Water Quality Trading:

City of Brodhead’s Path to Compliance

WISCONSIN WASTEWATER OPERATORS ASSOCIATION
51ST ANNUAL CONFERENCE
MIDDLETON, WISCONSIN
OCTOBER 18, 2017
Presentation Overview

• Background
• Feasibility Analysis
• Water Trading Plan
  ◦ Identified Projects
  ◦ Credits
  ◦ Costs
Background

- Green County
- Population = 3,276
- Lower Sugar River Watershed
- Permit Reissued in 2012
- 0.1 mg/L effluent limitation
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
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

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

**Compare to $5,300,000 for Treatment Upgrade**
## WQT Plan – Stormwater BMPs

<table>
<thead>
<tr>
<th>BMP</th>
<th>Credits (credits/year)</th>
<th>Cost (20-Year PW)</th>
<th>Unit Cost (per credit/year)</th>
</tr>
</thead>
</table>
| Street Sweeping      | • Minimal areas with curb/gutter  
                      |                    |                              |                             |
|                      | • Existing sweeping program  
                      |                    |                              |                             |
|                      | • New/expensive sweeping truck needed |                    |                              |                             |
| Roadside Swales      | • 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’

<table>
<thead>
<tr>
<th>Location</th>
<th>Credits (lb/year)</th>
<th>Proposed BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream Restoration (0.80 mi.)</td>
<td>205</td>
<td>• Bank Grading&lt;br&gt;• Riprap&lt;br&gt;• Livestock Crossings&lt;br&gt;• Fencing (as needed)&lt;br&gt;• Grass Seeding&lt;br&gt;• Habitat Improvements (NRCS habitat guide)</td>
</tr>
</tbody>
</table>

| Life Cycle Costs                  |                   | $550,000  
  $135/credit/yr  
  *assumes no EQIP obtained* |

- 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’

<table>
<thead>
<tr>
<th>Location</th>
<th>Credits (lb/year)</th>
<th>Proposed BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream Restoration (0.45 mi.)</td>
<td>146</td>
<td>• Clearing/Grubbing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bank Grading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Riprap</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Livestock Crossings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fencing (as needed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Grass Seeding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Habitat Improvements (NRCS habitat guide)</td>
</tr>
</tbody>
</table>

**Life Cycle Costs**

- $410,000
- $140/credit/yr

*assumes no EQIP obtained*

- 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’

<table>
<thead>
<tr>
<th>Location</th>
<th>Credits (lb/year)</th>
<th>Proposed BMPs</th>
</tr>
</thead>
</table>
| All Lots          | 92                | • Lot abandonment w/ conservation easement  
                      • Roofs & Gutters  
                      • Waste Reception Tank & Pump Station for Runoff collection (‘zero’ discharge) |
| Field Practices   | 144               | • Nutrient Management  
                      • No-Till & Cover Crops  
                      • Manure Lagoon/Waste Storage |
| **Total Credits** | **236**           |                                                                            |

**Life Cycle Costs**

- $570,000  
  - $120/credit/yr  
  - assumes EQIP obtained

- O&M responsibly of Landowner  
- Incentive payments  
- Annual Inspection by City
## Water Quality Trading Plan

<table>
<thead>
<tr>
<th>Timeline</th>
<th>TP Credit Generated (lb/yr)</th>
<th>Present Worth (20-year)</th>
<th>Cost Reduction</th>
<th>Unit Cost (per credit/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 PCAP</td>
<td>654</td>
<td>$3,671,000</td>
<td>--</td>
<td>$280</td>
</tr>
<tr>
<td>2016 Trading Phase I</td>
<td>187</td>
<td>$1,500,000</td>
<td>60%</td>
<td>$400</td>
</tr>
<tr>
<td>2017 Trading Plan</td>
<td>587</td>
<td>$1,500,000(a)</td>
<td>&gt;60%</td>
<td>$130</td>
</tr>
</tbody>
</table>

(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

• Andrew Skog, MSA
• NRCS
• Green County
• Rich Vogel, DPW, City of Brodhead
• City of Brodhead
• Lower Sugar River Watershed Association
• Decatur Lake Mill Race Association
• DNR
THANK YOU!

MSA PROFESSIONAL SERVICES, INC.
Greg Gunderson
ggunderson@msa-ps.com
608-355-8883