm water permit.

The conversion of the crop fields from row crops to perrenial grass hay will not require any permit.

Operation & Maintenance Plan:

Proposed items for the Operation and Maintenance Plan are listed below. Implementation of the Operation and Maintenance Plan for items related to whole field management will primarily be the landowner's responsibility. The Village will provide annual inspections and aid, as needed, for necessary maintenance and/or repairs for deteriorating or failing BMPs.

For the purposes of this Operation and Maintenance Plan, severe floods are defined as any hydrologic event resulting from a 24-hour cumulative precipitation in excess of 3.5 inches of rainfall (i.e., the 5-year 24-hour precipitation event based on the annual maximum time series as defined for Belleville, WI, by NOAA Atlas 14, Volume 8, Version 2).

Conditions for Riprap Placements & Log Revetments:

1. Check the riprap, plantings, and/or tree revetments twice each year and immediately after severe floods. Repair or replace any damaged or missing revetments.

2. Logs, trees, driftwood, and other debris lodged in or near the riprap shall be removed.

3. Check for sloughing, erosion, or damage to vegetative cover. Damaged areas shall be graded, shaped, and re-vegetated.

4. Repair any vandalism, vehicle, or livestock damage.

Conditions for Stream Habitat Improvements:

1. Check all habitat structures twice each year and immediately after severe floods. Repair any structure causing streambank or streambed instability.

Additional Conditions for Stabilized Streambanks:

1. All repairs that include the streambank or streambed should be approved by DNR before implementing the repair in order to protect aquatic and terrestrial species and to determine if a permit is needed to complete the repair.

2. Maintain vegetated areas in adequate cover within the buffer area (~35 ft) of the streambank. Three to four inches of plant residue will remain at all times during the grazing season. Horses or livestock will not be placed into paddocks until the average paddock height is at least six to ten inches (or more) and they will be removed before damaging the forage resource and/or leaving the three to four inch minimum.

3. If any major changes are planned regarding the type of vegetation to be grown in the buffer area of the stream, the Village and the landowners will cooperate in good faith to maintain the intent and conditions of this agreement.

4. Clip and/or mechanically harvest vegetated areas, as needed, to control undesirable species and woody vegetation.

5. If fences are installed, they shall be maintained to prevent unauthorized human or livestock access to the stream.

6. Cash crops and row crops will not be allowed to be planted or harvested in the buffer area (~35 ft) of the stream.

Conditions for Perennial Forage and Biomass Planting and Harvest Management:

1. Identified crop fields shall be seeded with a perennial grass or grass/legume mixture. No row crops are allowed to be planted on these fields during the 10-year agreement (i.e., credit generating) period. Identified fields will not be used for livestock grazing.

2. Inspect and calibrate seeding equipment prior to use. Continually monitor the performance of the seeding equipment during planting to achieve proper rate, distribution, and depth of planting material.

3. The growth of desired seedlings shall be monitored and evaluated during the establishment period.

4. Monitor new plantings for water stress. Depending on the severity of drought, water stress may require reducing weeds, early harvest of any companion crops, irrigating when possible, or replanting failed stands.

5. New seedings shall not be harvested until plants have established sufficient root systems to withstand traffic and to recover from removal of top growth.

6. Mowing or herbicide applications shall be used as necessary to control competitive weeds. Mowing should be done before weeds develop matured seed. The residue from mowing shall be uniformly distributed or harvested as necessary to avoid smothering new seedlings.

7. Harvest of the grass hay cover crop is allowed and encouraged to draw down soil test phosphorus concentrations. Minimum stubble height after cutting shall not be less than 4 inches.

8. Reseed and/or add the recommended fertilizer and other necessary soil amendments to maintain sufficient growth and vegetative coverage of the perennial grass hay cover crop.

9. Dispose of the plastic wrap or bags used to store forage in an environmentally sound manner.

Conditions for Nutrient Management Plan:

1. All crop fields that the landowner owns, rents, or apply nutrients must be incorporated into a Nutrient Management Plan consistent with the NRCS 590 standard. All crop field management practices shall be documented using SnapPlus, Wisconsin's NRCS 590 nutrient management planning software. The SnapPlus database and Nutrient Management Plan shall be annually updated to account for planned and actual cropping practices, including crop rotation, tillage practices, manure applications, commercial fertilizer applications, and other field amendments. The Nutrient Management Plan must be approved by a Certified Crop Advisor (CCA) or equivalent and must be annually submitted

to Dane County Land Conservation Division and the Village of Belleville for review and record keeping.

2. All fields in the Nutrient Management Plan that the landowner owns, rents, or otherwise controls cropping practices shall have up to date soil testing completed in accordance with University of Wisconsin-Extension document *A2100 Sampling Soils for Testing*.

3. All grassed waterways and other conservation practices supporting the Nutrient Management Plan must be implemented and maintained in accordance with applicable NRCS standards.

4. No application of phosphorus containing fertilizer or other soil amendments are allowed until soil test levels are drawn down to optimum levels per University of Wisconsin-Extension document *A2809 Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin*.

5. No application of manure, biosolids, or industrial wastes is allowed on snow-covered or frozen ground or on fields with high groundwater (soils with less than 12 inches to apparent water table) or tile drainage.

6. If any field is found to be non-compliant with the Nutrient Management Plan during a given crop year, the landowner will be required to repay the annual rental payment for the acreage that was deemed non-compliant for that year. Any fields planted to row crops during the 10-year agreement period that were previously agreed to remain as perennial grass hay will automatically be considered non-compliant with the Nutrient Management Plan and will continue to be deemed non-compliant until the perennial grass hay cover crop is reestablished.

Modeling Procedures:

Streambank erosion was estimated using the NRCS "Erosion Calculator (Direct Volume Method)" (NRCS Field Office Technical Guide, 2017). A total of 29 actively eroding streambanks were identified and sampled on the property. **Equation 4-6** was used to estimate phosphorus loss from each eroding streambank. The sum of the phosphorus loss from all eroding banks was used to estimate phosphorus credits for the site. Detailed modeling procedures are provided in **Appendix D**. Based on this modeling, a total of **69.4 lbs/yr** of phosphorus loss is estimated from the existing, eroding streambanks.

Equation 4-6:

$$\text{Streambank Phosphorus Loss} = L \times H \times R \times \gamma_{soil} \times C_{TP} \times \frac{1}{1{,}000{,}000}$$

Where:

L	=	length of eroding bank [ft]
H	=	slope height of eroding bank [ft]
R	=	annual lateral recession rate of eroding bank $\left[\frac{ft}{yr}\right]$
γ_{soil}	=	soil bulk density $\left[\frac{lb}{ft^3}\right]$
C_{TP}	=	soil total phosphorus concentration [ppm]

Phosphorus reductions from the implementation of whole field management practices were simulated using the "P Trade Report" in SnapPlus. SnapPlus modeling procedures are described in greater detail in **Appendix E**. As discussed above, the landowner plans to convert from an annual corn-soybean crop rotation to perrenial grass hay rotation thoughout the life of the agreeement with the Village of Belleville. **Table 4-6** summarizes estimated annual phosphorus loss reductions from the crop fields for a 5-year crop rotation beginning in 2021 and ending in 2025. As shown, phosphorus loss is expected to be reduced by an average of **118.0 lbs/yr** (rotation average).

Table 4-6: Phosphorus Reductions Estimated using the SnapPlus "P Trade Report"

Field ID	Acres	Scenario	PTP (lbs/year) Permit Term #1				
			2021	**2022**	**2023**	**2024**	**2025**
1	7.3	Baseline	48.2	19.4	52.0	19.9	53.1
		Whole Field Management	23.0	4.7	3.5	2.3	1.6
		Phosphorus Reduction	**25.2**	**14.6**	**48.6**	**17.6**	**51.6**
1B	3.7	Baseline	4.3	25.1	4.3	24.9	4.4
		Whole Field Management	4.0	2.2	1.8	1.4	1.1
		Phosphorus Reduction	**0.3**	**22.9**	**2.5**	**23.5**	**3.3**
2	11.5	Baseline	62.7	18.8	67.9	19.2	69.5
		Whole Field Management	22.8	13.5	11.9	9.9	8.3
		Phosphorus Reduction	**39.9**	**5.3**	**56.0**	**9.2**	**61.2**
3	11.6	Baseline	20.8	77.1	20.6	76.5	20.8
		Whole Field Management	26.7	19.3	15.2	11.1	9.3
		Phosphorus Reduction	**-5.8**	**57.9**	**5.3**	**65.4**	**11.5**
4	2.8	Baseline	12.5	3.8	13.6	3.8	14.0
		Whole Field Management	7.8	4.5	3.4	2.5	2.0
		Phosphorus Reduction	**4.7**	**-0.7**	**10.2**	**1.4**	**11.9**
5	2.0	Baseline	19.1	10.1	6.6	3.9	32.2
		Whole Field Management	21.4	1.9	1.1	0.5	0.3
		Phosphorus Reduction	**-2.3**	**8.3**	**5.5**	**3.4**	**31.9**
Total	**38.9**	Baseline	167.7	154.3	165.1	148.2	194.0
		Whole Field Management	105.7	46.1	37.0	27.7	22.6
		Phosphorus Reduction	**62.0**	**108.2**	**128.2**	**120.5**	**171.4**
		Avg. Reduction	**118.0**				

Trade Ratios Calculations:

Calculation for Streambank Stabilization w/ Habitat Adjustment

$$\text{Trade Ratio} = \text{Delivery} + \text{Uncertainty}$$

$$\text{Delivery Factor} = 0.02 \ (\text{see } \mathbf{Table\ 4-2})$$

$$\text{Uncertainty Factor} = 2.00 \ (\text{see } \mathbf{Table\ 4-3})$$

**Since Milum Creek is currently considered impaired due to phosphorus, streambank stabilization is eligible for habitat adjustment of the trade ratio if appropriate habitat improvements are included in the scope of work.*

$$\text{Trade Ratio} = 0.02 + 2.00 = 2.02$$

Calculation for Whole Field Management:

$$\text{Trade Ratio} = \text{Delivery} + \text{Uncertainty}$$

$$\text{Delivery Factor} = 0.02 \ (\text{see } \mathbf{Table\ 4-2})$$

$$\text{Uncertainty Factor} = 1.00 \ (\text{see } \mathbf{Table\ 4-3})$$

$$\text{Trade Ratio} = 0.02 + 1.00 = 1.02 \rightarrow 1.20 \ (\text{minimum point to non-point trade ratio})$$

Credit Calculations:

Calculation for Streambank Stabilization w/ Habitat Adjustment:

$$\text{Phosphorus Credits} \left[\frac{\text{lbs}}{\text{yr}}\right] = \frac{\text{Phosphorus Removed by BMP} \left[\frac{\text{lbs}}{\text{yr}}\right]}{\text{Trade Ratio}}$$

$$= \frac{69.4 \text{ lbs/yr}}{2.02}$$

$$= \mathbf{34.3 \text{ lbs/yr}}$$

Calculation for Whole Field Management:

$$\text{Phosphorus Credits } \left[\frac{\text{lbs}}{\text{yr}}\right] = \frac{\text{Phosphorus Removed by BMP } \left[\frac{\text{lbs}}{\text{yr}}\right]}{\text{Trade Ratio}}$$

$$= \frac{118.0 \text{ lbs/yr}}{1.20}$$

$$= \mathbf{98.4 \text{ lbs/yr}}$$

Estimated Cost:

The estimated costs for the Village to implement the improvements for Landowner E are shown in **Table 4-7**. These costs assume the Village of Belleville bears all costs. Annual operation and maintenance costs include annual rental payments to the landowner, annual repair funds to facilitate the maintenance and repair of BMPs, and the costs of annual inspections and reporting.

Table 4-7: Updated Village's Estimated Costs for Implementing BMPs for Landowner E

Practice	Construction Capital Cost	Annual O&M	20-yr Present Worth
Streambank Stabilization	$190,000	$7,000	$292,300
Whole Field Management	$6,000	$18,600	$278,000
Total	**$196,000**	**$25,600**	**$570,300**

Eligible Funding Sources:

The Village should consider funding a portion of the streambank stabilization & habitat improvement project with Landowner E through the NRCS Environmental Quality Incentives Program (EQIP), if landowner is eligible.

No external funding sources are recommended to be pursued for the whole field management practice implementation with Landowner E.

Landowner F

History of Project Site:

Landowner F raises dairy livestock and owns approximately 140 acres of crop fields near the headwaters of Milum Creek, a small stream impaired for phosphorus in Dane County. The landowner is interested in reducing streambank erosion along Milum Creek, which flows through the landowner's property. The stream has a sandy bed and silty banks. The stream corridor is heavily wooded with boxelder and other undesirable trees and is surrounded by existing crop fields. Twenty-five (25) eroding banks were identified ranging from moderate to very severe erosion. The erosion is likely attributable to high amounts of runoff from the steep surrounding topography and trees that have fallen in the channel, reducing flow capacity. No livestock have access to the steam. Erosion is most notable on the upstream end of the property where the stream gradient is believed to be higher. At the downstream end of the property, the stream gradient flattens as it begins to enter a wetland. Bare eroding banks, vegetative overhang, exposed roots, fallen trees, and exposed fence posts signify that streambank erosion is a resource concern for the site.

Project Location:

The project site is located in the West Branch Sugar River subwatershed (HUC 070900040103) in Dane County, Wisconsin. The site is approximately 8.5 stream miles upstream from the Belleville WWTF. A map of the locations of eroding streambanks along Milum Creek is shown in **Figure 4-5**.

Proposed BMPs:

BMPs that are planned to be implemented to address streambank erosion and improve habitat conditions for this site include the following:

- Clearing and Snagging
- Bank Grading
- Riprap
- Soil Bioengineering Treatments
- Grass Seeding
- Aquatic Habitat Improvements (see NRCS Riparian Habitat Guide)
    - Backwater Wetlands
    - Boulder Retards (Cover Rocks)
    - Cross Channel Logs
    - Escape Logs (Basking Logs)
    - Log Deflectors
    - LUNKER Structures
    - Rock Deflectors
    - Rock Vortex Weirs
    - Tree Top Brush Bundles

Design Life:

10 to 20 years (with proper maintenance)

Figure 4-5: Map of Actively Eroding Streambanks Identified on Property Owned by Landowner F

Applicable Standards:

- NRCS 326 - Clearing and Snagging
- NRCS 342 - Critical Area Planting
- NRCS 395 - Stream Habitat Improvement and Management
- NRCS 572 - Spoil Spreading
- NRCS 580 - Streambank and Shoreline Protection

Permitting Requirements:

The project will require a wetland delineation, DNR streambank erosion control permit, and DNR construction site storm water permit.

Operation & Maintenance Plan:

Proposed items for the Operation and Maintenance Plan are listed below. Implementation of the Operation and Maintenance Plan for Landowner F will be shared by the landowner and the Village of Belleville, with the landowner responsible for normal observation (excluding inspections by the Village) and the Village providing aid as needed for necessary maintenance and/or repairs for deteriorating or failing BMPs.

For the purposes of this Operation and Maintenance Plan, severe floods are defined as any hydrologic event resulting from a 24-hour cumulative precipitation in excess of 3.5 inches of rainfall (i.e., the 5-year 24-hour precipitation event based on the annual maximum time series as defined for Belleville, WI, by NOAA Atlas 14, Volume 8, Version 2).

Conditions for Riprap Placements & Log Revetments:

1. Check the riprap, plantings, and/or tree revetments twice each year and immediately after severe floods. Repair or replace any damaged or missing revetments.

2. Logs, trees, driftwood, and other debris lodged in or near the riprap shall be removed.

3. Check for sloughing, erosion, or damage to vegetative cover. Damaged areas shall be graded, shaped, and re-vegetated.

4. Repair any vandalism, vehicle, or livestock damage.

Conditions for Stream Habitat Improvements:

1. Check all habitat structures twice each year and immediately after severe floods. Repair any structure causing streambank or streambed instability.

Additional Conditions:

1. All repairs that include the streambank or streambed should be approved by DNR before implementing the repair in order to protect aquatic and terrestrial species and to determine if a permit is needed to complete the repair.

2. Maintain vegetated areas in adequate cover within the buffer area (~35 ft) of the streambank. Three to four inches of plant residue will remain at all times during the grazing season. Horses or livestock will not be placed into paddocks until the average paddock height is at least six to ten inches (or more) and they will be removed before damaging the forage resource and/or leaving the three to four inch minimum.

3. If any major changes are planned regarding the type of vegetation to be grown in the buffer area of the stream, the Village and the landowner will cooperate in good faith to maintain the intent and conditions of this agreement.

4. Clip and/or mechanically harvest vegetated areas, as needed, to control undesirable species and woody vegetation.

5. If fences are installed, they shall be maintained to prevent unauthorized human or livestock access to the stream.

6. Cash crops and row crops will not be allowed to be planted or harvested in the buffer area (~35 ft) of the stream.

Modeling Procedures:

Streambank erosion was estimated using the NRCS "Erosion Calculator (Direct Volume Method)" (NRCS Field Office Technical Guide, 2017). A total of 25 actively eroding streambanks were identified and sampled on the property. **Equation 4-6** was used to estimate phosphorus loss from each eroding streambank. The sum of the phosphorus loss from all eroding banks was used to estimate phosphorus credits for the site. Detailed modeling procedures are provided in **Appendix D**. Based on this modeling, a total of **61.8 lbs/yr** of phosphorus loss is estimated from the existing, eroding streambanks.

Equation 4-6:

$$\text{Streambank Phosphorus Loss} = L \times H \times R \times \gamma_{soil} \times C_{TP} \times \frac{1}{1{,}000{,}000}$$

Where:

	L	=	length of eroding bank [ft]
	H	=	slope height of eroding bank [ft]
	R	=	annual lateral recession rate of eroding bank $\left[\frac{ft}{yr}\right]$
	γ_{soil}	=	soil bulk density $\left[\frac{lb}{ft^3}\right]$
	C_{TP}	=	soil total phosphorus concentration [ppm]

Trade Ratios Calculations:

$$\text{Trade Ratio} = \text{Delivery} + \text{Uncertainty}$$

$$\text{Delivery Factor} = 0.00 \text{ (see } \mathbf{Table\ 4-2}\text{)}$$

$$\text{Uncertainty Factor} = 2.00 \text{ (see } \mathbf{Table\ 4-3}\text{)}$$

**Since Milum Creek is currently considered impaired due to phosphorus, streambank stabilization is eligible for habitat adjustment of the trade ratio if appropriate habitat improvements are included in the scope of work.*

$$\text{Trade Ratio} = 0.02 + 2.00 = 2.02$$

Credit Calculations:

$$\text{Phosphorus Credits } \left[\frac{\text{lbs}}{\text{yr}}\right] = \frac{\text{Phosphorus Removed by BMP } \left[\frac{\text{lbs}}{\text{yr}}\right]}{\text{Trade Ratio}}$$

$$= \frac{61.8 \text{ lbs/yr}}{2.02}$$

$$= \mathbf{30.6 \text{ lbs/yr}}$$

Estimated Cost:

The estimated costs for implementing the streambank stabilization repairs and habitat improvements for Landowner F are shown in **Table 4-8**. These costs assume the Village of Belleville bears all costs. Annual operation and maintenance costs include annual repair funds to facilitate the maintenance and repair of BMPs in the future and the cost of annual inspections and reporting.

Table 4-8: Updated estimated costs for implementing BMPs for Landowner F

Construction Capital Costs	Annual O&M Costs	20-year Present Worth
$ 236,000	$ 9,000	$ 368,000

Eligible Funding Sources:

It is recommended that the Village consider funding for the streambank stabilization & habitat improvement project with Landowner F through the NRCS Environmental Quality Incentives Program (EQIP), if landowner is eligible.

Landowner G

History of Project Site:

Landowner G raises beef cows and owns approximately 280 acres of farmland north of Belleville, along the Main Branch of the Sugar River in Dane County. The original proposed project included plans to repair eroding streambanks along the property. During the landowner agreement drafting process, there were complications that arose and led to the Village no longer pursuing this project with Landowner G. Therefore, subsequent project information and credit calculations for Landowner G included in the original WQT Plan have been deleted from this version.

Figure 4-9 and Table 4-11 have been deleted.

4.5 TOTAL PROJECTED CREDITS

The total amount of phosphorus credits that are expected to be generated for the Village of Belleville by working with each landowner are summarized in **Table 4-9**. This table only summarizes the amount of credits expected to be generated throughout the first permit term of WQT.

As shown in **Table 4-9**, 199.2 lbs/yr of credit is estimated to be generated in the year 2025 and beyond. Therefore, WQT appears to be a feasible alternative to comply with water quality based effluent limits for phosphorus at the Village of Belleville's WWTF.

Table 4-9: Updated Total Amount of Phosphorus Credits Generated in Permit Term #1 Of WQT

Landowner ID	Phosphorus Credits Generated (lbs/yr)				
	2021[1]	2022[1]	2023[1]	2024[2]	2025[2]
Landowner D - Whole Field Management			35.9	35.9	35.9
Landowner E - Streambank Stabilization				20.1[3]	34.3
Landowner E - Whole Field Management	98.4	98.4	98.4	98.4	98.4
Landowner F - Streambank Stabilization				17.9[3]	30.6
Total	**98.4**	**98.4**	**134.3**	**172.3**	**199.2**

[1] Number of phosphorus credits actually generated.

[2] Minimum number of credits expected to be generated assuming revised project schedule is adhered to.

[3] Project annual totals adjusted to account for seven-month post final construction period when credits are available (June – December).

Projects with all landowners listed above have been implemented by the Village of Belleville. Additional credits could prove valuable in the event that any management practices fail due to poor management or severe weather events. Additional credits will also provide for greater operational flexibility of the Belleville WWTF. For example, if more credits are generated than the minimum, the WWTF could potentially discharge effluent at a higher phosphorus concentration than the target concentration of 0.28 mg/L and still comply with WQT. **Table 4-10** lists the number of credits needed for the Village to comply with long term WQT goals at various average effluent total phosphorus concentrations. Based on the amount of credits projected to be available, it may be

reasonable for the Village to maintain compliance with WQT if an effluent total phosphorus concentration of 0.28 mg/L is targeted.

Table 4-10: Credits Needed to Comply with WQT Based on Target Effluent Concentration

Avg. Effluent TP Conc. (mg/L)	**Minimum Phosphorus Credits Needed[1] (lbs/yr)**
0.28	199
0.30	218
0.35	267
0.40	315

[1]*Assumes annual design influent flow of 0.261 MGD and a safety factor of 1.22.*

CHAPTER 5 – IMPLEMENTATION AND MONITORING REQUIREMENTS

5.1 LEGAL AGREEMENTS

The Village of Belleville had developed binding legal agreements with Landowners A, D, E, and F after the approval of the original WQT Plan. The Village is currently in the process of terminating the legal agreement with Landowner A since the projects will no longer be moving forward. A legal agreement was not completed with Landowner G during project development, and the Village does not have plans to enter into an agreement with Landowner G at this time. All agreements will be binding for a minimum to 10 years, ideally to correspond with the first two WPDES permit terms of WQT compliance, each 5 years in length. Agreements will have a renewal clause to allow the agreements to be renewed for five years at the end of the contract term, provided BMPs are still in good condition and generating credits. Agreements will be recorded with the Dane County Register of Deeds and will be transferred to new landowners in the event of ownership transition. Agreements will identify best management practices that will be implemented on each landowner's property, the landowner's and the Village's obligations for maintaining those practices (e.g., operation and maintenance conditions), and financial contributions from the Village to pay for the implementation of the proposed practices. Legal agreements will also identify processes for repairing failing management practices. Operation and Maintenance Plans will be included in each legal agreement. The parties responsible for the implementation of the various components of the Operation and Maintenance Plan will be project specific, depending on the preference of the given landowner. In general, implementation of the Operation and Maintenance Plans will be shared by the Landowners and the Village of Belleville, with the landowners taking care of normal observation (excluding annual inspections by the Village) and the Village providing aid as needed in the case of deteriorating or failing BMPs.

5.2 CREDIT TRACKING

Credit tracking will be completed using a geographic information system (GIS) developed and maintained by MSA and the Village of Belleville. All BMPs that are implemented will be recorded spatially and stored in a geodatabase. This will reduce the possibility of credit calculation errors and prevent any "double" counting of credits by the Village of Belleville or another municipality. The only exception to this tracking process will be for cropland BMPs implemented as part of a nutrient management plan. In this case, all fields will be tracked using the online web site SnapMaps (http://snapmaps.snapplus.wisc.edu/) and the associated SnapPlus database for each crop land credit generator.

5.3 ANNUAL REVIEW PROCESS

All BMPs will be inspected periodically (a minimum of once per year) to determine if BMPs are functioning properly and to evaluate landowner compliance with operation and maintenance plan conditions. Annual inspections should occur at a time when compliance with the operation and maintenance plan can be easily established. For example, crop rotations and tillage practices can be easily identified in early summer after planting and in late fall after harvest. Compliance with grazing along streambank sites can be completed in summer during the grazing season, and any flood damage could likely be identified in late spring or early summer. Therefore, the number of reviews per year will be dependent on the specific practices that are implemented. The minimum

number of inspections will be established on a case by case basis as per the legal agreement developed with each landowner.

Current draft legal agreements for all landowners specify a minimum of two planned inspections per year. Additional inspections may be triggered by severe weather events, if landowners express concerns regarding the condition of installed BMPs, or if any justified complaints are received by the Village, Dane County LCD, NRCS, or DNR regarding properties engaged in a trade with the Village of Belleville.

The Village or its agents will provide the findings of annual inspections to the Dane County LCD and the DNR for concurrence with findings. This will allow the Dane County LCD to track landowner compliance with NR 151 agricultural performance standards and manure management prohibitions and other applicable regulations and will allow the DNR to track the Village of Belleville's compliance with WPDES permit requirements.

The Village acknowledges that in addition to annual reporting, the Village will be required to certify on a monthly basis that nonpoint source management practices are installed and being operated/maintained in a manner consistent with applicable standards and the conditions specified in this Water Quality Trading Plan.

5.4 NR 151 Compliance Determinations

All compliance determinations with NR 151 agricultural performance standards and manure management prohibitions will be the responsibility of the Dane County LCD. All proposed practices will be reviewed by the Dane County LCD prior to implementation and the findings of annual inspections will be submitted to the Dane County LCD for concurrence with findings. This will enable the Dane County LCD to identify initial landowner compliance with NR 151 requirements and other regulations and will promote the County's ability to track future compliance with these rules.

5.5 Process For Mitigating Failing BMPs

The goal of the Village and landowner partnership will be to quickly identify any failing BMPs and to repair or replace these BMPs as quickly as possible. The legal agreement with each landowner will provide processes for the Village to aid the landowner in compliance with the proposed operation and maintenance plan conditions. The Village will take a proactive approach to preventing failing BMPs and to repairing or replacing failing BMPs. Annual inspections will promote the possibility of identifying potential damage before a BMP fails. The Village will also establish an annual BMP repair/replacement fund to help pay for any repairs or technical services needed to maintain installed BMPs.

The DNR will be notified promptly if a situation arises where a BMP is damaged or deteriorated and no longer generating the amount of credits initially intended. For all forms of noncompliance , the Village will provide a written report to the DNR Basin Engineer within 30 days after becoming aware of noncompliance, unless the DNR approves later submittal with the Village's next scheduled monthly monitoring report. In any case of noncompliance, the Village will provide the following:

- A description of the noncompliance and its cause
- The period of noncompliance (including exact dates and times)

- The steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance
- The length of time expected for noncompliance to continue if it has not already been corrected

CHAPTER 6 – FINANCIAL ANALYSIS

6.1 WATER QUALITY TRADING IMPLEMENTATION COSTS

The estimated costs that the Village of Belleville would provide for implementing the projects recommended in this WQT are summarized in **Table 6-1**. As shown, the estimated capital cost for the Village is $959,500, and the estimated total annual operation and maintenance (O&M) cost is $58,200. This results in a total 20-year present worth of approximately $1.8 million. These costs are reduced from the original WQT estimates due to the removal of Landowner A and G projects. Annual O&M costs include costs for establishing a BMP repair/replacement fund, annual rental payments for whole field management sites, and estimated annual inspection and reporting costs. Overall, WQT is anticipated to be significantly less costly than a tertiary phosphorus removal upgrade, as referenced in Section 1.5 of this report. Costs could potentially be further reduced if the Village pursues funding from external sources or partners as referenced in Section 6.2.

Table 6-1: Updated estimated Costs of Implementing the Water Quality Trading Plan

Landowner ID	Capital Cost	Annual O&M	20-yr Present Worth	Unit Cost ($/credit)
Landowner D - Whole Field Management	$24,000	$23,600	$369,000	$514
Landowner E - Streambank Stabilization	$190,000	$7,000	$292,000	$426
Landowner E - Whole Field Management	$6,000	$18,600	$278,000	$141
Landowner F - Streambank Stabilization	$236,000	$9,000	$367,000	$600
Engineering	$489,500	--	$489,500	--
Permits, Archeology Review, Road Bonds	$14,000	--	$14,000	--
Total:	**$959,500**	**$58,200**	**$1,809,500**	**$454**

6.2 EXTERNAL FUNDING OPPORTUNITIES

Based on review of eligible financial aid programs for Water Quality Trading, the Village and MSA plan to consider funding specific landowner projects partially through the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP), especially for the barnyard improvements recommended for Landowner A. EQIP provides financial assistance to agricultural producers to plan and implement conservation practices that address natural resource concerns and improve soil, water, plant, animal, air, and related resources on agricultural land. EQIP pays a specific flat rate for each eligible practice. Payments are typically equivalent to 70 to 75 percent of eligible costs but may be greater or less than this target. Certain practices are only eligible for payments up to a maximum cost limit (e.g., riprap, waste storage, roofs and covers, etc.). Due to the scope of the projects recommended for each landowner, it is likely that the cost of some practices could exceed the maximum payment limit of EQIP. Therefore, it is unlikely that EQIP will actually provide 70 to 75 percent of the capital costs for the projects. Securing the funding for the landowners in a timely manner before the Village's WPDES permit deadlines may also present challenges. Therefore, funding through NRCS is not guaranteed, and the Village should still expect to be the major source of funding for the project.

All projects submitted to NRCS for EQIP funding are evaluated, prioritized, and ranked for funding after specified signup deadlines or "batching dates." Signup deadlines for the EQIP program typically occur at least once every year, typically in the fall. Successful applications require the

project to be "shovel ready." Therefore, engineering plans and specifications and permits should be in hand at the time of application. Many practices also require a comprehensive nutrient management plan (CNMP) to be developed prior to the application deadline. The CNMP is an engineering and agronomic evaluation of a farm operation that identifies environmental resource concerns on the farm that could be remedied by practices funded by NRCS. Projects that receive funding from EQIP typically run 1 to 2 years in duration after the contract is approved. Because the Village must comply with WQT by March 31, 2023, all eligible projects should be submitted to NRCS in the fall of 2021 so that the projects can be completed in a timely manner prior to the final WQT compliance deadline.

6.3 FINANCING

The Village may consider financing the project through DNR's Clean Water Fund Pilot Projects program. Interest rates for a 20-year loan as low as 1.65% are currently available. However, it is recommended that the Village speak with its financial advisors to determine the appropriate loan term, as legal agreements with the participating landowners are currently only anticipated to extend 10 years, with the option for 5 year renewals at the end of each agreement period. The Village should also consider that construction costs may increase if a loan through Clean Water Fund is pursued, due to the additional regulatory and administrative costs passed on to the prospective contractors. Therefore, financing options should be carefully considered prior to project implementation.

CHAPTER 7 – PROJECT IMPLEMENTATION SCHEDULE

7.1 IMPLEMENTATION SCHEDULE

The anticipated implementation schedule for this *Water Quality Trading Plan* is summarized in **Table 7-1**. The implementation schedule shown below has changed since the original 2020 WQT plan submittal. The Landowner D and E Whole Field Management projects were completed in 2022 and 2021, respectively. Management practice registration forms have been submitted for these projects. With the completion of the Landowner E and F streambank stabilization projects in 2024, the management practice registration forms are anticipated to be submitted in mid-2024. With the submission and approval of this WQT Plan revision, the Village of Belleville is expected to be in compliance with Water Quality Trading.

Table 7-1: Anticipated Project Implementation Schedule

Proposed Action	Approximate Date
Submit Water Quality Trading Plan to DNR	December 2020
Establishment of Trade Agreements with Landowners A, D, E, and F	December 2020
Submit Water Quality Trading Plan Revisions to DNR	January 2021
Initiate Crop Land Conversion Projects with Landowners D and E	April 2021
Submit Management Practice Registration Form for Landowner E to DNR	June 2021
Submit Management Practice Registration Form for Landowner D to DNR	January 2023
Approval of Engineering Plans, Specs, and Permits for Landowners A, E, and F	September 2023
Initiate Construction for Landowners E and F Streambank Stabilization	October 2023
Finish Construction for Landowners E and F Streambank Stabilization	May 2024
Submit Revised WQT Plan for Removal of Landowners A and G Projects	June 2024
Submit Revised WQT Plan with DNR Comments Addressed	July 2024
Submit Management Practice Registration Forms for Landowners E and F to DNR	July 2024
Achieve Compliance with Water Quality Trading	August 2024

Note: Project implementation schedule subject to change based on timing of DNR approval of the Water Quality Trading Plan and reissuance of the Village of Belleville's WPDES Permit.

7.2 CASH FLOW SUMMARY FOR WQT PERMIT TERM #1

In order to accommodate the project schedule shown in **Table 7-1**, the Village should budget expenses for the next five years as shown in the cash flow summary presented in **Table 7-2**. This cash flow summary includes anticipated capital costs and annual O&M costs. These costs assume that no external funding is available from the NRCS EQIP or other similar programs to offset the capital costs of the projects. With the deletion of Landowner A and G projects from the WQT Plan, the annual O&M costs are reduced from the original WQT Plan estimates. Capital costs have been removed, since these have been paid for by the Village with the completion of project implementation. Annual O&M costs are shown as increasing starting in 2024 with the construction of Landowner E and F streambank stabilization projects being completed. Budgeting for these costs will benefit the Village for both the payment of landowner annual incentive payments and for when future repairs are needed on the constructed practices.

Table 7-2: Updated Cash Flow Summary for WQT Permit Term #1

Year	Annual O&M Costs	Total Annual Cost
2021	$42,000	$42,000
2022	$42,000	$42,000
2023	$42,000	$42,000
2024	$58,200	$58,200
2025	$58,200	$58,200

APPENDIX A

WPDES Permit

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

VILLAGE OF BELLEVILLE

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
105 REMY ROAD, BELLEVILLE, WISCONSIN
to

SUGAR RIVER (ALLEN CREEK/MIDDLE SUGAR RIVER WATERSHED, SP13 – SUGAR-PECATONICA RIVER BASIN) IN DANE COUNTY

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By _____
Thomas Bauman
Wastewater Field Supervisor

March 13, 2024
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE - August 01, 2021 **EXPIRATION DATE – June 30, 2026**
Permit Modification Effective Date – April 1, 2024

TABLE OF CONTENTS

1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
701	Representative influent samples shall be collected after the raw pumps and before the Grit tank.

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD_5, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

2 Surface Water Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
001	Representative composite effluent samples shall be collected prior to the chlorine contact tank and grab samples after the chlorine contact tank, prior to discharge to the Sugar River.

2.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point (Outfall) 001 - EFFLUENT

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD_5, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD_5, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	3/Week	Grab	
pH Field	Daily Min	6.0 su	3/Week	Grab	
Nitrogen, Ammonia (NH_3-N) Total	Daily Max	17 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	17 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	17 mg/L	3/Week	24-Hr Flow Prop Comp	
Chlorine, Total Residual	Daily Max	38 µg/L	Daily	Grab	
Chlorine, Total Residual	Weekly Avg	38 µg/L	Daily	Grab	
Chlorine, Total Residual	Monthly Avg	38 µg/L	Daily	Grab	

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Weekly	Grab	Interim limit effective May - September annually until the final E. coli limit goes into effect per the "Effluent Limitations for E. coli" Schedule.
E. coli		#/100 ml	Weekly	Grab	Monitoring only May - September annually until the final limit goes into effect per the "Effluent Limitations for E. coli" Schedule.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Limit Effective May - September annually per the "Effluent Limitations for E. coli" Schedule.
E. coli	% Exceedance	10 Percent	Weekly	Grab	Limit Effective May - September annually per the "Effluent Limitations for E. coli" Schedule. See the "E. coli Percent Limit" section below. Enter the result in the DMR on the last day of the month.
Phosphorus, Total	Monthly Avg	0.8 mg/L	3/Week	24-Hr Flow Prop Comp	Effective upon reissuance, this limit is retained to prevent backsliding and is not an interim limit.
Phosphorus, Total		lbs/day	3/Week	Calculated	Report daily mass discharged using Equation 1a. in the "Water Quality Trading (WQT)" section.
WQT Credits Used (TP)		lbs/month	Monthly	Calculated	Report WQT TP Credits used per month using Equation 2c. in the "Water Quality Trading (WQT)" section. Available TP Credits are specified in Table 2 and in the approved Water Quality Trading Plan.
WQT Computed Compliance (TP)	Monthly Avg	0.225 mg/L	Monthly	Calculated	Effective upon reissuance.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
WQT Computed Compliance (TP)	6-Month Avg	0.075 mg/L	Monthly	Calculated	Effective upon reissuance and evaluated every 6 months at the end of June and end of December each year. Value entered on the last day of the month.
WQT Computed Compliance (TP)	6-Month Avg	0.22 lbs/day	Monthly	Calculated	Effective upon reissuance and evaluated every 6 months at the end of June and end of December each year. Use Equation 4b in the Water Quality Trading subsection below. Value entered on the last day of the month.
WQT Credits Used (TP)	Annual Total	134.3 lbs/yr	Annual	Calculated	Effective for calendar year 2021. The sum of total monthly credits used may not exceed Table 2 values listed below.
WQT Credits Used (TP)	Annual Total	338.9 lbs/yr	Annual	Calculated	Effective for calendar years 2022 - 2026. The sum of total monthly credits used may not exceed Table 2 values listed below.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section below.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section below.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring section below. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	See subsection 2.2.1.9 below for Whole Effluent Toxicity (WET) Testing monitoring dates and WET requirements.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See subsection 2.2.1.9 below for Whole Effluent Toxicity (WET) Testing monitoring dates and WET requirements.

2.2.1.1 Annual Average Design Flow

The annual average design flow of the permittee's wastewater treatment facility is 0.346 MGD.

2.2.1.2 *E. coli* Percent Limit

No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 #/100 ml. Bacteria samples may be collected more frequently than required. All samples shall be reported on the monthly discharge monitoring reports (DMRs). The following calculation should be used to calculate percent exceedances.

$$\frac{\#\ of\ Samples\ greater\ than\ 410\ \#/100}{Total\ \#\ of\ samples} \times 100 = \%\ Exceedance$$

2.2.1.3 Phosphorus Water Quality Trading (WQT)

The permittee may use water quality trading to demonstrate compliance with WQBELs for total phosphorus (TP) of 0.225 mg/L monthly average and 0.075 mg/L 6-month average and 0.22 lbs/day 6-month average. Pollutant reduction credits for total phosphorus are available as specified in Water Quality Trading Plan **WQT-2021-0007** or approved amendments thereof.

Table 2. Available Phosphorus Credits per WQT-2021-0007

Year	Available TP Credits (lbs/yr) – Total
2021	134.3
2022	134.3
2023	338.9
2024	338.9
2025	338.9

*In the event that this permit is not reissued prior to the expiration date, 338.9 lbs/yr of long-term credits will be available in subsequent year(s).

Only those pollutant reduction credits established by a water quality trading plan approved by the Department may be used by the permittee to demonstrate compliance with the WQBELs identified in this subsection. If the permittee wishes to use pollutant reduction credits not identified in an approved water quality trading plan, the permittee must amend the plan or develop a new plan and obtain Department approval of the amended or new plan prior to use of the new pollutant reduction credits. Prior to Department approval, the amended or new water quality trading plan will be subject to notice and opportunity for public comment. Any change in the number of available credits requires a permit modification.

In the event pollutant reduction credits as defined in the approved water quality trading plan are no longer generated, the permittee shall comply with the WQBELs for TP contained in this subsection. The sum of

available interim and long-term credits shown in Table 2 may be used to demonstrate compliance for a given year. Interim credits are subject to duration limits and may not be used past the duration defined in Water Quality Trading Plan **WQT-2021-0007.**

2.2.1.4 Demonstrating Compliance with TP WQBELs Using Water Quality Trading

Use the following methods to demonstrate compliance with the TP WQBELs contained in the Water Quality Trading subsection above.

TOTAL POLLUTANT DISCHARGED (TP)

Use the following equations to calculate the amount of pollutant discharged for Monthly Avg TP [lbs/day].

TP or TSS Discharged [lbs/day] = TP or TSS Discharged [mg/L] × Daily Flow [MGD] × 8.34 *(Eq. 1a.)*

Monthly or Weekly Avg = Σ daily results ÷ # of results *(Eq. 1b.)*

WQT CREDITS USED (TOTAL PHOSPHORUS)

Use the following method to calculate the credits to be used expressed as a mass in lbs/month:

WQT TP Credits Needed [lbs/day] = (Monthly Avg TP [mg/L] – 0.075 [mg/L]) × Monthly Avg Flow [MGD] × 8.34 *(Eq. 2a.)*

WQT TP Credits Needed [lbs/day] = Monthly Avg TP [lbs/day] – 0.22 lbs/day *(Eq. 2b.)*

When the "Monthly Avg TP" discharged is greater than both 0.075 mg/L and 0.22 lbs/day, select the greater of the two values from Equation 2a or 2b to be used in Equation 2c below.

Note: When the TP discharge is less than 0.075 mg/L AND 0.22 lbs/day as a monthly avg, report 0 (zero) as the "WQT Credits Used (TP)".

WQT TP Credits Used [lbs/month] = WQT TP Credits Needed [lbs/day] × # of days of discharge/month *(Eq. 2c.)*

WQT COMPUTED COMPLIANCE (TOTAL PHOSPHORUS)

Use the following method to demonstrate compliance with TP WQBELs expressed as a concentration in mg/L:

WQT TP Computed Compliance [mg/L] = Monthly Avg TP [mg/L] – [WQT TP Credits Needed [lbs/day]* ÷ (Monthly Avg Flow [MGD] × 8.34)] *(Eq. 4a.)*

*Greater of either Equation 2a or 2b, the value used for Equation 2c.

Use the following method to demonstrate compliance with TP WQBELs expressed as a mass in lbs/day:

WQT TP Computed Compliance [lbs/day] = Monthly Avg TP [lbs/day] – WQT TP Credits Needed [lbs/day]** (*Eq. 4b.)*

**Greater of either Equation 2a or 2b, the value used for Equation 2c.

2.2.1.5 Additional Water Quality Trading Requirements

When using water quality trading to demonstrate compliance with WQBELs for TP, the permittee shall comply with the following:

• Failure to implement any of the terms or conditions of the approved water quality trading plan is a violation of this permit.

• Each month the permittee shall certify that the nonpoint source management practices installed to generate pollutant reduction credits are operated and maintained in a manner consistent with that specified in the approved water quality trading plan. Such a certification may be made by including the following statement as a comment on the monthly discharge monitoring report:

> I certify that management practices identified in the approved water quality trading plan as the source of pollutant reduction credits are installed, established and properly maintained.

• At least once a year the permittee or the permittee's agent shall inspect each nonpoint source management practice that generates pollutant reduction credits to confirm the implementation of the management practice and their appropriate operation and adequate maintenance.

• The permittee shall notify WDNR by telephone within 24 hours or next business day of becoming aware that pollutant reduction credits used or intended for use by the permittee are not being implemented or generated as defined in the approved trading plan. A written notification shall be submitted to the Department within 5 days regarding the status of the permittee's pollutant reduction credits.

• The permittee shall provide WDNR written notice within 7 days of the trade agreement upon which the approved water quality trading plan is based being amended, modified, or revoked. This notification shall include the details of any amendment or modification in addition to the justification for the changes.

• The permittee shall not use pollutant reduction credits for the demonstration of compliance when pollutant reduction credits are not being generated.

2.2.1.6 Water Quality Trading Reopener Clause

Under any of the following conditions as provided by s. 283.53(2), Wis. Stats. and Wis. Adm. Code NR 203.135 and 203.136, the Department may modify or revoke and reissue this permit to modify or eliminate permit terms and conditions related to water quality trading:

• The permittee fails to implement the water quality trading plan as approved;

• The permittee fails to comply with permit terms and conditions related to water quality trading;

• New information becomes available that would change the number of credits available for the water quality trade or would change the Department's determinations that water quality trading is an acceptable option.

2.2.1.7 Submittal of Permit Application for Next Reissuance and Pollutant Trading Plan

The permittee shall submit the permit application for the next reissuance at least 6 months prior to expiration of this permit. The permittee has submitted a Water Quality Trading Plan that was approved by WDNR on December 16, 2020. If the permittee intends to pursue pollutant trading to achieve compliance in a future permit term, and updated water quality trading plan is due with the application for the next reissuance. If system upgrades will be used in combination with pollutant trading the permittee shall submit plans for any system upgrade**.**

2.2.1.8 Nitrogen Series Monitoring

Monitoring for Total Kjeldahl Nitrogen (TKN), Nitrite + Nitrate Nitrogen, and Total Nitrogen shall be conducted once each year in rotating quarters in order to collect seasonal information about the discharge. Tests are required during the following quarters.

- **October – December 2021; January – March 2022; April – June 2023; July – September 2024; October – December 2025**

Nitrogen Series monitoring shall continue after the permit expiration date (until the permit is reissued) in accordance with the monitoring requirements specified in the last full calendar year of this permit. For example, the next test would be required in **October – December 2026**.

Testing: Monitoring shall be performed during normal operating conditions. Permittees are not allowed to turn off or otherwise modify treatment systems, production processes, or change other operating or treatment conditions during testing.

2.2.1.9 Whole Effluent Toxicity (WET) Testing

Primary Control Water: Sugar River

Instream Waste Concentration (IWC): 6%

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Acute:** 100, 50, 25, 12.5, 6.25% and any additional selected by the permittee.
- **Chronic:** 100, 30, 10, 3, 1% and any additional selected by the permittee.

WET Testing Frequency:

Acute tests shall be conducted twice during the permit term in rotating quarters in order to collect seasonal information about the discharge. Tests are required during the following quarters.

- **Acute:** January 1, 2022 – March 31, 2022; July 1, 2024 – September 30, 2024

  Acute WET testing shall continue after the permit expiration date (until the permit is reissued) in accordance with the WET requirements specified for the last full calendar year of this permit. For example, the next test would be required in July 1, 2026 – September 30, 2026.

Chronic tests shall be conducted twice during the permit term in rotating quarters in order to collect seasonal information about the discharge. Tests are required during the following quarters.

- **Chronic:** January 1, 2022 – March 31, 2022; July 1, 2024 – September 30, 2024

  Chronic WET testing shall continue after the permit expiration date (until the permit is reissued) in accordance with the WET requirements specified for the last full calendar year of this permit. For example, the next test would be required in July 1, 2026 – September 30, 2026.

Testing: WET testing shall be performed during normal operating conditions. Permittees are not allowed to turn off or otherwise modify treatment systems, production processes, or change other operating or treatment conditions during WET tests.

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion. The Discharge Monitoring Report (DMR) form shall be submitted electronically by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: $TU_a = 100 \div LC_{50}$. A chronic toxicity test shall be considered positive if the Toxic Unit - Chronic (TU_c) is greater than 17 for either species. The TU_c shall be calculated as follows: $TU_c = 100 \div IC_{25}$.

Additional Testing Requirements: Within 90 days of a test which showed positive results, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The 90 day reporting period shall begin the day after the test which showed a positive result. The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements section herein).

3 Land Application Requirements

3.1 Sampling Point(s)

The discharge(s) shall be limited to land application of the waste type(s) designated for the listed sampling point(s) on Department approved land spreading sites or by hauling to another facility.

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
002	Aerobically digested, Liquid, Class B. Representative sludge samples shall be collected from the sludge storage tank. Sludge is either land applied by the permittee or hauled by Madison Met Sewerage District.

3.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 002 - SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Jan. 1, 2022 - Dec. 31, 2022
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Jan. 1, 2022 - Dec. 31, 2022
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH_4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	

Other Sludge Requirements	
Sludge Requirements	**Sample Frequency**
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	**Annual**
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	**Annual**

3.2.1.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

3.2.1.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

3.2.1.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

3.2.1.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

[(Pollutant concentration (mg/kg) x dry tons applied/ac) ÷ 500] + previous loading (lbs/acre) = cumulative lbs pollutant per acre

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

3.2.1.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during **2022**. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

3.2.1.6 Lists 1, 2, 3, and 4

List 1 **TOTAL SOLIDS AND METALS** See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 **NUTRIENTS** See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH4-N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3
PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion	Air Drying	
Anaerobic Digestion	Composting	
Alkaline Stabilization	PSRP Equivalent Process	

***** The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4
VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O_2/hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

3.2.1.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements**.**		
Parameters	**Units**	**Sample Frequency**
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

*gallons, cubic yards, dry US Tons or dry Metric Tons

4 Schedules

4.1 Effluent Limitations for E. coli

The permittee shall 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 the notification

Required Action	Due Date
Status Update: The permittee shall submit information within the discharge monitoring report (DMR) comment section documenting the steps taken in preparation for properly monitoring and testing for E. coli including, but not limited to, selected test method and location of sampling.	08/21/2021
Operational Evaluation Report: The permittee shall prepare and submit an Operational Evaluation Report to the Department for review and approval. The report shall include an evaluation of collected effluent data and proposed operational improvements that will optimize efficacy of disinfection at the treatment plant during the period prior to complying with final E. coli limitations and, to the extent possible, enable compliance with the final E. coli limitations. The report shall include a plan and schedule for implementation of the operational improvements. These improvements shall occur as soon as possible, but not later than January 31, 2023. The report shall state whether the operational improvements are expected to result in compliance with the final E. coli limitations. The permittee shall implement the operational improvements in accordance with the approved plan and schedule specified in the Operational Evaluation Report and in no case later than January 31, 2023. If the Operational Evaluation Report concludes that the operational improvements are expected to result in compliance with the final E. coli limitations, the permittee shall comply with the final E. coli limitations by January 31, 2023 and the permittee is not required to comply with subsequent milestones identified below in this compliance schedule (‘Submit Facility Plan’, 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet Limitations', ‘Construction Upgrade Progress Report’, 'Complete Construction', 'Achieve Compliance'). FACILITY PLAN - If the Operational Evaluation Report concludes that operational improvements alone are not expected to result in compliance with the final E. coli limitations, the permittee shall initiate development of a facility plan for meeting final E. coli limitations and comply with the remaining required actions in this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final E. coli limitations using the existing treatment system with only operational improvements, the Department may reopen and modify the permit to include an implementation schedule for achieving the final E. coli limitations sooner than April 30, 2026.	07/31/2022
Submit Facility Plan: If the Operational Evaluation Report concluded that the permittee cannot achieve final E. coli limitations with operational improvements alone, the permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	01/31/2023
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 E. coli limitations and a schedule for completing construction of the upgrades by the complete construction date specified below.	01/31/2024
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement,	07/31/2024

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.	
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	07/31/2025
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	01/31/2026
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	04/30/2026

4.2 Annual Water Quality Trading (WQT) Report

Required Action	Due Date
Annual WQT Report: Submit an annual WQT report that shall cover August 1, 2021 - December 31, 2021. The WQT Report shall include: The number of pollutant reduction credits (lbs/month) used each month of the previous year to demonstrate compliance; The source of each month's pollutant reduction credits by identifying the approved water quality trading plan that details the source; A summary of the annual inspection of each nonpoint source management practice that generated any of the pollutant reduction credits used during the previous year; and Identification of noncompliance or failure to implement any terms or conditions of this permit with respect to water quality trading that have not been reported in discharge monitoring reports.	01/31/2022
Annual WQT Report #2: Submit an annual WQT report that shall cover the previous year.	01/31/2023
Annual WQT Report #3: Submit an annual WQT report that shall cover the previous year.	01/31/2024
Annual WQT Report #4: Submit an annual WQT report that shall cover the previous year.	01/31/2025
Annual WQT Report #5: Submit the 5th annual WQT report. If the permittee wishes to continue to comply with phosphorus limits through WQT in subsequent permit terms, the permittee shall submit a revised WQT plan including a demonstration of credit need, compliance record of the existing WQT, and any additional practices needed to maintain compliance over time.	01/31/2026
Annual WQT Report Required After Permit Expiration: In the event that this permit is not reissued by the expiration date, the permittee shall continue to submit annual WQT reports by January 31 each year covering the total number of pollutant credits used, the source of the pollution reduction credits, a summary of annual inspection reports performed, and identification of noncompliance or failure to implement any terms or conditions of the approved water quality trading plan for the previous calendar year.	

5 Standard Requirements

NR 205, Wisconsin Administrative Code: The conditions in ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(2).

5.1 Reporting and Monitoring Requirements

5.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

Monitoring results shall be reported on an electronic discharge monitoring report (eDMR). The eDMR shall be certified electronically by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

5.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

5.1.3 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

5.1.4 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For purposes of calculating NR 101 fees, the 2 mg/l lower reporting limits for BOD_5 and Total Suspended Solids shall be considered to be limits of quantitation

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a "0" (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

- If no discharge occurs through an outfall, flow related parameters (e.g. flow rate, hydraulic application rate, volume, etc.) should be reported as "0" (zero) at the required sample frequency specified for the outfall. For example: if the sample frequency is daily, "0" would be reported for any day during the month that no discharge occurred.

5.1.5 Compliance Maintenance Annual Reports

Compliance Maintenance Annual Reports (CMAR) shall be completed using information obtained over each calendar year regarding the wastewater conveyance and treatment system. The CMAR shall be submitted and certified by the permittee in accordance with ch. NR 208, Wis. Adm. Code, by June 30, each year on an electronic report form provided by the Department.

In the case of a publicly owned treatment works, a resolution shall be passed by the governing body and submitted as part of the CMAR, verifying its review of the report and providing responses as required. Private owners of wastewater treatment works are not required to pass a resolution; but they must provide an Owner Statement and responses as required, as part of the CMAR submittal.

The CMAR shall be certified electronically by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The certification verifies that the electronic report is true, accurate and complete.

5.1.6 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings or electronic data records for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. All pertinent sludge information, including permit application information and other documents specified in this permit or s. NR 204.06(9), Wis. Adm. Code shall be retained for a minimum of 5 years.

5.1.7 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

5.1.8 Reporting Requirements – Alterations or Additions

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

- The alteration or addition to the permitted facility may meet one of the criteria for determining whether a facility is a new source.
- The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification requirement applies to pollutants which are not subject to effluent limitations in the existing permit.
- The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use of disposal sites not reported during the permit application process nor reported pursuant to an approved land application plan. Additional sites may not be used for the land application of sludge until department approval is received.

5.2 System Operating Requirements

5.2.1 Noncompliance Reporting

Sanitary sewer overflows and sewage treatment facility overflows shall be reported according to the 'Sanitary Sewer Overflows and Sewage Treatment Facility Overflows' section of this permit.

The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance:

- any noncompliance which may endanger health or the environment;
- any violation of an effluent limitation resulting from a bypass;
- any violation of an effluent limitation resulting from an upset; and
- any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit, either for effluent or sludge.

A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

A scheduled bypass approved by the Department under the 'Scheduled Bypass' section of this permit shall not be subject to the reporting required under this section.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. **The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill**. **To report a hazardous substance spill, call DNR's 24-hour HOTLINE at 1-800-943-0003.**

5.2.2 Flow Meters

Flow meters shall be calibrated annually, as per s. NR 218.06, Wis. Adm. Code.

5.2.3 Raw Grit and Screenings

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility or picked up by a licensed waste hauler. If the facility or hauler are located in Wisconsin, then they shall be licensed under chs. NR 500-555, Wis. Adm. Code.

5.2.4 Sludge Management

All sludge management activities shall be conducted in compliance with ch. NR 204 "Domestic Sewage Sludge Management", Wis. Adm. Code.

5.2.5 Prohibited Wastes

Under no circumstances may the introduction of wastes prohibited by s. NR 211.10, Wis. Adm. Code, be allowed into the waste treatment system. Prohibited wastes include those:

- which create a fire or explosion hazard in the treatment work;
- which will cause corrosive structural damage to the treatment work;
- solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment work;
- wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency; and
- changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

5.2.6 Bypass

This condition applies only to bypassing at a sewage treatment facility that is not a scheduled bypass, approved blending as a specific condition of this permit, a sewage treatment facility overflow or a controlled diversion as provided in the sections titled ‘Scheduled Bypass’, ‘Blending’ (if approved), ‘SSO’s and Sewage Treatment Facility Overflows’ and ‘Controlled Diversions’ of this permit. Any other bypass at the sewage treatment facility is prohibited and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats. The Department may approve a bypass if the permittee demonstrates all the following conditions apply:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance. When evaluating feasibility of alternatives, the department may consider factors such as technical achievability, costs and affordability of implementation and risks to public health, the environment and, where the permittee is a municipality, the welfare of the community served; and
- The bypass was reported in accordance with the Noncompliance Reporting section of this permit.

5.2.7 Scheduled Bypass

Whenever the permittee anticipates the need to bypass for purposes of efficient operations and maintenance and the permittee may not meet the conditions for controlled diversions in the ‘Controlled Diversions’ section of this permit,

the permittee shall obtain prior written approval from the Department for the scheduled bypass. A permittee's written request for Department approval of a scheduled bypass shall demonstrate that the conditions for bypassing specified in the above section titled 'Bypass' are met and include the proposed date and reason for the bypass, estimated volume and duration of the bypass, alternatives to bypassing and measures to mitigate environmental harm caused by the bypass. The department may require the permittee to provide public notification for a scheduled bypass if it is determined there is significant public interest in the proposed action and may recommend mitigation measures to minimize the impact of such bypass.

5.2.8 Controlled Diversions

Controlled diversions are allowed only when necessary for essential maintenance to assure efficient operation. Sewage treatment facilities that have multiple treatment units to treat variable or seasonal loading conditions may shut down redundant treatment units when necessary for efficient operation. The following requirements shall be met during controlled diversions:

- Effluent from the sewage treatment facility shall meet the effluent limitations established in the permit. Wastewater that is diverted around a treatment unit or treatment process during a controlled diversion shall be recombined with wastewater that is not diverted prior to the effluent sampling location and prior to effluent discharge;
- A controlled diversion does not include blending as defined in s. NR 210.03(2e), Wis. Adm. Code, and as may only be approved under s. NR 210.12. A controlled diversion may not occur during periods of excessive flow or other abnormal wastewater characteristics;
- A controlled diversion may not result in a wastewater treatment facility overflow; and
- All instances of controlled diversions shall be documented in sewage treatment facility records and such records shall be available to the department on request.

5.2.9 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

5.2.10 Operator Certification

The wastewater treatment facility shall be under the direct supervision of a state certified operator. In accordance with s. NR 114.53, Wis. Adm. Code, every WPDES permitted treatment plant shall have a designated operator-in-charge holding a current and valid certificate. The designated operator-in-charge shall be certified at the level and in all subclasses of the treatment plant, except laboratory. Treatment plant owners shall notify the department of any changes in the operator-in-charge within 30 days. Note that s. NR 114.52(22), Wis. Adm. Code, lists types of facilities that are excluded from operator certification requirements (i.e. private sewage systems, pretreatment facilities discharging to public sewers, industrial wastewater treatment that consists solely of land disposal, agricultural digesters and concentrated aquatic production facilities with no biological treatment).

5.3 Sewage Collection Systems

5.3.1 Sanitary Sewage Overflows and Sewage Treatment Facility Overflows

5.3.1.1 Overflows Prohibited

Any overflow or discharge of wastewater from the sewage collection system or at the sewage treatment facility, other than from permitted outfalls, is prohibited. The permittee shall provide information on whether any of the following conditions existed when an overflow occurred:

- The sanitary sewer overflow or sewage treatment facility overflow was unavoidable to prevent loss of life, personal injury or severe property damage;
- There were no feasible alternatives to the sanitary sewer overflow or sewage treatment facility overflow such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or preventative maintenance activities;
- The sanitary sewer overflow or the sewage treatment facility overflow was caused by unusual or severe weather related conditions such as large or successive precipitation events, snowmelt, saturated soil conditions, or severe weather occurring in the area served by the sewage collection system or sewage treatment facility; and
- The sanitary sewer overflow or the sewage treatment facility overflow was unintentional, temporary, and caused by an accident or other factors beyond the reasonable control of the permittee.

5.3.1.2 Permittee Response to Overflows

Whenever a sanitary sewer overflow or sewage treatment facility overflow occurs, the permittee shall take all feasible steps to control or limit the volume of untreated or partially treated wastewater discharged, and terminate the discharge as soon as practicable. Remedial actions, including those in NR 210.21 (3), Wis. Adm. Code, shall be implemented consistent with an emergency response plan developed under the CMOM program.

5.3.1.3 Permittee Reporting

Permittees shall report all sanitary sewer overflows and sewage treatment overflows as follows:

- The permittee shall notify the department by telephone, fax or email as soon as practicable, but no later than 24 hours from the time the permittee becomes aware of the overflow;
- The permittee shall, no later than five days from the time the permittee becomes aware of the overflow, provide to the department the information identified in this paragraph using department form number 3400-184. If an overflow lasts for more than five days, an initial report shall be submitted within 5 days as required in this paragraph and an updated report submitted following cessation of the overflow. At a minimum, the following information shall be included in the report:

  ◦The date and location of the overflow;
  ◦The surface water to which the discharge occurred, if any;
  ◦The duration of the overflow and an estimate of the volume of the overflow;
  ◦A description of the sewer system or treatment facility component from which the discharge occurred such as manhole, lift station, constructed overflow pipe, or crack or other opening in a pipe;
  ◦The estimated date and time when the overflow began and stopped or will be stopped;
  ◦The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information;
  ◦Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
  ◦A description of the actual or potential for human exposure and contact with the wastewater from the overflow;
  ◦Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps;
  ◦To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred

concurrently with the sanitary sewer overflow and that were within the same area of the sewage collection system as the sanitary sewer overflow; and
◦The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event. This includes any information available including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.

NOTE: A copy of form 3400-184 for reporting sanitary sewer overflows and sewage treatment facility overflows may be obtained from the department or accessed on the department's web site at http://dnr.wi.gov/topic/wastewater/SSOreport.html. As indicated on the form, additional information may be submitted to supplement the information required by the form.

- The permittee shall identify each specific location and each day on which a sanitary sewer overflow or sewage treatment facility overflow occurs as a discrete sanitary sewer overflow or sewage treatment facility overflow occurrence. An occurrence may be more than one day if the circumstances causing the sanitary sewer overflow or sewage treatment facility overflow results in a discharge duration of greater than 24 hours. If there is a stop and restart of the overflow at the same location within 24 hours and the overflow is caused by the same circumstance, it may be reported as one occurrence. Sanitary sewer overflow occurrences at a specific location that are separated by more than 24 hours shall be reported as separate occurrences; and
- A permittee that is required to submit wastewater discharge monitoring reports under NR 205.07 (1) (r) shall also report all sanitary sewer overflows and sewage treatment facility overflows on that report.

5.3.1.4 Public Notification

The permittee shall notify the public of any sanitary sewer and sewage treatment facility overflows consistent with its emergency response plan required under the CMOM (Capacity, Management, Operation and Maintenance) section of this permit and s. NR 210.23 (4) (f), Wis. Adm. Code. Such public notification shall occur promptly following any overflow event using the most effective and efficient communications available in the community. At minimum, a daily newspaper of general circulation in the county(s) and municipality whose waters may be affected by the overflow shall be notified by written or electronic communication.

5.3.2 Capacity, Management, Operation and Maintenance (CMOM) Program

- The permittee shall have written documentation of the Capacity, Management, Operation and Maintenance (CMOM) program components in accordance with s. NR 210.23(4), Wis. Adm. Code. Such documentation shall be available for Department review upon request. The Department may request that the permittee provide this documentation or prepare a summary of the permittee's CMOM program at the time of application for reissuance of the WPDES permit.
- The permittee shall implement a CMOM program in accordance with s. NR 210.23, Wis. Adm. Code.
- The permittee shall at least annually conduct a self-audit of activities conducted under the permittee's CMOM program to ensure CMOM components are being implemented as necessary to meet the general standards of s. NR 210.23(3), Wis. Adm. Code.

5.3.3 Sewer Cleaning Debris and Materials

All debris and material removed from cleaning sanitary sewers shall be managed to prevent nuisances, run-off, ground infiltration or prohibited discharges.

- Debris and solid waste shall be dewatered, dried and then disposed of at a licensed solid waste facility.
- Liquid waste from the cleaning and dewatering operations shall be collected and disposed of at a permitted wastewater treatment facility.

- Combination waste including liquid waste along with debris and solid waste may be disposed of at a licensed solid waste facility or wastewater treatment facility willing to accept the waste.

5.4 Surface Water Requirements

5.4.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

5.4.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average concentration limits and mass limits and total load limits:

Weekly/Monthly/Six-Month/Annual Average Concentration = the sum of all daily results for that week/month/six-month/year, divided by the number of results during that time period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

Six-Month Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the six-month period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Annual Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the entire year.

Total Monthly Discharge: = monthly average concentration (mg/L) x total flow for the month (MG/month) x 8.34.

Total Annual Discharge: = sum of total monthly discharges for the calendar year.

12-Month Rolling Sum of Total Monthly Discharge: = the sum of the most recent 12 consecutive months of Total Monthly Discharges.

5.4.3 Effluent Temperature Requirements

Weekly Average Temperature – The permittee shall use the following formula for calculating effluent results to determine compliance with the weekly average temperature limit (as applicable): Weekly Average Temperature = the sum of all daily maximum results for that week divided by the number of daily maximum results during that time period.

Cold Shock Standard – Water temperatures of the discharge shall be controlled in a manner as to protect fish and aquatic life uses from the deleterious effects of cold shock. 'Cold Shock' means exposure of aquatic organisms to a rapid decrease in temperature and a sustained exposure to low temperature that induces abnormal behavior or physiological performance and may lead to death.

Rate of Temperature Change Standard – Temperature of a water of the state or discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state.

5.4.4 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

5.4.5 Surface Water Uses and Criteria

In accordance with NR 102.04, Wis. Adm. Code, surface water uses and criteria are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all surface waters including the mixing zone meet the following conditions at all times and under all flow and water level conditions:

a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

d) Substances in concentrations or in combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

5.4.6 Percent Removal

During any 30 consecutive days, the average effluent concentrations of BOD_5 and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively. This requirement does not apply to removal of total suspended solids if the permittee operates a lagoon system and has received a variance for suspended solids granted under NR 210.07(2), Wis. Adm. Code.

5.4.7 Fecal Coliform

The monthly limit for fecal coliform shall be expressed as a geometric mean. In calculating the geometric mean, a value of 1 is used for any result of 0.

5.4.8 *E. coli*

The monthly limit for *E. coli* shall be expressed as a geometric mean. In calculating the geometric mean, a value of 1 is used for any result of 0.

5.4.9 Seasonal Disinfection

Disinfection shall be provided from May 1 through September 30 of each year. Monitoring requirements and the limitations for Fecal Coliform (interim) and *E. coli* apply only during the period in which disinfection is required. Whenever chlorine is used for disinfection or other uses, the limitations and monitoring requirements for residual chlorine shall apply. A dechlorination process shall be in operation whenever chlorine is used.

5.5 Land Application Requirements

5.5.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations

In the event that new federal sludge standards or regulations are promulgated, the permittee shall comply with the new sludge requirements by the dates established in the regulations, if required by federal law, even if the permit has not yet been modified to incorporate the new federal regulations.

5.5.2 General Sludge Management Information

The General Sludge Management Form 3400-48 shall be completed and submitted prior to any significant sludge management changes.

5.5.3 Sludge Samples

All sludge samples shall be collected at a point and in a manner which will yield sample results which are representative of the sludge being tested, and collected at the time which is appropriate for the specific test.

5.5.4 Land Application Characteristic Report

Each report shall consist of a Characteristic Form 3400-49 and Lab Report. The Characteristic Report Form 3400-49 shall be submitted electronically by January 31 following each year of analysis.

Following submittal of the electronic Characteristic Report Form 3400-49, this form shall be certified electronically via the 'eReport Certify' page by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report is true, accurate and complete. The Lab Report must be sent directly to the facility's DNR sludge representative or basin engineer unless approval for not submitting the lab reports has been given.

The permittee shall use the following convention when reporting sludge monitoring results: Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 1.0 mg/kg, report the pollutant concentration as < 1.0 mg/kg .

All results shall be reported on a dry weight basis.

5.5.5 Calculation of Water Extractable Phosphorus

When sludge analysis for Water Extractable Phosphorus is required by this permit, the permittee shall use the following formula to calculate and report Water Extractable Phosphorus:
Water Extractable Phosphorus (% of Total P) =
[Water Extractable Phosphorus (mg/kg, dry wt) ÷ Total Phosphorus (mg/kg, dry wt)] x 100

5.5.6 Monitoring and Calculating PCB Concentrations in Sludge

When sludge analysis for "PCB, Total Dry Wt" is required by this permit, the PCB concentration in the sludge shall be determined as follows.

Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with the following provisions and Table EM in s. NR 219.04, Wis. Adm. Code.

- EPA Method 1668 may be used to test for all PCB congeners. If this method is employed, all PCB congeners shall be delineated. Non-detects shall be treated as zero. The values that are between the limit of detection and the limit of quantitation shall be used when calculating the total value of all congeners. All results shall be added together and the total PCB concentration by dry weight reported. **Note**: It is recognized that a number of the congeners will co-elute with others, so there will not be 209 results to sum.

- EPA Method 8082A shall be used for PCB-Aroclor analysis and may be used for congener specific analysis as well. If congener specific analysis is performed using Method 8082A, the list of congeners tested shall include at least congener numbers 5, 18, 31, 44, 52, 66, 87, 101, 110, 138, 141, 151, 153, 170, 180, 183, 187, and 206 plus any other additional congeners which might be reasonably expected to occur in the particular sample. For either type of analysis, the sample shall be extracted using the Soxhlet extraction (EPA Method 3540C) (or the Soxhlet Dean-Stark modification) or the pressurized fluid extraction (EPA Method 3545A). If Aroclor analysis is performed using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.11 mg/kg as possible. Reporting protocol, consistent with s. NR 106.07(6)(e), should be as follows: If all Aroclors are less than the LOD, then the Total PCB Dry Wt result should be reported as less than the highest LOD. If a single Aroclor is detected then that is what should be reported for the Total PCB result. If multiple Aroclors are detected, they should be summed and reported as Total PCBs. If congener specific analysis is done using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.003 mg/kg as possible for each congener. If the aforementioned limits of detection cannot be achieved after using the appropriate clean up techniques, a reporting limit that is achievable for the Aroclors or each congener for the sample shall be determined. This reporting limit shall be reported and qualified indicating the presence of an interference. The lab conducting the analysis shall perform as many of the following methods as necessary to remove interference:

3620C – Florisil	3611B - Alumina
3640A - Gel Permeation	3660B - Sulfur Clean Up (using copper shot instead of powder)
3630C - Silica Gel	3665A - Sulfuric Acid Clean Up

5.5.7 Annual Land Application Report

Land Application Report Form 3400-55 shall be submitted electronically by January 31, each year whether or not non-exceptional quality sludge is land applied. Non-exceptional quality sludge is defined in s. NR 204.07(4), Wis. Adm. Code. Following submittal of the electronic Annual Land Application Report Form 3400-55, this form shall be certified electronically via the 'eReport Certify' page by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

5.5.8 Other Methods of Disposal or Distribution Report

The permittee shall submit electronically the Other Methods of Disposal or Distribution Report Form 3400-52 by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied. Following submittal of the electronic Report Form 3400-52, this form shall be certified electronically via the 'eReport Certify' page by a responsible executive or municipal officer, manager, partner or proprietor as specified in s. 283.37(3), Wis. Stats., or a duly authorized representative of the officer, manager, partner or proprietor that has been delegated signature authority pursuant to s. NR 205.07(1)(g)2, Wis. Adm. Code. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

5.5.9 Approval to Land Apply

Bulk non-exceptional quality sludge as defined in s. NR 204.07(4), Wis. Adm. Code, may not be applied to land without a written approval letter or Form 3400-122 from the Department unless the Permittee has obtained permission from the Department to self approve sites in accordance with s. NR 204.06 (6), Wis. Adm. Code. Analysis of sludge characteristics is required prior to land application. Application on frozen or snow covered ground is restricted to the extent specified in s. NR 204.07(3) (l), Wis. Adm. Code.

5.5.10 Soil Analysis Requirements

Each site requested for approval for land application must have the soil tested prior to use. Each approved site used for land application must subsequently be soil tested such that there is at least one valid soil test in the four years prior to land application. All soil sampling and submittal of information to the testing laboratory shall be done in accordance with UW Extension Bulletin A-2100. The testing shall be done by the UW Soils Lab in Madison or Marshfield, WI or at a lab approved by UW. The test results including the crop recommendations shall be submitted to the DNR contact listed for this permit, as they are available. Application rates shall be determined based on the crop nitrogen recommendations and with consideration for other sources of nitrogen applied to the site.

5.5.11 Land Application Site Evaluation

For non-exceptional quality sludge, as defined in s. NR 204.07(4), Wis. Adm. Code, a Land Application Site Request Form 3400-053 shall be submitted to the Department for the proposed land application site. The Department will evaluate the proposed site for acceptability and will either approve or deny use of the proposed site. The permittee may obtain permission to approve their own sites in accordance with s. NR 204.06(6), Wis. Adm. Code.

5.5.12 Class B Sludge: Fecal Coliform Limitation

Compliance with the fecal coliform limitation for Class B sludge shall be demonstrated by calculating the geometric mean of at least 7 separate samples. (Note that a Total Solids analysis must be done on each sample). The geometric mean shall be less than 2,000,000 MPN or CFU/g TS. Calculation of the geometric mean can be done using one of the following 2 methods.

Method 1:

Geometric Mean = $(X_1 \times X_2 \times X_3 \ldots \times X_n)^{1/n}$

Where X = Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Method 2:

Geometric Mean = $\text{antilog}[(X_1 + X_2 + X_3 \ldots + X_n) \div n]$

Where X = $\log_{10}$ of Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Example for Method 2

Sample Number	Coliform Density of Sludge Sample	$\log_{10}$
1	6.0×10^5	5.78
2	4.2×10^6	6.62
3	1.6×10^6	6.20
4	9.0×10^5	5.95
5	4.0×10^5	5.60
6	1.0×10^6	6.00
7	5.1×10^5	5.71

The geometric mean for the seven samples is determined by averaging the $\log_{10}$ values of the coliform density and taking the antilog of that value.

$(5.78 + 6.62 + 6.20 + 5.95 + 5.60 + 6.00 + 5.71) \div 7 = 5.98$

The antilog of $5.98 = 9.5 \times 10^5$

5.5.13 Class B Sludge: Aerobic Digestion

Agitate the sludge with air or oxygen to maintain an aerobic condition for a mean cell residence time and temperature between 40 days at 20° C and 60 days at 15° C.

5.5.14 Sludge Hauling

The permittee is required to submit Form 3400-52 to the Department. If sludge is hauled to another facility, information shall include the quantity of sludge hauled, the name, address, phone number, contact person, and permit number of the receiving facility. Form 3400-52 shall be submitted annually by January 31 each year whether or not sludge is hauled.

6 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Effluent Limitations for E. coli -Status Update	August 21, 2021	15
Effluent Limitations for E. coli -Operational Evaluation Report	July 31, 2022	15
Effluent Limitations for E. coli -Submit Facility Plan	January 31, 2023	15
Effluent Limitations for E. coli -Final Plans and Specifications	January 31, 2024	15
Effluent Limitations for E. coli -Treatment Plant Upgrade to Meet Limitations	July 31, 2024	16
Effluent Limitations for E. coli -Construction Upgrade Progress Report	July 31, 2025	16
Effluent Limitations for E. coli -Complete Construction	January 31, 2026	16
Effluent Limitations for E. coli -Achieve Compliance	April 30, 2026	16
Annual Water Quality Trading (WQT) Report -Annual WQT Report	January 31, 2022	16
Annual Water Quality Trading (WQT) Report -Annual WQT Report #2	January 31, 2023	16
Annual Water Quality Trading (WQT) Report -Annual WQT Report #3	January 31, 2024	16
Annual Water Quality Trading (WQT) Report -Annual WQT Report #4	January 31, 2025	16
Annual Water Quality Trading (WQT) Report -Annual WQT Report #5	January 31, 2026	16
Annual Water Quality Trading (WQT) Report -Annual WQT Report Required After Permit Expiration	See Permit	16
Compliance Maintenance Annual Reports (CMAR)	by June 30, each year	18
General Sludge Management Form 3400-48	prior to any significant sludge management changes	26
Characteristic Form 3400-49 and Lab Report	by January 31 following each year of analysis	26
Land Application Report Form 3400-55	by January 31, each year whether or not non-exceptional quality sludge is land applied	27
Other Methods of Disposal or Distribution Report Form 3400-52	by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied	27

Wastewater Discharge Monitoring Report	no later than the date indicated on the form	17

Report forms shall be submitted electronically in accordance with the reporting requirements herein. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non-industrial wastewater systems shall be submitted to the Bureau of Water Quality, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to:
South Central Region, 3911 Fish Hatchery Road, Fitchburg, WI 53711-5397

APPENDIX B

Notice of Intent to Conduct Water Quality Trading

State of Wisconsin
Department of Natural Resources
101 South Webster Street
Madison, WI 53707

Notification that Water Quality Trading Will Be Used to Comply with WQBELs
Form 8700-nnn (R10/12)

Applicant Information

Permittee Name:	Permit Number:	Facility Site Number:
Village of Belleville	**WI**-0023361-09-0	N/A

Facility Address:	City:	State:	ZIP Code:
20 River Street Box 79	Belleville	WI	53508

Project Contact Name(if applicable)	*Address*	*City*	*State*	*Zip Code*
Andrew Skog, P.E., MSA	1702 Pankratz Street	Madison	WI	53704

Project Name:
Belleville Water Quality Trading Plan

Receiving Water Name:	Parameter(s) being traded:	HUC 12:
Sugar River	Phosphorus	070900040502 Ross Crossing-Sugar River

Is the permittee in a point or nonpoint source dominated watershed?
(See PRESTO results- http://dnr.wi.gov/topic/surfacewater/presto.html)
☐ Point source dominated
☒ Nonpoint source dominated

Credit Generator Information

Credit generator type (check all that apply):
☐ Permitted Discharge (non-MS4)
☐ Permitted MS4
☐ CAFOs
☐ Non-permitted urban discharge
☒ Agricultural nonpoint source discharge
☐ Other- Specify: _____

Are any of the credit generators in a different HUC 12 than the applicant?
☒ Yes; HUC 12: 070900040102, 070900040103, 070900040203
☐ No
☐ Unsure

Are any of the credit generators downstream of the applicant?
☐ Yes
☒ No
☐ Unsure

Will a broker/exchange be used to facilitate trade?
☐ Yes; Broker Name: _____
☒ No
☐ Unsure

Permitted Discharge Information (Traditional Municipal/Industrial Discharge, MS4, CAFO):

Discharge Type	Permit Number	Name	Contact Address	Is the PS currently in compliance with their permit requirements?
☐ Traditional ☐ MS4 ☐ CAFO				☐ Yes ☐ No ☐ Unsure
☐ Traditional ☐ MS4 ☐ CAFO				☐ Yes ☐ No ☐ Unsure
☐ Traditional ☐ MS4 ☐ CAFO				☐ Yes ☐ No ☐ Unsure
☐ Traditional ☐ MS4 ☐ CAFO				☐ Yes ☐ No ☐ Unsure
☐ Traditional ☐ MS4 ☐ CAFO				☐ Yes ☐ No ☐ Unsure

Other Information:	
Will other improvements be made to improve effluent quality towards permit compliance?	☐ Yes *(if yes, please attach a description of these improvements)* ☒ No ☐ Unsure

Practices that will be used to generate credits:

Agricultural Practices:

Barnyard Improvements (Production Area Practices)

Streambank Stabilization

Whole Field Management

Method for quantifying credits generated:
☐ Monitoring
☒ Modeling, Names: BARNY, NRCS Recession Calculation, SnapPlus
☐ Other: _____

Projected date credits will be available: March 31, 2023

The preparer and owner certify all of the following:

- I am familiar with the specifications submitted for this application, and I believe all applicable items in this checklist have been addressed.
- I have completed this document to the best of my knowledge and have not excluded pertinent information.
- I certify that the information in this document is true to the best of my knowledge.

Signature of Preparer	Date Signed
Andrew Shy	12/4/2020

APPENDIX C

Barnyard Modeling Overview

APPENDIX C

BARNYARD MODELING OVERVIEW

1.1 BACKGROUND

The Village of Belleville originally planned to generate phosphorus credits by installing clean water diversions for the outdoor barnyards operated by Landowner A. In order to quantify the number of credits that could be generated by implementing barnyard improvements, phosphorus losses from the barnyards were quantified based on existing conditions and proposed future improvements. This Appendix originally described the details of DNR's BARNY model and how it was utilized to determine these phosphorus losses and the credits to be generated for the barnyard improvements on the Landowner A project. However, because the Village of Belleville will no longer be including this project as part of the WQT Plan, all subsequent descriptions and analysis originally provided in this Appendix have been deleted from this version.

APPENDIX D

Streambank Erosion Modeling Overview

APPENDIX D

STREAMBANK EROSION MODELING OVERVIEW

1.1 BACKGROUND

The Village of Belleville is generating phosphorus credits by completing approximately 0.8 miles of streambank stabilization and habitat improvements along Milum Creek. Two landowners have been identified to complete this work: Landowner E and Landowner F. Landowner A and Landowner G, which originally had projects with streambank stabilization and habitat improvements proposed, have been removed from this version of the WQT Plan. Landowner E owns approximately 0.30 miles of streambank along Milum Creek and Landowner F owns approximately 0.50 miles of streambank along Milum Creek. A total of 29 and 25 actively eroding streambanks were identified on the properties owned by Landowners E and F, respectively. Streambank erosion for each eroding bank was estimated using the process defined in the NRCS "Erosion Calculator," which uses the "Direct Volume Method" to estimate streambank erosion (NRCS Field Office Technical Guide, 2017). **Equation 1**, based on the Direct Volume Method, was used to estimate phosphorus loss from each eroding streambank. The sum of phosphorus loss from all eroding banks was used to estimate the amount of potential phosphorus credits that could be generated by stabilizing the eroding streambanks.

Equation 1:

$$\text{Streambank Phosphorus Loss} = L \times H \times R \times \gamma_{soil} \times C_{TP} \times \frac{1}{1{,}000{,}000}$$

Where:

L	=	length of eroding bank [ft]
H	=	slope height of eroding bank [ft]
R	=	annual lateral recession rate of eroding bank $\left[\frac{ft}{yr}\right]$
γ_{soil}	=	soil bulk density $\left[\frac{lb}{ft^3}\right]$
C_{TP}	=	soil total phosphorus concentration [ppm]

1.2 METHODS

Estimating phosphorus loss using Direct Volume Method, requires the modeler to collect field data to estimate the eroding area of each bank (L x H), the annual lateral recession rate of each bank (R), the soil bulk density (γ_{soil}), and the total phosphorus concentration of soil (C_{TP}) eroded from each bank. The eroding area for each bank was determined by hand measuring the length and slope height of each bank. Length was measured along the face of each bank with a measuring wheel or 100-ft measuring tape. The bank slope height was measured by pressing a tape measure along the surface of the eroding bank from the toe of slope in the channel to the top of the eroding bank (see example shown in **Figure 1**). Because each bank generally exhibits variability in slope height depending on where the measurements are taken, three (3) representative slope heights were measured for each bank, each approximately the same distance apart. The average bank slope height was used to estimate phosphorus loss. On a few

occasions, less than three slope heights were measured for specific banks when existing vegetation made it infeasible to collect an accurate measurement.

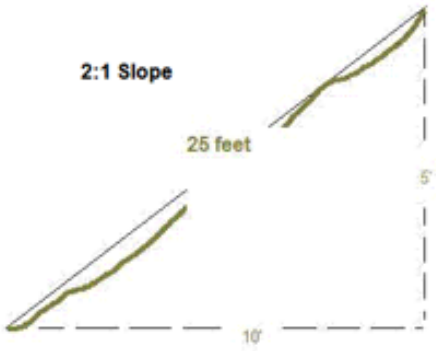

Figure 1: Example measurement of bank slope height. In this example, the bank slope height is 25 ft or the length of the hypotenuse (Source: NRCS Erosion Calculator).

Due to the timing of this study, it was not deemed feasible to directly measure annual lateral recession rates in the field, and historical survey records and high-definition aerial photographs were not available to the extent that annual lateral recession rates could be estimated based on historical records. Therefore, for the purposes of this study, annual lateral recession rates were estimated using the qualitative descriptions listed in **Table 1**. These qualitative descriptions are based on the values found in the NRCS "Erosion Calculator" (NRCS Field Office Technical Guide, 2017). Please note that numeric values for lateral recession rate in **Table 1** are based on the mid-point of the range of values defined for each category of erosion in the "Erosion Calculator." The mid-point of the range was selected to prevent arbitrary selection of lateral recession rates for a given erosion category. Also, an additional category "Moderate/Severe" was defined to account for eroding banks which were not well defined by the categories "Moderate" or "Severe" erosion. The lateral recession rate for the "Moderate/Severe" category was assumed to be 0.25 ft/yr based on the mid-point of the high range of the "Moderate" and the low range of the "Severe" category as defined in the "Erosion Calculator." Lastly, since the "Erosion Calculator" defines "Very Severe" as a lateral recession rate greater than 0.5 ft/yr, it was assumed that all lateral recession rates in this category were approximately 0.5 ft/yr.

Soil bulk densities were estimated using published data from Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm) based on the mapped soil type in which each eroding bank was located. **Table 2** lists the soil bulk density for the five soil types that were mapped along the streambanks owned by Landowner A, Landowner E, Landowner F, and Landowner G. This data was believed to be more representative than the typical soil unit weights based on soil texture listed in the "Erosion Calculator" (NRCS Field Office Technical Guide, 2017). The collection of soil samples for laboratory bulk density analysis was not completed since the collection of representative samples was determined to be infeasible. It would have been difficult to obtain soil bulk density samples which were representative of the entire soil profile of the eroding banks since portions of the sample would need to be collected below the water level of the stream. In addition, sampling for bulk density would have required trained and experienced field staff able to collect representative samples. Variability of bulk density across these large sites was also a concern. For these reasons, it is assumed that

published values of bulk density from Web Soil Survey are sufficient for estimating phosphorus loss for this project.

Table 1: Lateral recession rate based on qualitative description of erosion.

Lateral Recession Rate (ft/yr)	Category	Description
0.03	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.13	Moderate	Bank is predominantly bare with some rills and vegetative overhang. Some exposed tree roots but no slumps or slips.
0.25	Moderate/Severe	Bank is predominantly bare with some rills and vegetative overhang. Some exposed tree roots and some slumps or slips.
0.40	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross section becomes U-shaped as opposed to V-shaped.
> 0.50 ≈ 0.50	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross section is U-shaped and stream course may be meandering.

Table 2: Soil bulk densities for soil types mapped in the project area.

Soil Type	Bulk Density[1] (g/cm^3)	Bulk Density (lb/ft^3)
Huntsville Silt Loam	1.28	79.9
Colwood Silt Loam	1.42	88.6
Dunnbot Fine Sandy Loam	1.56	97.4
Northbend-Ettrick Silt Loams	1.56	97.4
Otter Silt Loam	1.29	80.5

[1]*Bulk density based on representative physical soil properties published by Web Soil Survey for Dane County, Wisconsin.*

Soil samples were collected from each eroding bank in order to estimate the total phosphorus concentration of the eroding soil. Soil samples were collecting using a 7/8" diameter soil probe. A total of 3 subsamples were collected at each location where bank slope height was measured, resulting in a total of 9 subsamples for each bank (see **Figure 2**). Subsamples at each slope

height measurement location were taken from the top, middle, and bottom of the bank above the water level. All 9 subsamples for each bank were combined and mixed in a 5-gallon bucket and placed in a soil sample bag to form a single composite sample of approximately 2 cups of soil. All soil samples were sent to the University of Wisconsin Soil and Forage Analysis Laboratory in Marshfield, WI, and were analyzed for total leachable phosphorus.

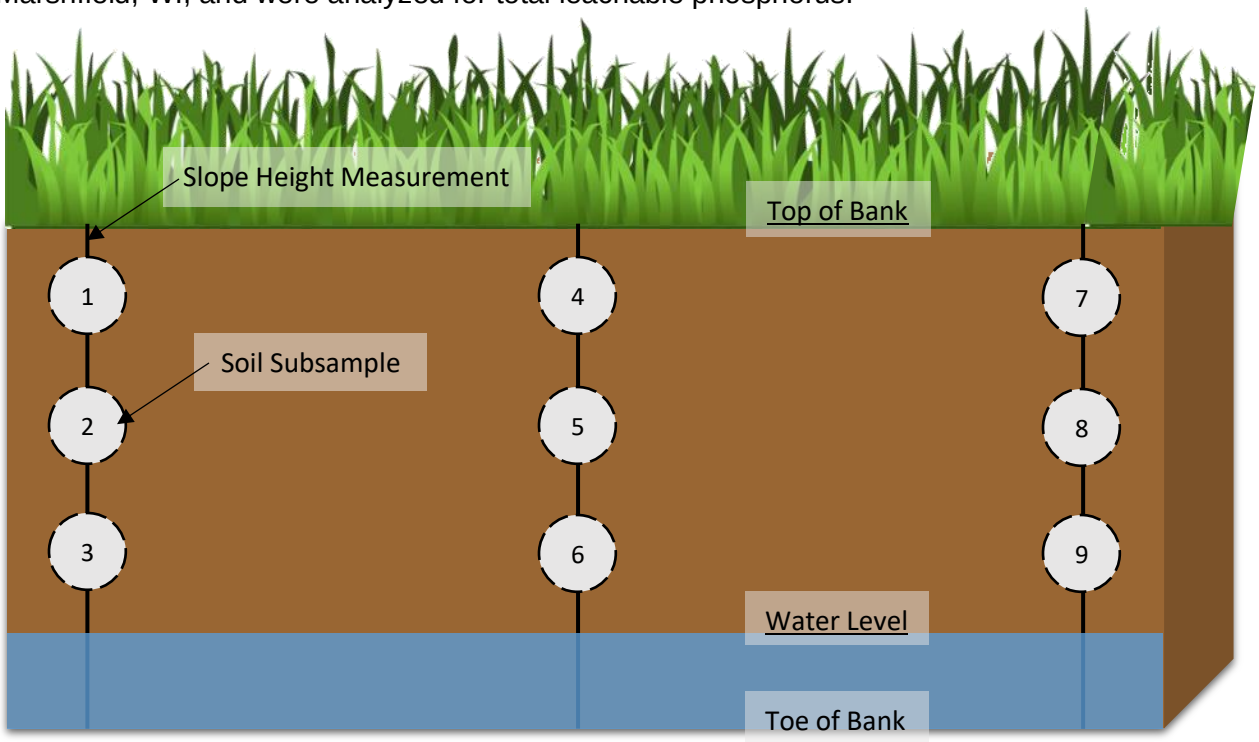

Figure 2: Diagram of soil sampling locations for a typical eroding bank

1.3 RESULTS FOR LANDOWNER A

The Landowner A project has been removed from the WQT Plan. All subsequent information, photos, and credit calculations for Landowner A originally in this Appendix have been deleted from this version. Figures 3 – 35 and Table 3 have been deleted.

1.4 RESULTS FOR LANDOWNER E

A map of streambank sampling points for the property owned by Landowner E is shown in **Figure 36**. A total of 29 eroding streambanks were identified on this property. Photographs of each streambank are shown in **Figures 37** through **65.** The bank length, bank slope height, lateral recession rate, soil bulk density, soil total phosphorus concentration, and estimated phosphorus loss for each eroding streambank is listed in **Table 4**. Phosphorus credits were estimated by dividing the estimated phosphorus loss for each bank by a trade ratio of 2.02 (accounting for an uncertainty factor of 2.0 for streambank stabilization and habitat restoration and a deliver factor or 0.02 for the trades generated in the West Branch Sugar River HUC 12 watershed). A total of 69.4 lbs/yr of phosphorus loss was estimated using **Equation 1**. Accounting for the trade ratio, a total of 34.3 lbs/yr of phosphorus credits could be generated by stabilizing the eroding banks and improving habitat conditions on the property owned by Landowner E.

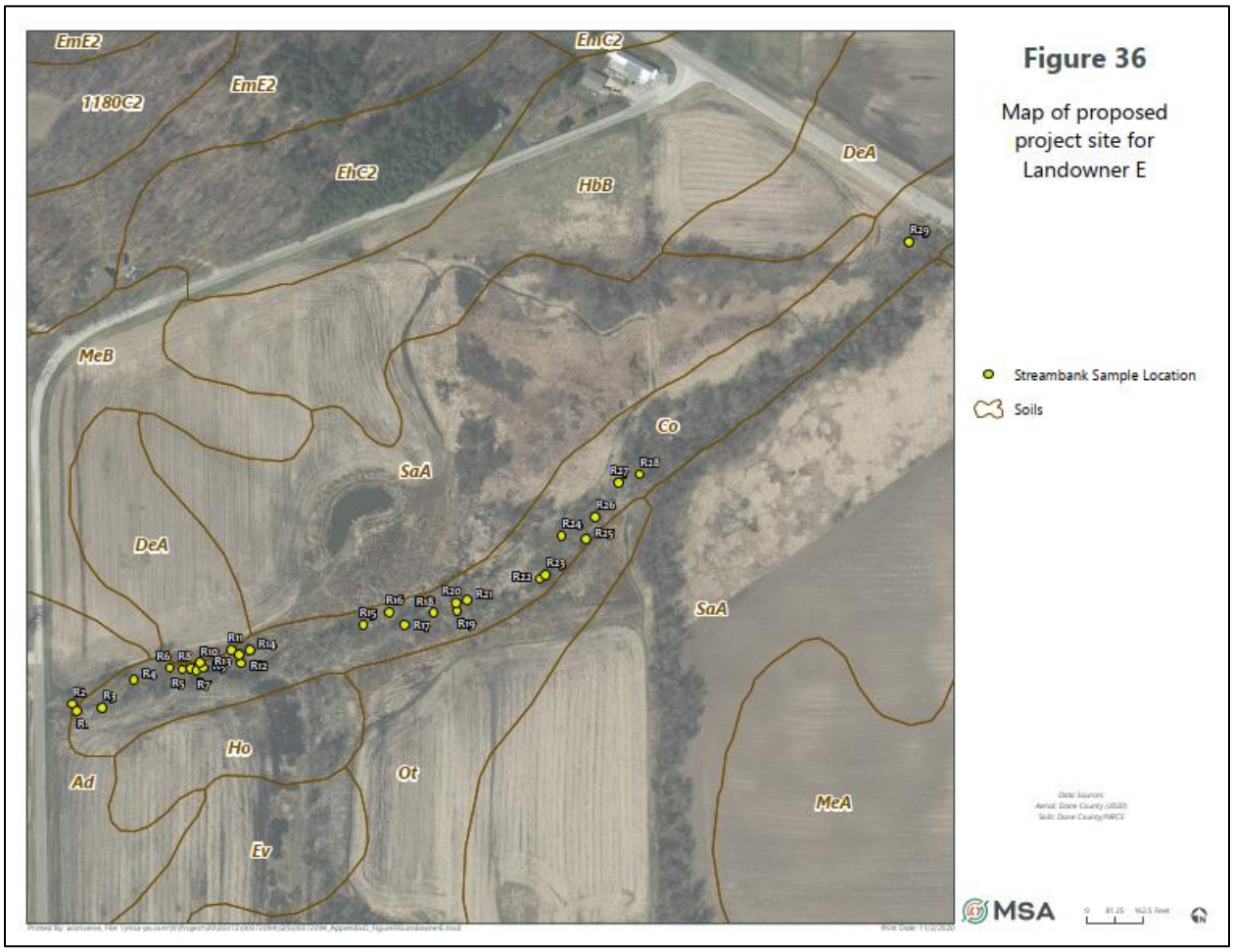

Figure 36: Map of proposed project site for Landowner E

Table 4: Phosphorus Credit Calculations for Landowner E

Streambank ID	Bank Location (LBFD or RBFD)	Bank Length (ft)	Bank Slope Height (ft)				Lateral Recession Rate Category	Lateral Recession Rate (ft/yr)	Soil Type	Soil Bulk Density (lb/ft^3)	Soil Total Phosphorus (ppm)	Estimated Phosphorus Loss (lb/yr)	Trade Ratio	Phosphorus Credits (lb/yr)
			#1	#2	#3	Avg.								
R1	RBFD	95	7.5	5.2	6.9	6.5	Severe	0.40	Colwood Silt Loam	88.6	900	19.8	2.02	9.8
R2	LBFD	45	4.2	2.4	3.3	3.3	Moderate	0.13	Colwood Silt Loam	88.6	400	0.7	2.02	0.3
R3	RBFD	80	8.3	4.8	-	6.6	Severe	0.40	Colwood Silt Loam	88.6	700	13.0	2.02	6.4
R4	RBFD	23	9.4	5.5	4.4	6.4	Severe	0.40	Colwood Silt Loam	88.6	300	1.6	2.02	0.8
R5	RBFD	54	10.2	10.7	2.5	7.8	Severe	0.40	Colwood Silt Loam	88.6	400	6.0	2.02	3.0
R6	LBFD	17	9.3	12.0	-	10.7	Severe	0.40	Colwood Silt Loam	88.6	300	1.9	2.02	1.0
R7	RBFD	47	5.9	4.2	4.2	4.8	Severe	0.40	Colwood Silt Loam	88.6	200	1.6	2.02	0.8
R8	LBFD	19	3.1	3.4	2.7	3.1	Moderate	0.13	Colwood Silt Loam	88.6	200	0.1	2.02	0.1
R9	RBFD	22	4.5	5.2	6.9	5.5	Severe	0.40	Colwood Silt Loam	88.6	300	1.3	2.02	0.6
R10	LBFD	16	3.9	-	-	3.9	Moderate	0.13	Colwood Silt Loam	88.6	300	0.2	2.02	0.1
R11	LBFD	19	3.8	3.7	4.3	3.9	Moderate	0.13	Colwood Silt Loam	88.6	200	0.2	2.02	0.1
R12	RBFD	55	6.5	6.3	6.1	6.3	Severe	0.40	Colwood Silt Loam	88.6	200	2.5	2.02	1.2
R13	LBFD	18	4.4	-	-	4.4	Moderate	0.13	Colwood Silt Loam	88.6	200	0.2	2.02	0.1
R14	RBFD	14	4.8	6.3	5.5	5.5	Severe	0.40	Colwood Silt Loam	88.6	100	0.3	2.02	0.1
R15	LBFD	17	3.1	3.2	3.3	3.2	Moderate	0.13	Colwood Silt Loam	88.6	400	0.3	2.02	0.1
R16	LBFD	25	3.1	4.0	2.9	3.3	Moderate	0.13	Colwood Silt Loam	88.6	400	0.4	2.02	0.2
R17	RBFD	45	3.6	4.5	3.5	3.9	Moderate	0.13	Colwood Silt Loam	88.6	400	0.8	2.02	0.4
R18	LBFD	31	4.7	-	-	4.7	Severe	0.40	Colwood Silt Loam	88.6	300	1.5	2.02	0.8
R19	RBFD	25	3.3	4.5	3.0	3.6	Severe	0.40	Colwood Silt Loam	88.6	400	1.3	2.02	0.6
R20	LBFD	17	3.4	3.1	3.2	3.2	Moderate	0.13	Colwood Silt Loam	88.6	200	0.1	2.02	0.1
R21	RBFD	23	3.6	4.0	4.1	3.9	Moderate	0.13	Colwood Silt Loam	88.6	600	0.6	2.02	0.3
R22	RBFD	36	2.9	3.3	3.6	3.3	Moderate	0.13	Colwood Silt Loam	88.6	600	0.8	2.02	0.4
R23	RBFD	83	4.4	4.8	4.6	4.6	Severe	0.40	Colwood Silt Loam	88.6	700	9.5	2.02	4.7
R24	LBFD	38	3.9	4.3	3.3	3.8	Moderate	0.13	Colwood Silt Loam	88.6	500	0.8	2.02	0.4
R25	RBFD	22	3.2	4.4	4.5	4.0	Moderate	0.13	Colwood Silt Loam	88.6	500	0.5	2.02	0.3
R26	RBFD	36	3.0	3.6	3.7	3.4	Moderate	0.13	Colwood Silt Loam	88.6	400	0.6	2.02	0.3
R27	LBFD	33	3.2	4.0	-	3.6	Moderate	0.13	Colwood Silt Loam	88.6	400	0.5	2.02	0.3
R28	RBFD	27	3.0	3.7	-	3.4	Moderate	0.13	Colwood Silt Loam	88.6	500	0.5	2.02	0.3
R29	LBFD	91	3.7	2.9	3.9	3.5	Moderate	0.13	Colwood Silt Loam	88.6	500	1.8	2.02	0.9
Total	-	**1,073**	-	-	-	-	-	-	-	-	-	**69.4**	-	**34.3**
Weighted Avg.	-	-	-	-	-	**4.8**	-	**0.27**	-	**88.6**	**471**	-	-	-

Figure 37: Photograph of Streambank R1

Figure 38: Photograph of Streambank R2

Figure 39: Photograph of Streambank R3

Figure 40: Photograph of Streambank R4

Figure 41: Photograph of Streambank R5

Figure 42: Photograph of Streambank R6

Figure 43: Photograph of Streambank R7

Figure 44: Photograph of Streambank R8

Figure 45: Photograph of Streambank R9

Figure 46: Photograph of Streambank R10

Figure 47: Photograph of Streambank R11

Figure 48: Photograph of Streambank R12

Figure 49: Photograph of Streambank R13

Figure 50: Photograph of Streambank R14

Figure 51: Photograph of Streambank R15

Figure 52: Photograph of Streambank R16

Figure 53: Photograph of Streambank R17

Figure 54: Photograph of Streambank R18

Figure 55: Photograph of Streambank R19

Figure 56: Photograph of Streambank R20

Figure 57: Photograph of Streambank R21

Figure 58: Photograph of Streambank R22

Figure 59: Photograph of Streambank R23

Figure 60: Photograph of Streambank R24

Figure 61: Photograph of Streambank R25

Figure 62: Photograph of Streambank R26

Figure 63: Photograph of Streambank R27

Figure 64: Photograph of Streambank R28

Figure 65: Photograph of Streambank R29

1.5 RESULTS FOR LANDOWNER F

A map of streambank sampling points for the property owned by Landowner F is shown in **Figure 66**. A total of 25 eroding streambanks were identified on this property. Photographs of each streambank are shown in **Figures 67** through **91.** The bank length, bank slope height, lateral recession rate, soil bulk density, soil total phosphorus concentration, and estimated phosphorus loss for each eroding streambank is listed in **Table 5**. Phosphorus credits were estimated by dividing the estimated phosphorus loss for each bank by a trade ratio of 2.02 (accounting for an uncertainty factor of 2.0 for streambank stabilization and habitat restoration and a deliver factor or 0.02 for the trades generated in the West Branch Sugar River HUC 12 watershed). A total of 61.8 lbs/yr of phosphorus loss was estimated using **Equation 1**. Accounting for the trade ratio, a total of 30.6 lbs/yr of phosphorus credits could be generated by stabilizing the eroding banks and improving habitat conditions on the property owned by Landowner F.

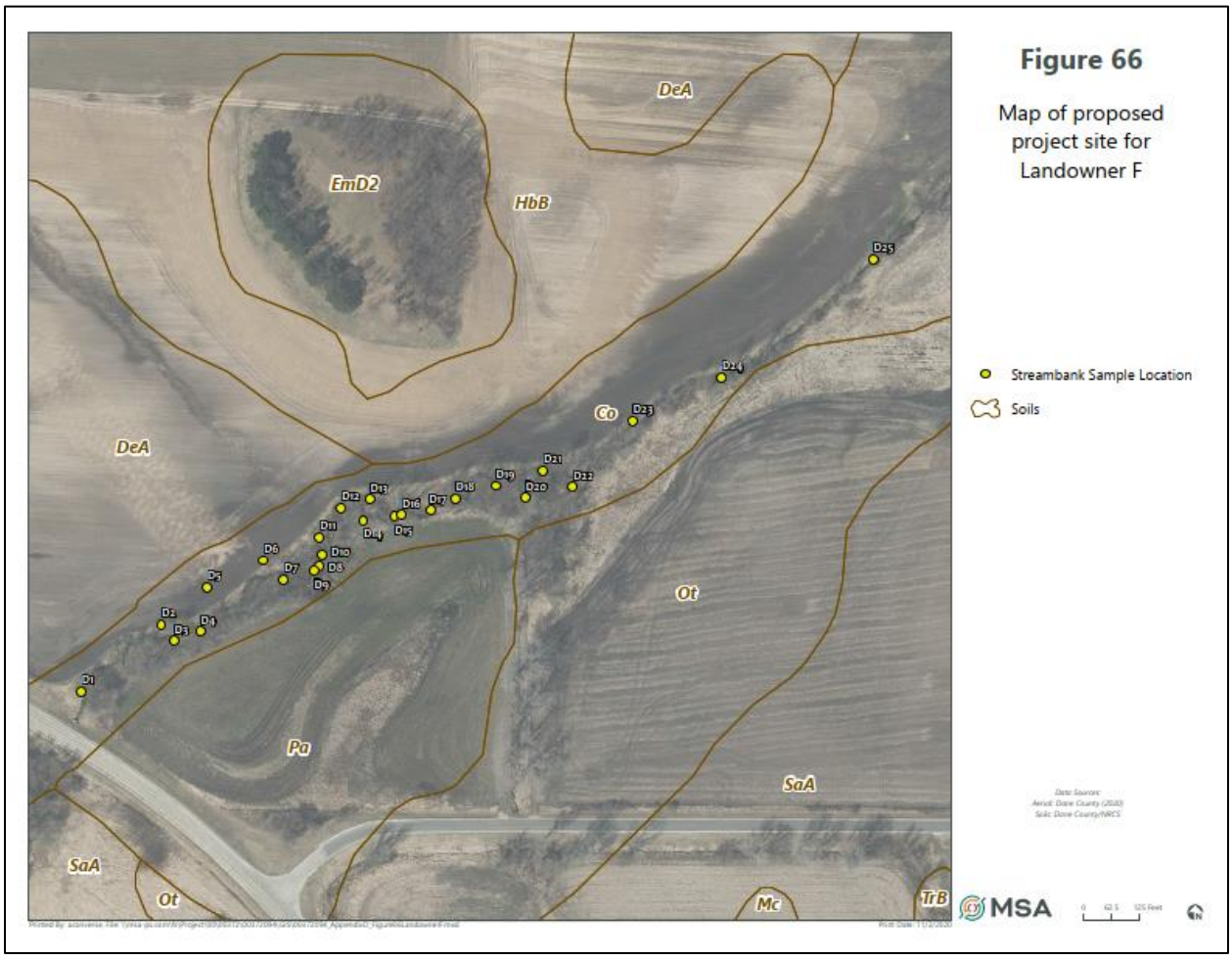

Figure 66: Map of proposed project site for Landowner F

Table 5: Phosphorus Credit Calculations for Landowner F

Streambank ID	Bank Location (LBFD or RBFD)	Bank Length (ft)	Bank Slope Height (ft)				Lateral Recession Rate Category	Lateral Recession Rate (ft/yr)	Soil Type	Soil Bulk Density (lb/ft^3)	Soil Total Phosphorus (ppm)	Estimated Phosphorus Loss (lb/yr)	Trade Ratio	Phosphorus Credits (lb/yr)
			#1	#2	#3	Avg.								
D1	LBFD	59	4.3	4.0	4.8	4.4	Severe	0.40	Colwood Silt Loam	88.6	500	4.6	2.02	2.3
D2	LBFD	56	4.1	3.6	4.9	4.2	Moderate	0.13	Colwood Silt Loam	88.6	600	1.6	2.02	0.8
D3	RBFD	25	4.3	4.1	3.9	4.1	Moderate	0.13	Colwood Silt Loam	88.6	500	0.6	2.02	0.3
D4	RBFD	63	3.8	4.0	4.8	4.2	Moderate	0.13	Colwood Silt Loam	88.6	400	1.2	2.02	0.6
D5	LBFD	64	4.5	5.5	4.8	4.9	Moderate	0.13	Colwood Silt Loam	88.6	300	1.1	2.02	0.5
D6	LBFD	92	5.6	4.8	4.4	4.9	Moderate	0.13	Colwood Silt Loam	88.6	500	2.6	2.02	1.3
D7	LBFD	14	2.6	4.2	3.6	3.5	Moderate	0.13	Colwood Silt Loam	88.6	500	0.3	2.02	0.1
D8	RBFD	116	4.5	5.4	4.5	4.8	Severe	0.40	Colwood Silt Loam	88.6	400	7.9	2.02	3.9
D9	LBFD	52	3.2	4.8	5.5	4.5	Severe	0.40	Colwood Silt Loam	88.6	500	4.1	2.02	2.1
D10	RBFD	16	3.1	3.2	4.1	3.5	Moderate	0.13	Colwood Silt Loam	88.6	400	0.3	2.02	0.1
D11	LBFD	31	3.3	2.9	4.2	3.5	Moderate	0.13	Colwood Silt Loam	88.6	400	0.5	2.02	0.2
D12	RBFD	44	3.9	3.6	3.5	3.7	Moderate	0.13	Colwood Silt Loam	88.6	500	0.9	2.02	0.5
D13	LBFD	39	5.2	4.1	3.8	4.4	Moderate	0.13	Colwood Silt Loam	88.6	300	0.6	2.02	0.3
D14	RBFD	64	3.5	4.3	4.1	4.0	Severe	0.40	Colwood Silt Loam	88.6	400	3.6	2.02	1.8
D15	RBFD	40	3.7	4.5	5.0	4.4	Severe	0.40	Colwood Silt Loam	88.6	300	1.9	2.02	0.9
D16	LBFD	22	4.1	5.0	3.8	4.3	Moderate	0.13	Colwood Silt Loam	88.6	200	0.2	2.02	0.1
D17	RBFD	45	4.9	5.9	-	5.4	Severe	0.40	Colwood Silt Loam	88.6	200	1.7	2.02	0.9
D18	RBFD	83	4.4	5.4	4.3	4.7	Severe	0.40	Colwood Silt Loam	88.6	300	4.1	2.02	2.1
D19	LBFD	57	5.4	4.2	3.9	4.5	Severe	0.40	Colwood Silt Loam	88.6	300	2.7	2.02	1.4
D20	RBFD	48	5.3	4.8	3.8	4.6	Severe	0.40	Colwood Silt Loam	88.6	400	3.2	2.02	1.6
D21	LBFD	98	5.0	4.3	5.6	5.0	Very Severe	0.50	Colwood Silt Loam	88.6	600	12.9	2.02	6.4
D22	RBFD	75	4.7	4.8	3.9	4.5	Moderate	0.13	Colwood Silt Loam	88.6	500	1.9	2.02	1.0
D23	RBFD	53	4.3	4.6	4.2	4.4	Moderate	0.13	Colwood Silt Loam	88.6	700	1.9	2.02	0.9
D24	RBFD	30	3.6	2.5	3.3	3.1	Moderate	0.13	Colwood Silt Loam	88.6	500	0.5	2.02	0.3
D25	RBFD	25	3.5	4.6	3.7	3.9	Moderate	0.13	Colwood Silt Loam	88.6	700	0.8	2.02	0.4
Total	-	1,311	-	-	-	-	-	-	-	-	-	61.8	-	30.6
Weighted Avg.	-	-	-	-	-	4.5	-	0.27	-	88.6	439	-	-	-

Figure 67: Photograph of Streambank D1

Figure 68: Photograph of Streambank D2

Figure 69: Photograph of Streambank D3

Figure 70: Photograph of Streambank D4

Figure 71: Photograph of Streambank D5

Figure 72: Photograph of Streambank D6

Figure 73: Photograph of Streambank D7

Figure 74: Photograph of Streambank D8

Figure 75: Photograph of Streambank D9

Figure 76: Photograph of Streambank D10

Figure 77: Photograph of Streambank D11

Figure 78: Photograph of Streambank D12

Figure 79: Photograph of Streambank D13

Figure 80: Photograph of Streambank D14

Figure 81: Photograph of Streambank D15

Figure 82: Photograph of Streambank D16

Figure 83: Photograph of Streambank D17

Figure 84: Photograph of Streambank D18

Figure 85: Photograph of Streambank D19

Figure 86: Photograph of Streambank D20

Figure 87: Photograph of Streambank D21

Figure 88: Photograph of Streambank D22

Figure 89: Photograph of Streambank D23

Figure 90: Photograph of Streambank D24

Figure 91: Photograph of Streambank D25

1.6 RESULTS FOR LANDOWNER G

The Landowner G project has been removed from the WQT Plan. All subsequent information, photos, and credit calculations for Landowner G originally in this Appendix have been deleted from this version. Figures 92 – 99 and Table 6 have been deleted.

APPENDIX E

SnapPlus Modeling Overview

APPENDIX E

SNAPPLUS MODELING OVERVIEW

1.1 BACKGROUND

The Village of Belleville plans to generate phosphorus credits by converting fields owned by Landowner D and E from annual row crop production to perennial grass hay. Improvements to nutrient management practices and supporting conservation practices will also be included to meet DNR's expectations of "whole field management." The preferred method for quantifying phosphorus reductions from nutrient management and supporting practices is Wisconsin's SnapPlus model. SnapPlus (Soil Nutrient Application Planner) is a publically available computer software program that was developed by researchers at the University of Wisconsin - Madison Department of Soil Science. The model was specifically created to help agricultural producers, crop consultants, and regulators develop Nutrient Management Plans in accordance with Wisconsin's NRCS 590 Nutrient Management Standard. The purpose of a Nutrient Management Plan is to aid an agricultural producer in selecting the proper amount, source, placement, form, and timing of nutrient applications on their farm. The primary goals of Nutrient Management Planning are to optimize the economic return from nutrient applications, promote soil conservation, and to protect the water quality of nearby water resources.

Nutrient recommendations in SnapPlus are made on a field-by-field basis for N, P_2O_5, and K_2O using recommendations from the University of Wisconsin – Extension Publication A2809. Inputs to SnapPlus include field slope, soil type, soil sampling results, crop rotations, tillage practices, and manure and fertilizer applications. SnapPlus uses these inputs and incorporates several models, including the Revised Soil Loss Equation Version 2 (RUSLE2) and the Wisconsin Phosphorus Index (PI), to estimate average annual sediment and phosphorus loadings from crop fields and pastures. Specifically, SnapPlus can be used to model phosphorus reductions from crop rotation changes, reduced tillage practices, contour farming, contour strip cropping, contour buffer strips, edge-of-field filter strips, manure incorporation, cover crops, etc. Phosphorus reductions for BMPs are estimated using the "*P Trade Report*" in SnapPlus. The P Trade Report estimates the annual mass of phosphorus [lbs/yr] that is likely to be transferred from the field to nearby surface waters based on a field's predominant soil type, soil test phosphorus concentration, crop rotation, tillage, and other nutrient management practices. The model only estimates losses from sheet and rill erosion. Losses from concentrated flow areas or gully erosion are not included in the calculations, and therefore, gullies must be repaired and/or prevented for the model results to reasonably estimate phosphorus losses from a given field.

1.2 METHODS

In order to estimate phosphorus reductions from nutrient management and supporting practices, it is necessary to estimate phosphorus losses for current baseline conditions (Pre-BMP conditions) and for conditions after BMPs are implemented (post-BMP conditions). Baseline conditions were created based on Landowner D and E's 2019 and 2020 cropping history. A minimum of two (2) years of cropping history are needed to accurately run the P-Trade Report in SnapPlus. Post-BMP conditions were estimated assuming that all fields would be converted to grass hay and that manure and phosphorus containing fertilizer would not be applied to any fields

until soil test phosphorus concentrations drop below excessively high levels. Additionally no manure, biosolids, industrial wastes, etc. would be allowed to be applied to fields with frozen soils, high groundwater, or subsurface tile drainage systems. Pre- and post- BMP conditions were estimated for a crop rotation beginning in 2021 and ending in 2030, corresponding with the Village's first two 5-year WPDES permit terms for Water Quality Trading. It is important to note that the nutrient management plans for Landowner D and E will need to be annually updated to account for actual cropping practices (e.g., fertilizer, manure applications rates, etc.) and that soil sample results must be updated a minimum of every four (4) years. Therefore, model results for the years 2026 through 2030 (the Village's 2nd WPDES permit term of Water Quality Trading) should only be considered an estimate at this time.

1.3 ASSUMPTIONS

Prior to reviewing SnapPlus model results, it is important to understand a few modeling assumptions for the Landowner D and E.

First, Landowner D currently rents his fields to a local dairy farm in Dane County. Landowner D does not have accurate cropping history as it relates to quantity and rate of manure or fertilizer applications. The crop fields do annually receive manure in the form of screened/settled dairy solids, though the amount has not been verified. All fields owned by Landowner D currently test excessively high (>30 ppm) for phosphorus. Therefore, it is reasonable to assume that historic annual phosphorus fertilizer and/or manure applications have been higher than recommended rates based on the current soil testing results. Therefore, it was conservatively assumed that annual manure/nutrient application rates for baseline conditions were equal to phosphorus removal of the given cover crop; 85 lbs P_2O_5 per acre per year for corn grain for a target yield of 211-230 bushels per acre. For modeling purposes, phosphorus application for baseline conditions was assumed to be in the form of diammonium phosphate (DAP), though we know the phosphorus in the field most likely comes from manure.

Second, Landowner E has not applied phosphorus fertilizer in recent years, but the landowner does annually apply manure. Manure is dry, bedded pack manure from a small beef herd (~30 head). The landowner does keep track of how many loads of manure he annually applies. In 2020, the landowner hauled 41 loads of manure with a Ford New Holland Model 520 spreader. This manure spreader has a rated capacity of 220 bushels. Assuming a bedded pack manure density of 40 lbs/ft^3, it is estimated that the landowner annually applies 224 tons of manure per year.

$$Annual\ Manure\ Application = 41\frac{loads}{year} \times \frac{220\ bu}{load} \times \frac{1.244\ ft^3}{bu} \times 40\frac{lbs}{ft^3} \times \frac{1\ ton}{2000\ lbs} = 224\frac{tons}{year}$$

This annual manure application rate was conservatively assumed for baseline and post-BMP conditions. Actual manure applications in the future are planned to decrease, as the landowner plans to downsize the existing beef herd to about half as part of the project with the Village. Since the landowner does not have a manure test for the bedded pack manure, text book values for solid, beef manure from SnapPlus were assumed.

1.4 LANDOWNER D RESULTS

Landowner D currently owns 50.9 acres of crop fields near the headwaters of Millum Creek. Maps and photographs of crop fields are shown in **Figures 1** through **4**. All fields currently test excessively high for soil test phosphorus. All fields have existing grassed waterways and subsurface drain tile systems installed. For crop years 2019 and 2020, the crops were harvested as corn silage. Baseline conditions conservatively assume a continuous corn grain rotation for the years 2021 through 2030. As part of the project with the Village of Belleville, all fields are intended to be converted to perennial grass hay. Also, new grassed waterways/diversions are planned to be installed in Field #1 and #3.

A summary of P Trade SnapPlus model results for baseline and post-BMP conditions for Landowner D is presented in **Table 1**. As shown, the conversion of the fields to grass hay will result in an annual phosphorus loss reduction of approximately 26 to 87 lbs per year. Assuming a trade ratio of 1.2:1 for whole field management, an average of approximately 36 lbs credit per year will be available in the Village's first WPDES permit term of Water Quality Trading and approximately 40 lbs per year available in the second term.

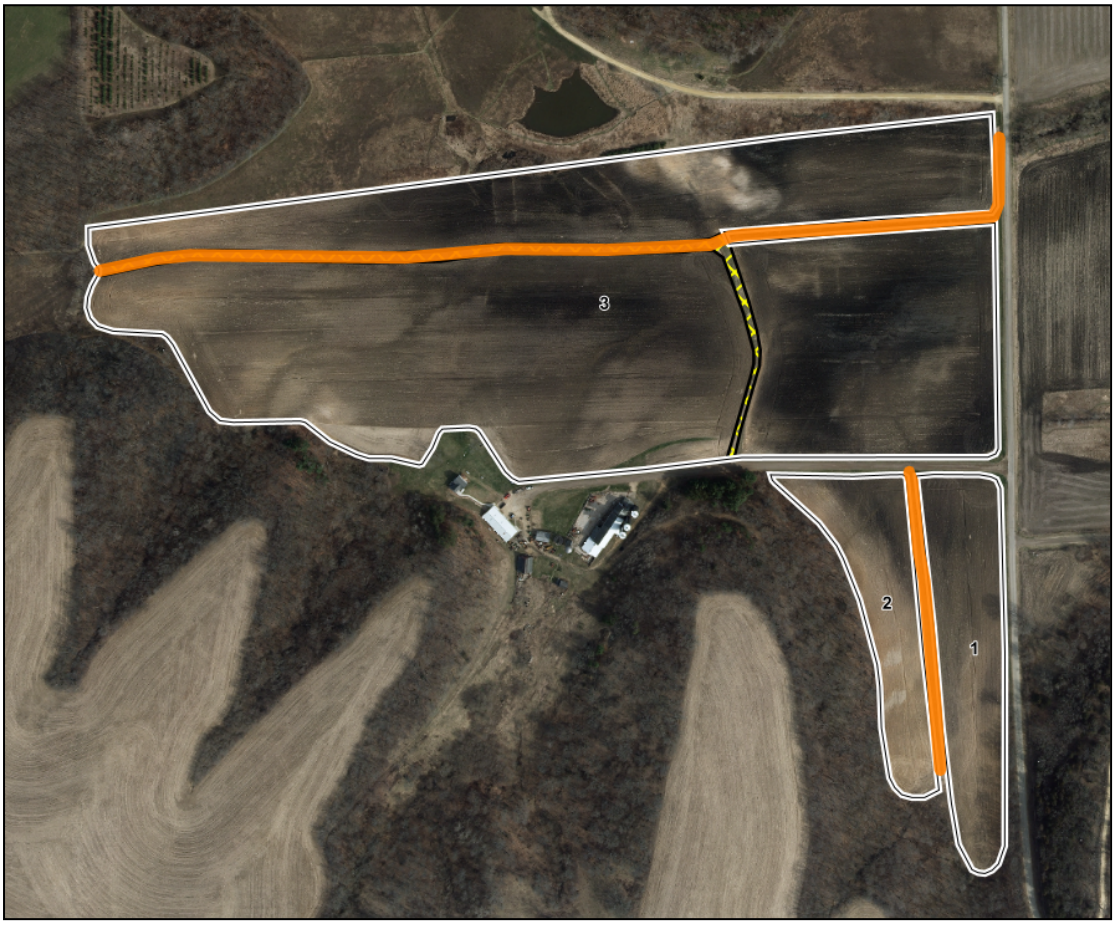

Figure 1: Map of crop fields owned by Landowner D (50.9 acres)

Orange lines indicate the location of existing grassed waterways.
Yellow crosshatching indicates the location of an existing field road.

Figure 2: Photograph of Field 1 Owned by Landowner D (photo taken during snow melt event)

Figure 3: Photograph of Field 2 Owned by Landowner D (photo taken during snow melt event)

Figure 4: Photograph of Field 3 Owned by Landowner D (photo taken during snow melt event)

Table 1: SnapPlus P Trade Report Summary for Landowner D

Field ID	Acres	Scenario	PTP (lbs/year)									
			Permit Term #1					Permit Term #2				
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	4.7	Baseline	21.5	7.0	6.5	6.4	6.4	6.4	6.4	6.4	6.4	6.4
		Whole Field Management	8.8	2.8	2.2	1.7	1.3	1.0	0.8	0.6	0.4	0.2
		Phosphorus Reduction	**12.7**	**4.2**	**4.3**	**4.8**	**5.2**	**5.4**	**5.6**	**5.8**	**6.0**	**6.2**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**10.6**	**3.5**	**3.6**	**4.0**	**4.3**	**4.5**	**4.7**	**4.9**	**5.0**	**5.2**
2	3.8	Baseline	24.6	6.6	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
		Whole Field Management	9.9	2.0	1.5	1.1	0.8	0.6	0.5	0.4	0.3	0.2
		Phosphorus Reduction	**14.7**	**4.6**	**4.6**	**4.9**	**5.2**	**5.4**	**5.5**	**5.6**	**5.7**	**5.8**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**12.2**	**3.8**	**3.8**	**4.1**	**4.3**	**4.5**	**4.6**	**4.7**	**4.8**	**4.8**
3	42.4	Baseline	125.0	50.9	48.1	47.8	47.7	47.7	47.7	47.7	47.7	47.7
		Whole Field Management	65.4	33.9	28.6	23.0	18.3	15.5	13.3	11.4	9.6	8.0
		Phosphorus Reduction	**59.6**	**17.0**	**19.5**	**24.7**	**29.4**	**32.2**	**34.4**	**36.3**	**38.1**	**39.7**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**49.6**	**14.1**	**16.2**	**20.6**	**24.5**	**26.8**	**28.7**	**30.3**	**31.7**	**33.1**
Total	50.9	Baseline	171.1	64.4	60.6	60.2	60.1	60.1	60.1	60.1	60.1	60.1
		Whole Field Management	84.2	38.6	32.3	25.8	20.3	17.1	14.5	12.3	10.3	8.4
		Phosphorus Reduction	**86.90**	**25.76**	**28.28**	**34.43**	**39.80**	**43.0**	**45.6**	**47.8**	**49.8**	**51.7**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**72.4**	**21.5**	**23.6**	**28.7**	**33.2**	**35.8**	**38.0**	**39.8**	**41.5**	**43.1**
		Avg. Credit			**35.9**					**39.6**		

1.5 LANDOWNER E RESULTS

Landowner E currently owns 38.9 acres of crop fields near the headwaters of Millum Creek. Maps and photographs of crop fields are shown in **Figures 5** through **11**. Fields #1A, #1B, #2, and #5 test excessively high for phosphorus (>30 ppm). Fields #3 and #4 test are at optimum levels. Fields #1A and #2 have drain tiles installed. The fields have been evaluated for gully erosion, and no existing signs of gully erosion are apparent. Surface water appears to be appropriately managed by the existing surface drains along Fields #1A, #1B, and #2. Baseline conditions assume a two-year corn and soybean rotation for the years 2021 through 2030. As part of the project with the Village of Belleville, all fields are intended to be converted to perennial grass hay. Existing manure sources are planned to be spread on Fields #3 and #4, until other eligible fields (non-tiled) drop below excessively high levels.

A summary of P Trade SnapPlus model results for baseline and post-BMP conditions for Landowner E is presented in **Table 2**. As shown, the conversion of the fields to grass hay will result in an annual phosphorus reduction of approximately 62 to 177 lbs per year. Assuming a trade ratio of 1.2:1 for whole field management, an average of approximately 98 lbs credit per year will be available in the Village's first WPDES permit term of Water Quality Trading and approximately 124 lbs per year available in the second term.

Figure 5: Map of crop owned by Landowner E (38.9 acres)

Figure 6: Photograph of Field 1A Owned by Landowner E

Figure 7: Photograph of Field 1B Owned by Landowner E

Figure 8: Photograph of Field 2 Owned by Landowner E

Figure 9: Photograph of Field 3 Owned by Landowner E

Figure 10: Photograph of Field 4 Owned by Landowner E

Figure 11: Photograph of Field 5 Owned by Landowner E

Table 2: SnapPlus P Trade Report Summary for Landowner E

Field ID	Acres	Scenario	PTP (lbs/year)									
			Permit Term #1					Permit Term #2				
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	7.3	Baseline	48.2	19.4	52.0	19.9	53.1	20.0	53.4	20.0	53.5	20.1
		Whole Field Management	23.0	4.7	3.5	2.3	1.6	1.2	0.9	0.6	0.3	0.1
		Phosphorus Reduction	**25.2**	**14.6**	**48.6**	**17.6**	**51.6**	**18.8**	**52.6**	**19.4**	**53.2**	**20.0**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**21.0**	**12.2**	**40.5**	**14.7**	**43.0**	**15.7**	**43.8**	**16.2**	**44.3**	**16.6**
1B	3.7	Baseline	4.3	25.1	4.3	24.9	4.4	25.0	4.5	25.2	4.6	25.3
		Whole Field Management	4.0	2.2	1.8	1.4	1.1	0.9	0.8	0.6	0.5	0.4
		Phosphorus Reduction	**0.3**	**22.9**	**2.5**	**23.5**	**3.3**	**24.1**	**3.7**	**24.5**	**4.1**	**24.9**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**0.2**	**19.1**	**2.1**	**19.6**	**2.7**	**20.1**	**3.1**	**20.5**	**3.4**	**20.8**
2	11.5	Baseline	62.7	18.8	67.9	19.2	69.5	19.3	69.8	19.3	69.9	19.3
		Whole Field Management	22.8	13.5	11.9	9.9	8.3	7.4	6.7	6.2	5.8	5.4
		Phosphorus Reduction	**39.9**	**5.3**	**56.0**	**9.2**	**61.2**	**11.9**	**63.1**	**13.1**	**64.2**	**13.9**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**33.3**	**4.4**	**46.7**	**7.7**	**51.0**	**9.9**	**52.6**	**10.9**	**53.5**	**11.6**
3	11.6	Baseline	20.8	77.1	20.6	76.5	20.8	76.8	21.1	77.3	21.4	77.7
		Whole Field Management	26.7	19.3	15.2	11.1	9.3	8.3	7.8	7.6	7.6	7.6
		Phosphorus Reduction	**-5.8**	**57.9**	**5.3**	**65.4**	**11.5**	**68.5**	**13.3**	**69.6**	**13.8**	**70.1**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**-4.9**	**48.2**	**4.5**	**54.5**	**9.6**	**57.1**	**11.1**	**58.0**	**11.5**	**58.4**
4	2.8	Baseline	12.5	3.8	13.6	3.8	14.0	3.9	14.1	3.9	14.1	3.9
		Whole Field Management	7.8	4.5	3.4	2.5	2.0	1.8	1.7	1.6	1.6	1.7
		Phosphorus Reduction	**4.7**	**-0.7**	**10.2**	**1.4**	**11.9**	**2.1**	**12.4**	**2.2**	**12.4**	**2.2**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**3.9**	**-0.6**	**8.5**	**1.2**	**9.9**	**1.7**	**10.3**	**1.9**	**10.4**	**1.9**

Table 2 (continued): SnapPlus P Trade Report Summary for Landowner E

Field ID	Acres	Scenario	PTP (lbs/year)									
			Permit Term #1					Permit Term #2				
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
5	2.0	Baseline	19.1	10.1	6.6	3.9	32.2	14.7	32.1	10.1	6.8	4.1
		Whole Field Management	21.4	1.9	1.1	0.5	0.3	0.2	0.2	0.1	0.1	0.0
		Phosphorus Reduction	**-2.3**	**8.3**	**5.5**	**3.4**	**31.9**	**14.4**	**31.9**	**10.0**	**6.7**	**4.1**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**-1.9**	**6.9**	**4.6**	**2.8**	**26.6**	**12.0**	**26.6**	**8.3**	**5.6**	**3.4**
Total	38.9	Baseline	167.7	154.3	165.1	148.2	194.0	159.6	195.0	155.7	170.3	150.4
		Whole Field Management	105.7	46.1	37.0	27.7	22.6	19.8	18.0	16.8	15.9	15.2
		Phosphorus Reduction	**62.0**	**108.2**	**128.2**	**120.5**	**171.4**	**139.8**	**177.0**	**138.9**	**154.4**	**135.2**
		Trade Ratio	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		Final Credit	**51.6**	**90.2**	**106.8**	**100.4**	**142.8**	**116.5**	**147.5**	**115.8**	**128.7**	**112.7**
		Avg. Credit			**98.4**					**124.2**		

1.6 SnapPlus Model Data

In order to support DNR's review of phosphorus credit calculations for nutrient management and supporting practices for crop fields owned by Landowners D and E, SnapPlus P-trade report outputs for both pre- and post-BMP conditions are provided in the following section. A copy of the SnapPlus files for Landowner D and E can be provided to the Department upon request to verify the modeling assumptions.

WQ1: P Trade Report

Reported For	Landowner D - Baseline
Printed	2020-11-05
Plan Completion/Update Date	2020-09-17
SnapPlus Version 20.0 built on 2020-09-02 17:17	

The P Trade Report estimates the annual pounds of phosphorus (P) in surface runoff from cropland entering surface waters. These P loss calculations are based on a field's soil test P concentration, crops, tillage, nutrient management practices and estimates of average runoff and sheet and rill erosion for the predominant soil type. Losses from concentrated flow channel or gully erosion with a field are not included in these calculations. Field runoff losses are calculated for each year as **PTP** (lb P/field/yr). Fields are only included if there are at least 2 years of crops before the selected start year. Before using this report as part of a Water Quality Trade activity, phosphorus losses (PTP) must be converted into 'P credits' according to DNR guidance.

For more information go to **http://dnr.wi.gov/** and type keyword: **Water Quality Trading**

Questions? Please contact DNRphosphorus@wisconsin.gov

This report was developed for Wisconsin DNR Water Quality Trading and Adaptive Management purposes and cannot be used to demonstrate compliance with NR 151 or NRCS 590 NM plan requirements.

P Trade Report				PTP									
Field Name	Soil Series	Soil Symbol	Acres	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	RADFORD	RaA	5	22	7	6	6	6	6	6	6	6	6
2	HIXTON	HbB	4	25	7	6	6	6	6	6	6	6	6
3	SABLE	SaA	42	125	51	48	48	48	48	48	48	48	48
Total			**51**	**171**	**64**	**61**	**60**	**60**	**60**	**60**	**60**	**60**	**60**

WQ1: P Trade Report

Reported For	Landowner D - Grass Hay
Printed	2020-11-05
Plan Completion/Update Date	2020-09-17
SnapPlus Version 20.0 built on 2020-09-02 17:17	

The P Trade Report estimates the annual pounds of phosphorus (P) in surface runoff from cropland entering surface waters. These P loss calculations are based on a field's soil test P concentration, crops, tillage, nutrient management practices and estimates of average runoff and sheet and rill erosion for the predominant soil type. Losses from concentrated flow channel or gully erosion with a field are not included in these calculations. Field runoff losses are calculated for each year as **PTP** (lb P/field/yr). Fields are only included if there are at least 2 years of crops before the selected start year. Before using this report as part of a Water Quality Trade activity, phosphorus losses (PTP) must be converted into 'P credits' according to DNR guidance.

For more information go to **http://dnr.wi.gov/** and type keyword: **Water Quality Trading**

Questions? Please contact DNRphosphorus@wisconsin.gov

This report was developed for Wisconsin DNR Water Quality Trading and Adaptive Management purposes and cannot be used to demonstrate compliance with NR 151 or NRCS 590 NM plan requirements.

P Trade Report				PTP									
Field Name	Soil Series	Soil Symbol	Acres	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	RADFORD	RaA	5	9	3	2	2	1	1	1	1	0	0
2	HIXTON	HbB	4	10	2	1	1	1	1	0	0	0	0
3	SABLE	SaA	42	65	34	29	23	18	15	13	11	10	8
Total			**51**	**84**	**39**	**32**	**26**	**20**	**17**	**15**	**12**	**10**	**8**

WQ1: P Trade Report

Reported For	Landowner E - Baseline
Printed	2020-11-12
Plan Completion/Update Date	2020-10-13
SnapPlus Version 20.0 built on 2020-09-02 17:17	

The P Trade Report estimates the annual pounds of phosphorus (P) in surface runoff from cropland entering surface waters. These P loss calculations are based on a field's soil test P concentration, crops, tillage, nutrient management practices and estimates of average runoff and sheet and rill erosion for the predominant soil type. Losses from concentrated flow channel or gully erosion with a field are not included in these calculations. Field runoff losses are calculated for each year as **PTP** (lb P/field/yr). Fields are only included if there are at least 2 years of crops before the selected start year. Before using this report as part of a Water Quality Trade activity, phosphorus losses (PTP) must be converted into 'P credits' according to DNR guidance.

For more information go to **http://dnr.wi.gov/** and type keyword: **Water Quality Trading**

Questions? Please contact DNRphosphorus@wisconsin.gov

This report was developed for Wisconsin DNR Water Quality Trading and Adaptive Management purposes and cannot be used to demonstrate compliance with NR 151 or NRCS 590 NM plan requirements.

P Trade Report				PTP									
Field Name	Soil Series	Soil Symbol	Acres	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1A	ELVERS	Ev	7	48	19	52	20	53	20	53	20	54	20
1B	OTTER	Ot	4	4	25	4	25	4	25	4	25	5	25
2	SABLE	SaA	12	63	19	68	19	69	19	70	19	70	19
3	HIXTON	HbB	12	21	77	21	77	21	77	21	77	21	78
4	HIXTON	HbB	3	13	4	14	4	14	4	14	4	14	4
5	NEWGLARUS	NeD2	2	19	10	7	4	32	15	32	10	7	4
Total			**39**	**168**	**154**	**165**	**148**	**194**	**160**	**195**	**156**	**170**	**150**

WQ1: P Trade Report

Reported For	Landowner E - Grass Hay
Printed	2020-11-12
Plan Completion/Update Date	2020-10-13
SnapPlus Version 20.0 built on 2020-09-02 17:17	

The P Trade Report estimates the annual pounds of phosphorus (P) in surface runoff from cropland entering surface waters. These P loss calculations are based on a field's soil test P concentration, crops, tillage, nutrient management practices and estimates of average runoff and sheet and rill erosion for the predominant soil type. Losses from concentrated flow channel or gully erosion with a field are not included in these calculations. Field runoff losses are calculated for each year as **PTP** (lb P/field/yr). Fields are only included if there are at least 2 years of crops before the selected start year. Before using this report as part of a Water Quality Trade activity, phosphorus losses (PTP) must be converted into 'P credits' according to DNR guidance.

For more information go to **http://dnr.wi.gov/** and type keyword: **Water Quality Trading**

Questions? Please contact DNRphosphorus@wisconsin.gov

This report was developed for Wisconsin DNR Water Quality Trading and Adaptive Management purposes and cannot be used to demonstrate compliance with NR 151 or NRCS 590 NM plan requirements.

P Trade Report				PTP									
Field Name	Soil Series	Soil Symbol	Acres	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1A	ELVERS	Ev	7	23	5	3	2	2	1	1	1	0	0
1B	OTTER	Ot	4	4	2	2	1	1	1	1	1	0	0
2	SABLE	SaA	12	23	14	12	10	8	7	7	6	6	5
3	HIXTON	HbB	12	27	19	15	11	9	8	8	8	8	8
4	HIXTON	HbB	3	8	5	3	2	2	2	2	2	2	2
5	NEWGLARUS	NeD2	2	21	2	1	1	0	0	0	0	0	0
Total			**39**	**106**	**46**	**37**	**28**	**23**	**20**	**18**	**17**	**16**	**15**

APPENDIX F

Water Quality Trading Checklist

State of Wisconsin
Department of Natural Resources
101 South Webster Street
Madison, WI 53707

Water Quality Trading Checklist
Form 8700-nnn (R10/12)

Applicant Information

Permittee Name:	Permit Number:	Facility Site Number
Village of Belleville	**WI-**0023361-09-0	N/A

Facility Address	City	State	ZIP Code
20 River Street Box 79	Belleville	WI	53508

Project Contact Name(if applicable)	*Address*	*City*	*State*	*Zip Code*
Andrew Skog, P.E., MSA	1702 Pankratz Street	Madison	WI	53704

Project Name
Belleville Water Quality Trading Plan

Receiving Water Name	Parameter(s) being traded	HUC 12
Sugar River	Phosphorus	070900040502 Ross Crossing-Sugar River

Credit Generator Information

Credit generator type (check all that apply):
- ☐ Permitted Discharge (non-MS4)
- ☐ Permitted MS4
- ☐ CAFOs
- ☐ Non-permitted urban discharge
- ☒ Agricultural nonpoint source discharge
- ☐ Other- Specify: _____

Are any of the credit generators in a different HUC 12 than the applicant?
- ☒ Yes; HUC 12: 070900040102, 070900040103, 070900040203
- ☐ No

Are any of the credit generators downstream of the applicant?
- ☐ Yes
- ☒ No

Was a broker/exchange be used to facilitate trade?
- ☐ Yes *(include description and contact information in WQT plan)*
- ☒ No

Permitted Discharge Information (Traditional Municipal/Industrial Discharge, MS4, CAFO):

Are each of the point sources identified in this section are in compliance with their WDPES permit requirements?
- ☐ Yes
- ☐ No

Discharge Type	Permit Number	Name	Contact Information	Trade Agreement Number
☐ Traditional ☐ MS4 ☐ CAFO				
☐ Traditional ☐ MS4 ☐ CAFO				
☐ Traditional ☐ MS4 ☐ CAFO				
☐ Traditional ☐ MS4 ☐ CAFO				
☐ Traditional ☐ MS4 ☐ CAFO				

Does plan have a narrative that describes:			Plan Section
a. Summary of discharge and existing treatment	☐ Yes	☐ No	
b. Amount of credit being generated	☐ Yes	☐ No	
c. Timeline for credits and agreements	☐ Yes	☐ No	
d. Method for quantifying credits	☐ Yes	☐ No	
e. Tracking and verification procedures	☐ Yes	☐ No	
f. Location of credit generator in proximity to receiving water and credit user	☐ Yes	☐ No	
g. Other: _____	☐ Yes	☐ No	

Non-Permitted Discharge Information (Non-permitted urban, agricultural, other):

Type	Practices Used to Generate Credits	Method of Quantification	Trade Agreement Number	Have the practice(s) been formally registered?
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Production Area Practices - Diversions - Roof Runoff Structure	BARNY	A	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Streambank Stabilization - Without Aquatic Habitat Adjustment	NRCS Recession Calculation	A	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Whole Field Management	SnapPlus	D	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Streambank Stabilization - With Aquatic Habitat Adjustment	NRCS Recession Calculation	E	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Whole Field Management	SnapPlus	E	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Streambank Stabilization - With Aquatic Habitat Adjustment	NRCS Recession Calculation	F	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☒ Agricultural NPS ☐ Other	Streambank Stabilization - With Aquatic Habitat Adjustment	NRCS Recession Calculation	G	☐ Yes ☒ No ☐ Only in part
☐ Urban NPS ☐ Agricultural NPS ☐ Other				☐ Yes ☐ No ☐ Only in part

Does plan have a narrative that describes:			Plan Section
a.	Description of existing land uses	[X] Yes [ ] No	Chapter 3,4
b.	Management practices used to generate credits	[X] Yes [ ] No	Chapter 4
c.	Amount of credit being generated	[X] Yes [ ] No	Chapter 4
d.	Description of applicable trade ratio per agreement/management practice	[X] Yes [ ] No	Chapter 4
e.	Timeline for credits and agreements	[X] Yes [ ] No	Chapter 7
f.	Method for quantifying credits	[X] Yes [ ] No	Chapter 4
g.	Tracking procedures	[X] Yes [ ] No	Chapter 5
h.	Conditions under which the management practices may be inspected	[X] Yes [ ] No	Chapter 4,5
i.	Reporting requirements should the management practice fail	[X] Yes [ ] No	Chapter 5
j.	Operation and maintenance plan for each management practice	[X] Yes [ ] No	Chapter 4
k.	Location of credit generator in proximity to receiving water and credit user	[X] Yes [ ] No	Chapter 4
l.	Practice registration documents, if available	[ ] Yes [X] No	
m.	History of project site(s)	[X] Yes [ ] No	Chapter 4
n.	Other: _____	[ ] Yes [ ] No	

The preparer and owner certify all of the following:

- I am familiar with the specifications submitted for this application, and I believe all applicable items in this checklist have been addressed.
- I have completed this document to the best of my knowledge and have not excluded pertinent information.
- I certify that the information in this document is true to the best of my knowledge.

Signature of Preparer	Date Signed
Andrew Shy	12/4/2020

APPENDIX G

Management Practice Registration Forms

State of Wisconsin
Department of Natural Resources
101 South Webster Street
Madison WI 53707-7921
dnr.wi.gov

Water Quality Trading Management Practice Registration

Form 3400-207 (R 1/14)

Notice: Pursuant to s. 283.84, Wis. Stats., this form must be completed by any WPDES permittee that is using water quality trading as a method of complying with a permit limitation. Failure to complete this form would not result in penalties. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law (ss. 19.31 - 19.39, Wis. Stats.).

Applicant Information

Permittee Name	Permit Number	Facility Site Number
Village of Belleville	WI- 0023361	

Facility Address	City	State	ZIP Code
105 Remy Road	Belleville	WI	53508

Project Contact Name (if applicable)	Address	City	State	ZIP Code
Andrew Skog, P.E., MSA	400 Ice Harbor Drive, Suite 110	Dubuque	IA	52001

Project Name
Village of Belleville - Water Quality Trading

Broker/Exchange Information (if applicable)

Was a broker/exchange be used to facilitate trade? ○ Yes ◉ No

Broker/Exchange Organization Name	Contact Name

Address	Phone Number	Email

Trade Registration Information (Use a separate form for each trade agreement)

Type	Trade Agreement Number	Practices Used to Generate Credits	Anticipated Load Reduction	Trade Ratio	Method of Quantification
○ Urban NPS ◉ Agricultural NPS ○ Other	Landowner D	Whole Field Management (perennial vegetation)	43.04	1.2	SnapPlus

County	Closest Receiving Water Name	Land Parcel ID(s)	Parameter(s) being traded
Dane	Milum Creek	048/0507-264-8502-0	Total Phosphorus

The preparer certifies all of the following:

- I have completed this document to the best of my knowledge and have not excluded pertinent information.
- I certify that the information in this document is true to the best of my knowledge.

Signature of Preparer	Date Signed
Andrew Skog	01/23/2023

Authorized Representative Signature

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision. Based on my inquiry of those persons directly responsible for gathering and entering the information, the information is, to the best of my knowledge and belief, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Authorized Representative	Date Signed
Dale Gf.	01/23/2023

Leave Blank – For Department Use Only

Date Received		Trade Docket Number
Entered in Tracking System ☐ Yes	Date Entered	Name of Department Reviewer

State of Wisconsin
Department of Natural Resources
101 South Webster Street
Madison WI 53707-7921
dnr.wi.gov

Water Quality Trading Management Practice Registration

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Applicant Information

Permittee Name	Permit Number	Facility Site Number
Village of Belleville	WI- 0023361	

Facility Address	City	State	ZIP Code
105 Remy Road	Belleville	WI	53508

Project Contact Name (if applicable)	Address	City	State	ZIP Code
Andrew Skog, P.E., MSA	400 Ice Harbor Drive, Suite 110	Dubuque	IA	52001

Project Name
Village of Belleville - Water Quality Trading

Broker/Exchange Information (if applicable)

Was a broker/exchange be used to facilitate trade? ○ Yes ◉ No

Broker/Exchange Organization Name	Contact Name	
Address	Phone Number	Email

Trade Registration Information (Use a separate form for each trade agreement)

Type	Trade Agreement Number	Practices Used to Generate Credits	Anticipated Load Reduction	Trade Ratio	Method of Quantification
○ Urban NPS ◉ Agricultural NPS ○ Other	Landowner E	Whole Field Management (perennial vegetation)	118	1.2	SnapPlus

County	Closest Receiving Water Name	Land Parcel ID(s)	Parameter(s) being traded
Dane	Milum Creek	048/0507-252-9000-4	Total Phosphorus

The preparer certifies all of the following:

- I have completed this document to the best of my knowledge and have not excluded pertinent information.
- I certify that the information in this document is true to the best of my knowledge.

Signature of Preparer	Date Signed
Andrew Skog	06/01/2021

Authorized Representative Signature

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision. Based on my inquiry of those persons directly responsible for gathering and entering the information, the information is, to the best of my knowledge and belief, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Authorized Representative	Date Signed
Dan Silvernale	6/9/2021

Leave Blank – For Department Use Only

Date Received		Trade Docket Number
Entered in Tracking System ☐ Yes	Date Entered	Name of Department Reviewer

Save... Clear Data

State of WisconsinDepartment of
Natural Resources101 South Webster
Street
Madison WI 53707-7921dnr.wi.gov

Water Quality Trading Management Practice Registration

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Applicant Information

Permittee Name	Permit Number	Facility Site Number
Village of Belleville	WI- 0023361	

Facility Address	City	State	ZIP Code
105 Remy Road	Belleville	WI	53508

Project Contact Name (if applicable)	Address	City	State	ZIP Code
MacKenzie Phillips, MSA	1702 Pankratz Street	Madison	WI	53704

Project Name
Village of Belleville - Water Quality Trading

Broker/Exchange Information (if applicable)

Was a broker/exchange be used to facilitate trade? ○ Yes ◉ No

Broker/Exchange Organization Name	Contact Name	
Address	Phone Number	Email

Trade Registration Information (Use a separate form for each trade agreement)

Type	Trade Agreement Number	Practices Used to Generate Credits	Anticipated Load Reduction	Trade Ratio	Method of Quantification
○ Urban NPS ○ Agricultural NPS ◉ Other	Landowner E	Streambank Stabilization and Habitat Improvements	69.4 lbs/yr (34.3 credits/yr)	2.02	NRCS Erosion Calculator

County	Closest Receiving Water Name	Land Parcel ID(s)	Parameter(s) being traded
Dane	Milum Creek	048/0507-252-9000-4; 8230-8	Total Phosphorus

The preparer certifies all of the following:

- I have completed this document to the best of my knowledge and have not excluded pertinent information.
- I certify that the information in this document is true to the best of my knowledge.

Signature of Preparer	Date Signed
MacKenzie Phillips	7/30/2024

Authorized Representative Signature

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision. Based on my inquiry of those persons directly responsible for gathering and entering the information, the information is, to the best of my knowledge and belief, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Authorized Representative	Date Signed
[signature]	8/06/2024

Leave Blank – For Department Use Only

Date Received		Trade Docket Number
Entered in Tracking System ☐ Yes	Date Entered	Name of Department Reviewer

Save... Print... Clear Data

State of WisconsinDepartment of Natural Resources101 South Webster Street
Madison WI 53707-7921dnr.wi.gov

Water Quality Trading Management Practice Registration

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Applicant Information

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Village of Belleville	WI- 0023361	

Facility Address	City	State	ZIP Code
105 Remy Road	Belleville	WI	53508

Project Contact Name (if applicable)	Address	City	State	ZIP Code
MacKenzie Phillips, MSA	1702 Pankratz Street	Madison	WI	53704

Project Name
Village of Belleville - Water Quality Trading

Broker/Exchange Information (if applicable)

Was a broker/exchange be used to facilitate trade? ○ Yes ◉ No

Broker/Exchange Organization Name	Contact Name	
Address	Phone Number	Email

Trade Registration Information (Use a separate form for each trade agreement)

Type	Trade Agreement Number	Practices Used to Generate Credits	Anticipated Load Reduction	Trade Ratio	Method of Quantification
○ Urban NPS ○ Agricultural NPS ◉ Other	Landowner F	Streambank Stabilization and Habitat Improvements	61.8 lbs/year (30.6 credits/yr)	2.02	NRCS Erosion Calculator

County	Closest Receiving Water Name	Land Parcel ID(s)	Parameter(s) being traded
Dane	Milum Creek	048/0507-252-8001-0; 251-8500-2	Total Phosphorus

The preparer certifies all of the following:

- I have completed this document to the best of my knowledge and have not excluded pertinent information.
- I certify that the information in this document is true to the best of my knowledge.

Signature of Preparer	Date Signed
MacKenzie Phillips	7/30/2024

Authorized Representative Signature

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision. Based on my inquiry of those persons directly responsible for gathering and entering the information, the information is, to the best of my knowledge and belief, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Authorized Representative	Date Signed
[signature]	8/31/2024

Leave Blank – For Department Use Only

Date Received		Trade Docket Number
Entered in Tracking System ☐ Yes	Date Entered	Name of Department Reviewer

Management Practice Registration Form Photos

Landowner E Streambank Stabilization – 6/21/2024 Site Visit

Landowner F Streambank Stabilization – 6/21/2024 Site Visit