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FEHR GRAHAM

ENGINEERING & ENVIRONMENTAL

PRESENTER | Jennifer Buholzer

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City of Monroe Water Quality Trading Case Study

Self Performing a Trade & Utilizing the Clearinghouse

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23+ Years of Experience

- Hydrologic and hydraulic studies
- Bridge and culvert replacement
- Wastewater Treatment & Collection Design
- Water Treatment and Water Distribution Design

Wastewater Project Experience

- Facilities Planning
- Infiltration and Inflow Studies
- WWTP updates and expansions
- Dissipative Cooling
- Stream Studies
- WQT Planning



History

In 1973, an alliance started between two engineers – Allen Fehr and Joseph Graham – in Freeport, Illinois. **Like our founders, we improve the communities where our clients – and our employees – live and work.**



#435 in 2025
#474 in 2024
#471 in 2023
#494 in 2022



#58 in 2025
#60 in 2024



#60 in 2025
#83 in 2024
#54 in 2023
#76 in 2022

since
1973



EMPLOYEES

250



**PART OF TRILON FAMILY
OF COMPANIES**

**13
Partner Firms**



**5,000+
Staff**



WE SERVE CLIENTS IN

ILLINOIS, IOWA,

WISCONSIN AND

NATIONWIDE

OUR COMMITMENT TO WISCONSIN COMMUNITIES

Fehr Graham serves communities across Wisconsin, prioritizes safety, supports public health and builds lasting relationships. We prioritize our clients and value open, transparent communication.

We're proud to serve:

- » Apple River, Wisconsin
- » Ashwaubenon, Wisconsin
- » Bellevue, Wisconsin
- » Beloit, Wisconsin
- » Boscobel, Wisconsin
- » Brodhead, Wisconsin
- » Brown County, Wisconsin
- » Browntown, Wisconsin
- » Chilton, Wisconsin
- » Columbus, Wisconsin
- » Delafield, Wisconsin
- » East Troy, Wisconsin
- » Fond du lac, Wisconsin
- » Gratiot, Wisconsin
- » Hartland, Wisconsin
- » Holstein, Wisconsin
- » Kenosha, Wisconsin
- » Kiel, Wisconsin
- » Merrill, Wisconsin
- » Middleton, Wisconsin
- » Monroe, Wisconsin
- » Mosinee, Wisconsin
- » Mount Hope, Wisconsin
- » Orfordville, Wisconsin
- » Oshkosh, Wisconsin
- » Pittsville, Wisconsin
- » Sheboygan, Wisconsin
- » Sheboygan Falls, Wisconsin
- » South Wayne, Wisconsin
- » Watertown, Wisconsin
- » Waupaca, Wisconsin
- » Wauwatosa, Wisconsin
- » West Bend, Wisconsin
- » Weston, Wisconsin
- » Weyauwega, Wisconsin



CITY OF MONROE PHOSPHORUS COMPLIANCE

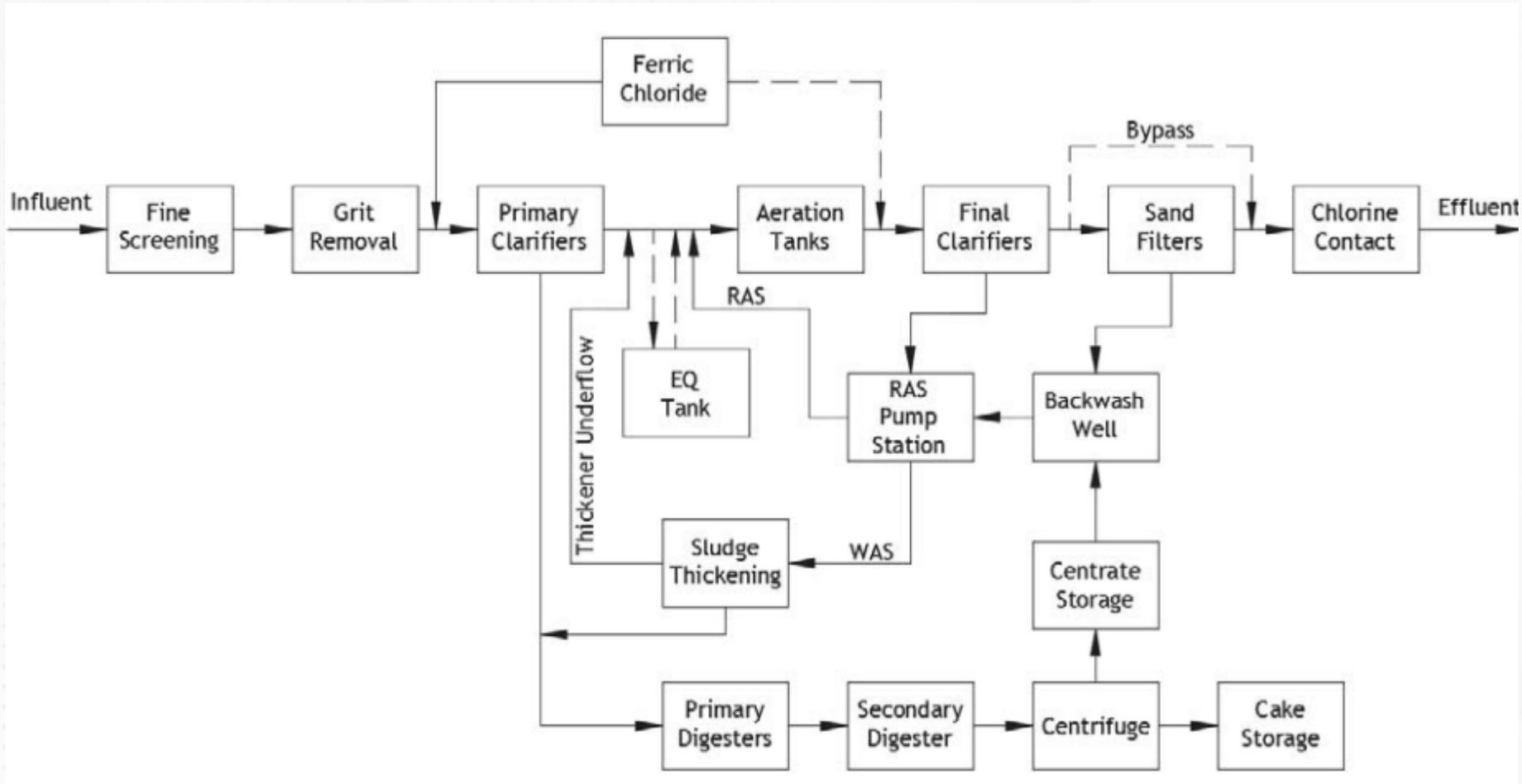
Monroe WWTP – Design Loadings

Design Flows (MGD)	Value
Annual Average	3.70
Maximum Month	4.14
Maximum Day	7.16
Peak Hour	8.35
Design Loadings (lbs/day)	
Annual Average BOD ₅	10,000
Maximum Week BOD ₅	19,014
Annual Average TSS	4,700
Maximum Week TSS	8,625
Annual Average TKN	926
Maximum Week TKN	1,481
Annual Average TP	278
Maximum Week TP	348

Current Population: 10,661

CITY OF MONROE PHOSPHORUS COMPLIANCE

Monroe WWTP – Design Loadings



CITY OF MONROE PHOSPHORUS COMPLIANCE

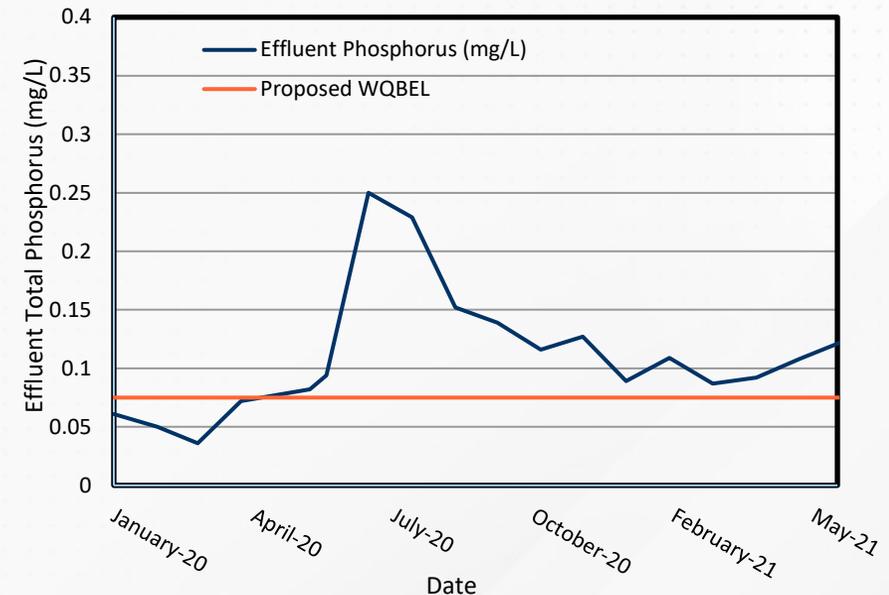
Monroe WWTP – Wastewater Flows and loadings

WWTP Effluent Phosphorus Data January 2020 to June 2021

Month	Actual Discharge Flow	Effluent Phosphorus (mg/L)	Effluent Phosphorus Loading (ld/day)
January-20	1.754	0.0609	0.890826492
February-20	1.674	0.0501	0.699454116
March-20	1.898	0.036	0.569885544
April-20	1.782	0.072	1.07005536
May-20	1.838	0.082	1.256834664
June-20	1.835	0.094	1.438644996
July-20	1.847	0.25	3.850578
August-20	1.868	0.229	3.568382424
September-20	1.943	0.152	2.463229008
October-20	1.777	0.139	2.059541316
November-20	1.661	0.116	1.60643412
December-20	1.659	0.127	1.756861866
January-21	1.775	0.089	1.3175115
February-21	1.789	0.109	1.62630834
March-21	2.069	0.087	1.50122502
April-21	1.884	0.092	1.44555552
May-21	1.832	0.108	1.65011904
June-21	2.014	0.123	2.06600148

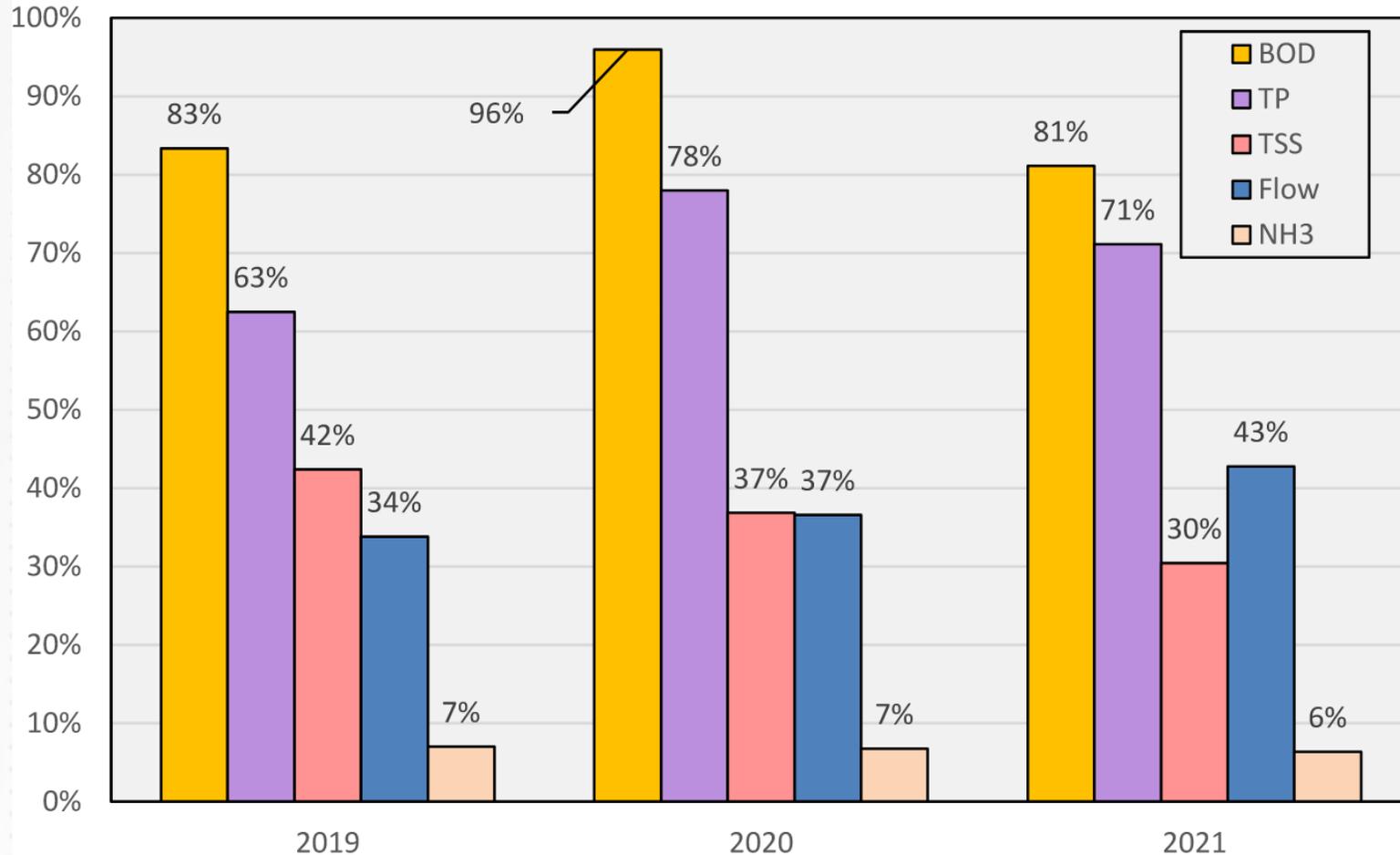
Needed Phosphorus Removal

- » Assuming 0.075 mg/l discharge limit
- » Annual average of 205.6 lbs



CITY OF MONROE CUSTOMER BASE

Monroe WWTP – Industrial Loadings



Commercial/Industrial Flow Implications

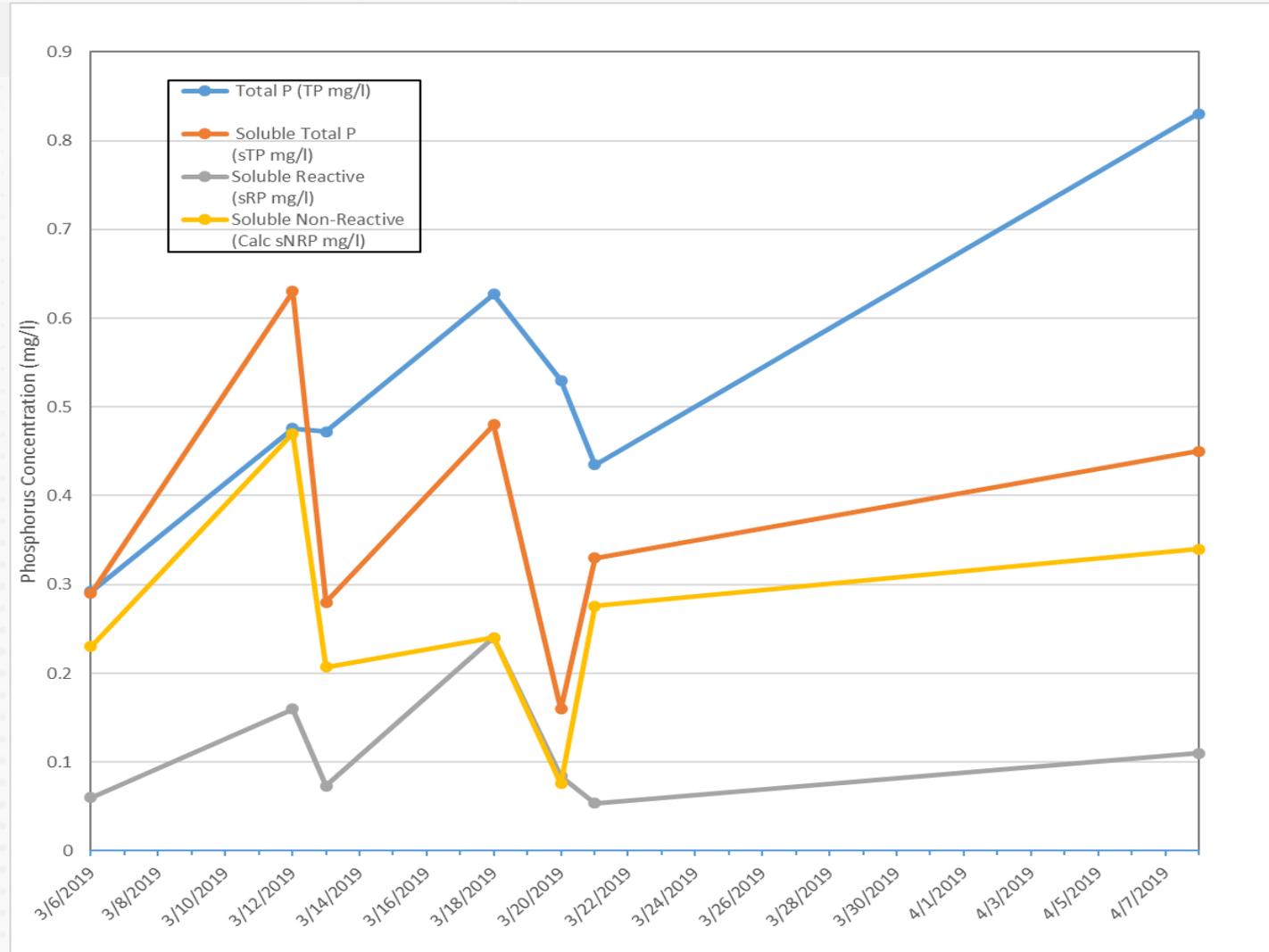
- » Variability in flows and loadings from weekend to weekday
- » Variability in flows and loadings due to production increases and decreases
- » Speciation of phosphorus

IMPROVEMENT PROJECT CONCERNS

Phosphorus Speciation

Soluble Non – Reactive Phosphorus

- » Not easily removed
- » Based on testing , after the BPR process, 75% - 90% of phosphorus in the waste stream is SNRP
- » Average SNRP during 2019 testing was 0.26 mg/l



TREATMENT ALTERNATIVES EXPLORED

Alternatives Reviewed

BPR Optimization

- » City hired Op2Myz, LLC to assist in optimization of the of the BPR process
- » The process explored the impact of High BOD (VFA) and low pH
- » Profiled the WWTP effluent to determine the impact on the removal of phosphorus
- » Reviewed ORP in aeration basins

Flocculation Basin and Disc Filtration System

Membrane Treatment such as a MBR

Both treatment options are excellent for the removal of orthophosphate and other forms of soluble reactive phosphorus but will have limited impact on removing the SNRP. Some manufacturers have seen their treatment system remove SNRP, however at the levels of removal needed, the manufacturers did not feel they will be able to help the City meet the WQBEL.



IMPROVEMENT COSTS

- » Assumptions:
 - » Coagulants can be found to allow for the efficient

Disc Filtration Construction Cost

- » Modification to chemical feed system
- » Removal of Sand Filtration
- » Addition of Disc Filtration
- » Capital Construction Costs ~ \$2.67 Millions

Future Cost assuming 2.5% Inflation = \$4,375,099

- » \$1,970 /lb of phosphorus removed to meet WQBEL

STREAM TESTING

Conduct Stream Testing in Honey Creek

Reason

- » City of Monroe was working on stormwater control long before the ultra phosphorus limits were implemented.
- » No Stormwater measures that predated phosphorus implementation could be used for Water Quality Trading Credits
- » DNR recommendation – conduct a stream study to perhaps get a higher discharge threshold based upon stream quality





STREAM TESTING

Conduct Stream Testing in Honey Creek

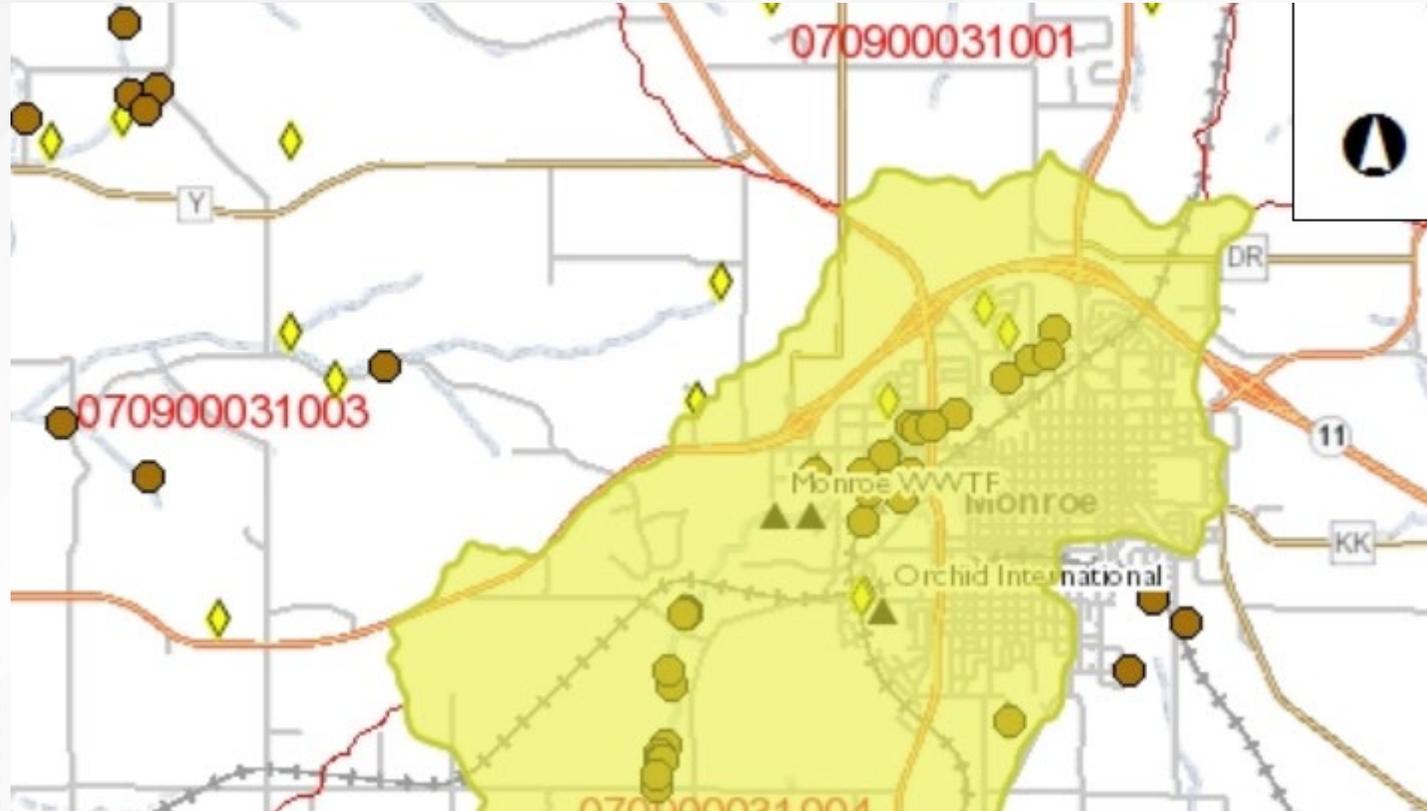
Date	Location				
	200 ft Upstream Badger State Ethanol Outfall (mg/l)	50 Ft Upstream of Badger State Ethanol Outfall (mg/l)	Between Badger State Ethanol and WWTP Outfall (mg/l)	Downstream of WWTP Outfall at Point of complete mix (mg/l)	150 Feet Below Point of complete mix (mg/l)
5/23/2019	NA	0.061	0.08	NA	0.197
5/29/2019	NA	0.031	0.045	NA	0.208
6/28/2019	0.005	0.014	0.007	0.038	0.041
7/1/2019	0.014	0.015	0.017	0.045	0.118
8/1/2019	0.005	0.008	0.015	0.084	0.033
8/29/2019	0.028	0.011	0.044	0.12	0.115
9/24/2019	0.022	0.04	0.037	0.079	0.073
10/23/2019	0.038	0.042	0.132	0.104	0.176
Average (mg/L)	0.019	0.028	0.047	0.078	0.120

Result

- » Allowable Water Quality Based Effluent Limit was raised to 0.092 mg/l
- » New Annual overage of 111.04 lbs
- » Saved the City 94.5 lbs of required phosphorus removal

CASE STUDY - WATER QUALITY TRADING

Watershed Outline



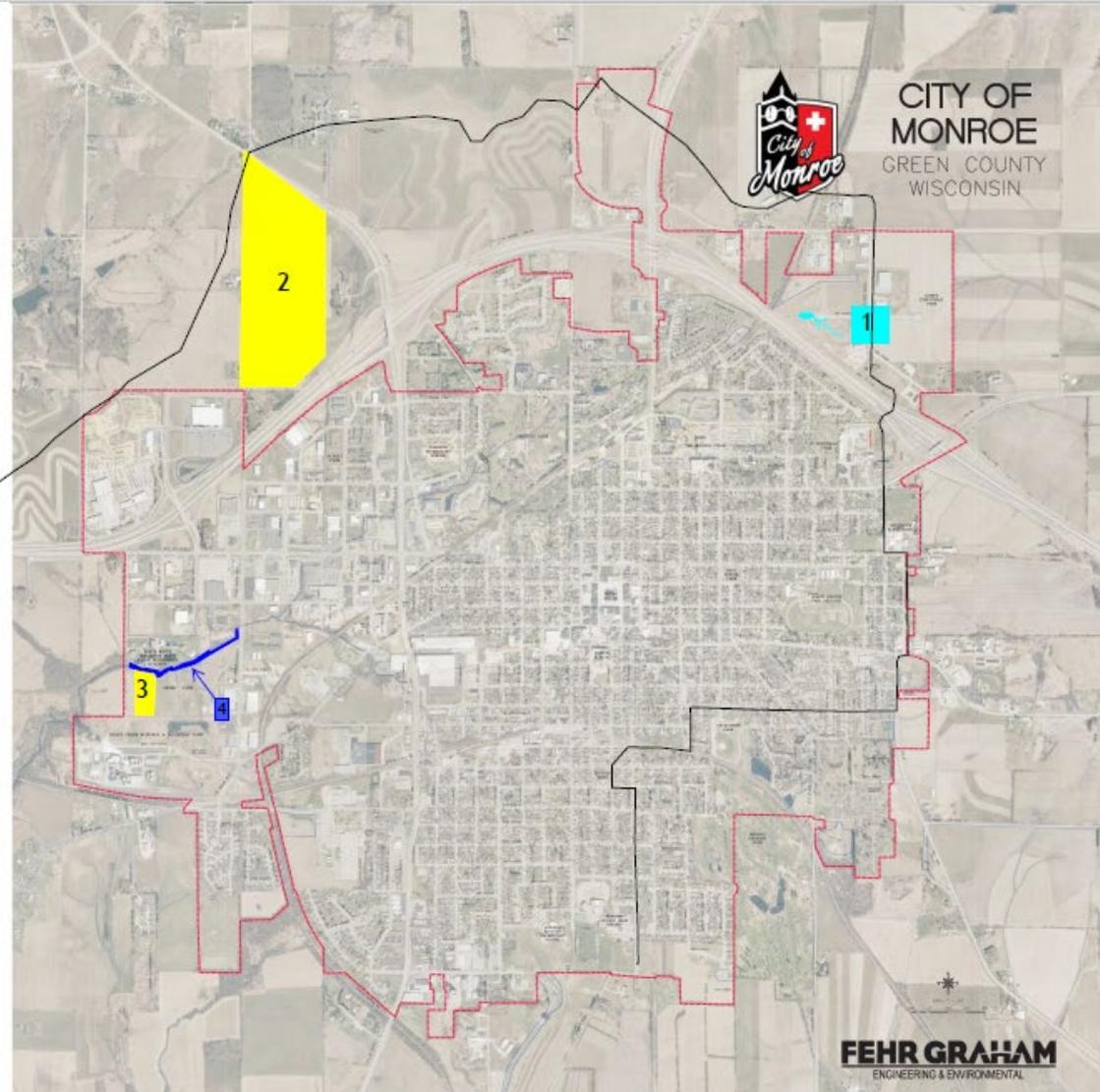
TR = (Delivery + Equivalency + Downstream + Uncertainty):1

CASE STUDY - WATER QUALITY TRADING

Trade Locations

Water Quality Trading Locations

Approximate HUC- 12 Boundary



Location Description:

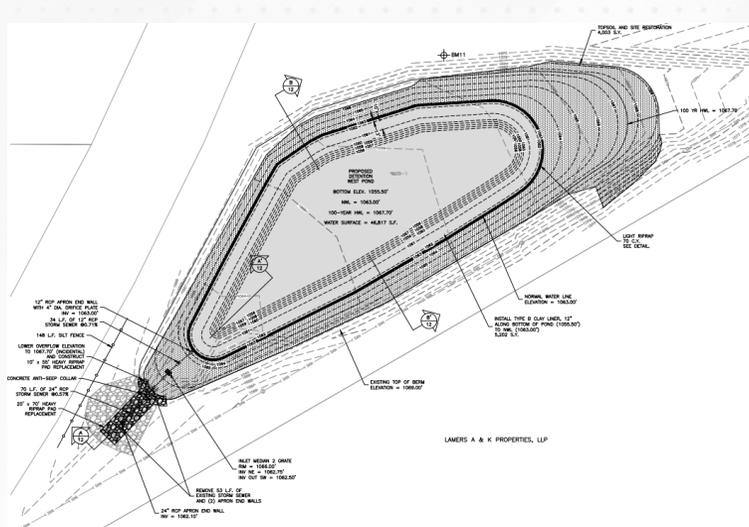
- 1 - City Owned Industrial Park install wet detention pond.
- 2 - Dolan Property - City Owned Property
- 3- WWTP Expansion Site
- 4-Honey Creek Stream Bank Restoration

CASE STUDY - WATER QUALITY TRADING

Industrial Park Pond Upgrade

Project Highlights

- » Could only include improvements that took place prior to 2015
- » Credits Generated with 2:1 trade ratio = 9.25 lbs/year
- » Trade completed with DNR because this is City owned property
- » Created an O& M plan to meet the standards of Wisconsin Conservation Practice 1001



CASE STUDY - WATER QUALITY TRADING

Modifications to Field Operations

Project Highlights

- » Both are City owned properties
- » Credits Generated with 1.2:1 Trade Ratio
 - » 44.2 lbs/year on the Dolan Site
 - » 11.7 lbs lbs/year on the WWTP expansion site
- » Both Trades were based on modifications to crop and application of fertilizer
- » Dolan property is planted as Alfalfa and the WWTP expansion site is planted in Oats
- » Soil Testing to be completed every 5 years
- » Trade completed with DNR because this is City owned property
- » Created an O& M plan implemented to meet Best Management Practices



CASE STUDY - WATER QUALITY TRADING

Streambank Restoration

Project Highlights

- » City owned property
- » Approximately 3,500 lineal feet of streambank restoration
- » Credits Generated with 3:1 Trade Ratio = 102.91
- » Soil samples were taken to ascertain the phosphorus runoff limits
- » Project included
 - » clearing and grubbing
 - » Grading
 - » boulder toes in high velocity locations
 - » rip rap on steep slopes
 - » native plantings
 - » and the placement of some root wads.
- » Trade completed with DNR because this is City owned property
- » Created an O& M plan implemented to meet Best Management Practices

CASE STUDY - WATER QUALITY TRADING

Streambank Restoration



WATER QUALITY TRADING COSTS & CONCERNS

Costs

- » Pond Upgrades = \$ 390,000 (\$640,000 future)
- » Modifications to field operation = \$0.00
- » Streambank Restoration = \$260,000 (\$426,000)

Future Cost assuming 2.5% Inflation = \$1,066,000

- » \$480/lb of phosphorus removed to meet WQBEL

Concerns

- » Ever changing phosphorus loading at WWTP due to wet industries
- » Potential Failure of practice
- » Ongoing operation & Maintenance

ANNUAL MAINTENANCE & REPORTING

- » City of Monroe hired Fehr Graham to oversee the inspection & reporting
- » A Water Quality Trading Document is ever changing – updated every 5 years.
- » Requirements for reporting can change as a result.
- » Each Trade has an inspection sheet that is filled out when inspected (I have a copy if anyone wants to review)
- » At the end of the year an annual report is combined to show where the trades were used and the condition of the trades
- » Each trade has an O&M document associated with the trade to be matched.

Dolan - Inspection/ Communication

Date	Inspector (name/phone number)	BMPs in place			Comments/Needed Maintenance/Dates Problems Addressed	Follow -Up inspection needed
		No-Till	Crop Type	management - meets NMS 590		
5/31/2022	Jennifer Buhozler - 608-329-6400	yes	alfalfa	yes	planting looks good and no additional action needed at this time.	none
6/1/2023	Jennifer Buhozler - 608-329-6400	yes	alfalfa	yes	planting looks good no additional needs	none
5/30/2024	Jennifer Buhozler - 608-329-6400	yes	alfalfa	yes	planting looks good no additional needs	yes - for photos
9/5/2024	Jennifer Buhozler - 608-329-6400	yes	alfalfa	yes	Look good, can see crop coming up, likely one more mow this season, no additional needs	none
6/19/2025	Jennifer Buhozler - 608-329-6400	yes	alfalfa	yes	soil sampling completed and fields reviewed for planting and condition	none

ANNUAL MAINTENANCE & REPORTING

Industrial Park Pond - Inspection

Date	Inspector (name/phone number)	BMPs in place				Comments/Needed Maintenance/Dates Problems Addressed
		Slope Condition	Vandalism/ Vehicle damage	Condition vegetation	Outfall	
5/31/2022	Jennifer Buholzer/ 608-329-6400	Good	None noted	No overgrowth noted	good condition- no erosion	WQT measure is in good condition and needs no additional maintenance at this time.
6/1/2023	Jennifer Buholzer/ 608-329-6400	Good	none	No overgrowth noted - maintained well	good condition- no erosion and well maintained	WQT measure is in good condition and needs no additional maintenance at this time.
5/30/2024	Jennifer Buholzer - 608-329-6400	Good	None noted	No washout noted - well established vegetation	Good Condition - no erosion	Return for photos later in year
9/5/2024	Jennifer Buholzer - 608-329-6400	yes	None noted	No washout noted - well established vegetation	Could not see - overgrowthn plants	outfall difficult to get to outfall due to plant growth

Streambank Restoration - Inspection & Clearinghouse Communication

Date	Inspector (name/phone number)	BMPs in place				Comments/Needed Maintenance/Dates Problems Addressed
		Boulder Toe / plantings/ trees	Debris	Erosion	Vandalism	
11/5/2024	Jennifer Buholzer - 608-329-6400	NA	NA	NA	NA	Talked to Clearinghouse - update on available Credits. No Credits Available.
11/23/2024	Jennifer Buholzer - 608-329-6400	Good Condition	None Noted	None Noted	None Noted	Project Completed Early November plants appear to be taking root well
6/2025	Jennifer Buholzer - 608-329-6400	na	NA	NA	NA	Finalized trade with Clearinghouse
11/12/25	Jennifer Buholzer	Looks to be in good condition	none	none	none	All BMPs appeared to be in good condition

WATER QUALITY TRADING PHOTOS



Streambank Restoration



Industrial Park



Dolan Property



WWTP Expansion Site

CASE STUDY WATER QUALITY TRADING CLEARINGHOUSE

Case Study Highlights

- » Contact was made with Clearinghouse because the City of Monroe Industrial users increased the amount of phosphorus being sent to WWTP
- » Monroe was short 181.76 credits in 2024
- » Request placed through Website and Chris took care of the legwork
- » When Trade was found and costs agreed upon Chris sent out an agreement.

WATER QUALITY TRADING CLEARINGHOUSE AGREEMENT

THIS WATER QUALITY TRADING CLEARINGHOUSE AGREEMENT (this “Agreement”) is entered as of the latest date set forth on the signature pages hereto (the “Effective Date”), by and between the City of Monroe (“Buyer”); Kenneth and Diane Clark (“Generator”); and Wisconsin Clearinghouse, LLC, a Wisconsin limited liability company (the “Clearinghouse” and together with Buyer and Generator, the “Parties” and each individually, a “Party”).

RECITALS

WHEREAS, the Wisconsin Department of Natural Resources (the “WDNR”) regulates the discharge of pollutants to waters of the state and administers a program for the trading of water pollutant reduction credits in accordance with Wis. Stat. § 283.84;

WHEREAS, the State of Wisconsin, as represented by its Department of Administration, Division of Enterprise Operations (“DOA”), entered a contract with the Clearinghouse (the “Clearinghouse Contract”) for the establishment and operation of a centralized clearinghouse for the buying and selling of water pollutant reduction credits (“Credits”) that may be traded under Wis. Stat. § 283.84(1)(f);

WHEREAS, the Clearinghouse is authorized to facilitate water quality trades by contracting with parties for the generation of Credits through water pollutant reduction activities and the purchase of Credits generated by such activities;

WHEREAS, Buyer operates the City of Monroe Waste Water Treatment Facility (the “Facility”) located at 1224 10th Ave West Monroe, WI 53566, under an existing Wisconsin Pollutant Discharge Elimination System Permit, No. WI-0020362-09-2 (the “Permit”);

WHEREAS, Buyer and/or its agents have, prior to the date hereof, in good faith and using the WDNR’s

WATER QUALITY TRADING CLEARINGHOUSE COSTS & REPORTING

Trade Details

- » Trade for Monroe – Filter strips
- » Trade Ratio 2.1:1
- » Total Credits 192/ year for 5 years
- » Trade good for 5 years
- » Clearinghouse creates the agreement.
 - » The one referenced previously is approximately 14 pages.
 - » a copy is on the desk if anyone wants to see a full document
- » Cost \$66,240/ year for 5 years
- » Cost per Credit \$69.0/ Lb.
- » Clearinghouse is responsible for all inspection of trades through the Clearinghouse.



CHALLENGES & OPPORTUNITIES

Challenges

- » Wet Industries and continued growth – 2025 updated WQT plan shows a need of 298 lbs/year
- » City of Monroe encompasses much of watershed to limited WQT opportunities
- » Losing credits from existing WQT sites from industrial park growth
- » Not yet encountered but anticipated costs associated with operation and maintenance of WQT practices.
- » City is in the process of conducting a WWTP upgrade to meet the expanded flow needs but will likely continue to use WQT credits to meet their needs

Opportunities

- » Use of Clearinghouse to supplement credits
- » Support for updating industrial user rates in community
- » Cooperation between departments to aid in development of WQT credits
- » Continued communication between City and other organizations of interest is vital.

RECOMMENDATIONS TO IMPROVE PROCESS

- » City would not have WQT plan today without the assistance of DNR. Recommend to involve them early
- » With the Clearinghouse being up and running a contact to them at the start of the process verses the end. Trades take some time to find.
- » Work with City early and often on documentation of maintenance of practices
- » Be active in advocating with local groups to try and find WQT credits. Some of the most productive credits are working with a farmer to improve their process through implementation of no till, changing crops, optimizing fertilizer, or planting field buffer strips.



Questions

Thank You.

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