



Water Quality Trading:

City of Brodhead's Path to Compliance

WISCONSIN WASTEWATER OPERATORS ASSOCIATION
51ST ANNUAL CONFERENCE
MIDDLETON, WISCONSIN
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Presentation Overview

- Background
- Feasibility Analysis
- Water Trading Plan
 - Identified Projects
 - Credits
 - Costs



Background

- Major upgrade in 1998
- Extended Aeration (Oxidation Ditch)
- A/O process for Bio-P
- Chemical Feed
- 0.60 MGD Design
- 0.28 MGD Historic Avg



Background

- TP Effluent = 0.8 mg/L
- Regularly <0.5 mg/L (mo. avg.)
- High variability due to hauled waste
 - Receive approx. 1 MG/year
 - Bio-P upset



Background

- Optimization
 - Step-feed selector tanks
 - Better MLSS/wasting control
 - More consistent operation of digesters
 - Dose secondary effluent instead of RAS
 - Hauled Waste evaluation
- 0.8 mg/L used for initial planning



Feasibility Analysis

- Treatment Upgrade
- ~~Regionalization~~
- ~~Alternative Discharge Location~~
- ~~Site Specific Criteria~~
- ~~Adaptive Management~~
- Water Quality Trading
- ~~Multi-Discharger Variance~~
- ~~Individual Statutory Variance (Economic)~~

Feasibility Analysis

- Adaptive Management
 - 27,000 lb/yr of offset
 - City responsible for health of Sugar River

*Large Watershed
+ Small Community*
Be Wary!

Feasibility Analysis - WQT

- 0.8 mg/L effluent
- 2.5 trade ratio
- City Growth
- Mix of Hard & Soft Practices
- Capital Costs
 - Construction – BMPs, Manure Lagoons
 - Administrative – NMPs, WQT Plan, Engineering, Legal
- Annual Costs
 - Construction – Additional BMPs, Maintenance/Rehabilitation
 - Administrative – NMP updates, Inspection/Reporting, Legal

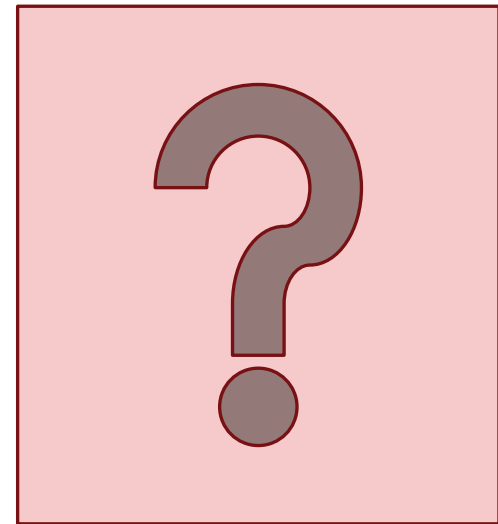
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Feasibility Analysis

- Treatment Upgrade
 - Ballasted Clarification
 - \$4,200,000 Capital Cost
 - \$5,300,000 Present Worth
 - \$407/credit/year
- Water Quality Trading
 - \$1,200,000 Capital Cost
 - \$3,700,000 Present Worth
 - \$282/credit/year

Feasibility Analysis

- Can we gain any more certainty before jumping headlong into a WQT plan?
 - Aggressive Optimization Plan
 - Chemical pilot
 - Hauled Waste fee/rate study
 - In-City Stormwater BMPs
 - Stakeholder Identification



Water Quality Trading Plan

- Chemical Pilot Study
 - Secondary Effluent Feed Point
 - Varied Dosage from 1-30 mol Al:mol P
 - <0.3 mg/L feasible @ 5-10 molar ratio
 - \$30/lb (<\$280/lb!)
 - Ortho-P Analyzer (installed in 2017)
- 0.3 mg/L used for planning moving forward

Water Quality Trading Plan

Treatment Scenario (mg/L)	TP Credit Required (lb/yr)	Present Worth (20-year)	Credit Reduction	Cost Reduction	Unit Cost (per credit/yr)
0.8	654	\$3,671,000	--	--	\$280
0.5	374	\$2,338,000	43%	36%	\$312
0.3	187	\$1,496,000	71%	59%	\$400

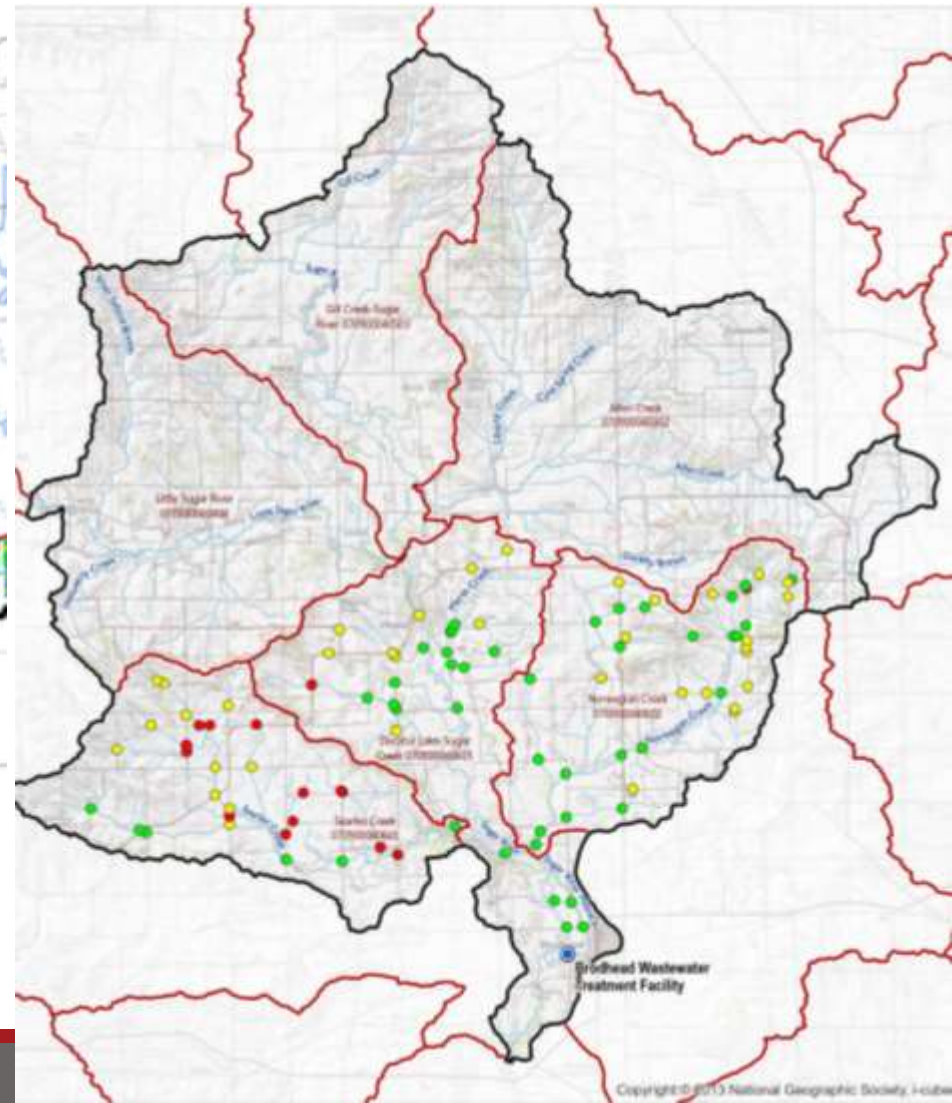
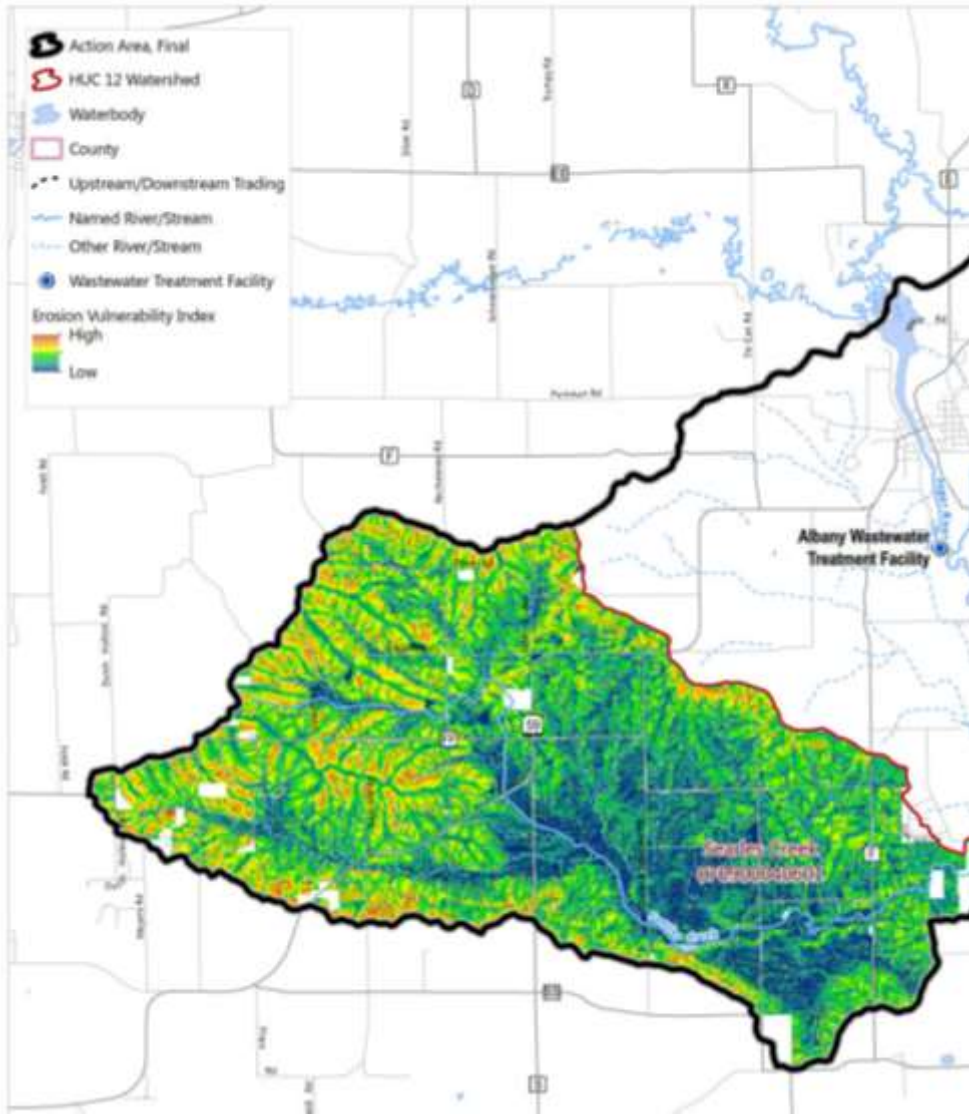
****Compare to \$5,300,000 for Treatment Upgrade****

WQT Plan – Stormwater BMPs

BMP	Credits (credits/year)	Cost (20-Year PW)	Unit Cost (per credit/year)
Street Sweeping	<ul style="list-style-type: none"> Minimal areas with curb/gutter Existing sweeping program New/expensive sweeping truck needed 		
Roadside Swales	<ul style="list-style-type: none"> Significant disturbance to residential property Would take credit from existing and proposed ponds 		
W10 Pond (City Property)	10	\$147,000	\$438
W30 Pond (City Park)	3	\$67,000	\$671
W80 Pond (Private Land)	29	\$204,000	\$218

Feasibility Analysis

- **Where are the credits?**
 - Modeling/Mapping
 - Sparrow
 - PRESTO
 - EVAAL
 - Land Use
 - Qualitative Assessment Scoring
 - Word of mouth
 - Documented Problem Areas



Water Quality Trading Plan

- Stakeholder Identification
 - Hold Stakeholder Meetings
 - Local watershed and farmer meetings
 - Develop Relationships, not models!
 - Understand their needs
 - Mutual benefit – I help you, you help me
 - Many farmers want to do the right thing
 - Leverage existing relationships

Herding Cats!



Water Quality Trading Plan

- Four Projects Identified
 1. Crop Farmer
 - Remove Land from Production
 - Buffer Strips
 - Streambank Restoration
 2. Homestead (Landowner 'A')
 - Streambank Restoration
 3. Homestead (Landowner 'B')
 - Streambank Restoration
 4. Dairy Farmer (Landowner 'C')
 - Farmstead/lot improvements
 - Improved Cropping Practices

WQT Plan

Landowner 'A'

- Former livestock farm
- Pasture land is rented for grazing
- Land is in family trust
- Existing relationship with City
- 37 locations of eroding banks (0.80 mi.)
- NRCS Erosion Model (Direct Volume Method)



WQT Plan – Landowner ‘A’

Location	Credits (lb/year)	Proposed BMPs
Stream Restoration (0.80 mi.)	205	<ul style="list-style-type: none"> • Bank Grading • Riprap • Livestock Crossings • Fencing (as needed) • Grass Seeding • Habitat Improvements (NRCS habitat guide)
Life Cycle Costs	<p style="text-align: center;">\$550,000 \$135/credit/yr <i>assumes no EQIP obtained</i></p>	

- EQIP would lower costs
- O&M completed by City
- Small incentive payment

WQT Plan

Landowner 'B'

- Former livestock farm
- Pasture land is grazed by cattle and equine
- Owner is member of LSRWA
- 26 locations of eroding banks (0.45 mi.)
- NRCS Erosion Model (Direct Volume Method)



WQT Plan – Landowner ‘B’

Location	Credits (lb/year)	Proposed BMPs
Stream Restoration (0.45 mi.)	146	<ul style="list-style-type: none"> • Clearing/Grubbing • Bank Grading • Riprap • Livestock Crossings • Fencing (as needed) • Grass Seeding • Habitat Improvements (NRCS habitat guide)
Life Cycle Costs	<p style="text-align: center;">\$410,000 \$140/credit/yr <i>assumes no EQIP obtained</i></p>	

- EQIP would lower costs
- O&M completed by Landowner
- Incentive payment
- Annual Inspection by City

WQT Plan

Landowner 'C'

- Small family farm
- Ownership transition; looking to grow
- Deficient waste storage
- Excessive manure application on owned property
- Four (4) outdoor barnyards with resource concerns
- Continuous Corn Silage
- Recently developed a draft NMP
- Seeking NRCS-EQIP funding

WQT Plan

Landowner 'C'

- **Barnyards/Lots**
 - BARNY model (DNR)
 - Baseline conditions confirmed with APLE-Lots (USDA)
 - Planning for 'zero' discharge
 - Range of Trade Ratios 1.20 – 3.03
- **Cropping Practices**
 - Snap-Plus (P-Trade Report)
 - Trade Ratio of 1.53
 - Credits only from fields owned/rented
- Utilized UAV (drone) for aerial mapping/contours

WQT Plan – Landowner ‘C’

Location	Credits (lb/year)	Proposed BMPs
All Lots	92	<ul style="list-style-type: none"> • Lot abandonment w/ conservation easement • Roofs & Gutters • Waste Reception Tank & Pump Station for Runoff collection ('zero' discharge)
Field Practices	144	<ul style="list-style-type: none"> • Nutrient Management • No-Till & Cover Crops • Manure Lagoon/Waste Storage
Total Credits	236	
Life Cycle Costs		<p>\$570,000 \$120/credit/yr <i>assumes EQIP obtained</i></p>

- O&M responsibly of Landowner
- Incentive payments
- Annual Inspection by City

Water Quality Trading Plan

Timeline	TP Credit Generated (lb/yr)	Present Worth (20-year)	Cost Reduction	Unit Cost (per credit/yr)
2015 PCAP	654	\$3,671,000	--	\$280
2016 Trading Phase I	187	\$1,500,000	60%	\$400
2017 Trading Plan	587	\$1,500,000 ^(a)	>60%	\$130

(a) Cost further reduces w/ additional EQIP

Water Quality Trading Plan

- **Status Update**

- Trading Plan submitted in July 2017
- Executed MOUs with landowners
- Developing final agreements
- Received DNR review comments
- Implementation of projects in 2018-2019

Take Home Messages

1. Optimize the WWTF
2. Build Relationships & Partnerships, Not Models!
3. Be willing to negotiate and focus on more than one practice. One size doesn't fit all.
4. Set a conservative budget to mitigate risk
5. Find projects that are consensus builders
6. You will invest time and money into a relationship that will not lead to an agreement

Acknowledgements

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THANK YOU!

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