Simple, Early Steps Toward Meeting Lower Phosphorus Effluent Limits

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Outline of Presentation

• Summary of Permit Requirements and Timelines
• Phosphorus Optimization Planning
• Operation and Needs Reviews (ONR)
• Facilities Planning
• Closing Thoughts
Permit Requirements and Timelines
Recently Reissued Wisconsin Permits – General Timeline for Stringent Limits

Year 1: P Optimization Plan/ONR

Year 2: Facilities Plan Status Report, Meet Interim Limit

Year 3: Facilities Plan Draft Report

Year 4: Facilities Plan Final Report

Year 5: Plans and Specifications
Recently Reissued Wisconsin Permits – General Timeline for Stringent Limits

Year 6: Construction Status Report

Year 7: Status Report or Meet Stringent Limit

Year 8: Status Report or Meet Stringent Limit

Year 9: Meet Stringent Limit

Year 10

No Filtration

With Filtration or =
Permit Discharge Optimization Planning
Proper Phosphorus Discharge Optimization Planning Can Reduce Costs

• Wisconsin DNR goals:

  Reduce as much of the phosphorus discharged as possible through *slight* operational changes to the facility

• Additional potential goals: reduce operating costs if possible

  • Reduce influent phosphorus
  • Optimize biological phosphorus removal (BPR)
  • Optimize chemical P removal
Optimization Step 1: Know Your Influent Sources

- Drinking water additives
- Industrial customers
- Commercial and institutional customers
- Perform monitoring
Optimization Step 2: Pollutant Minimization

- Draft Ordinance Limits
- Substitute Chemicals
- Reduce Chemical Use
- Pretreat at Source
Optimization Step 3: Treatment Optimization

• Additional chemical feed

• Multipoint chemical feed if available

• Optimize BPR through better monitoring, other simple methods
WDNR Provided Forms Provide Structure to P Optimization Plans

• Part 1 - Background Information
  – Description
  – Baseline Data
  – Identified P Contributors

• Part 2 – Optimization Action Plans
  – Self Identified Actions

• Part 3 – Approval
Operation and Needs Reviews
Operation and Needs Review Can Be a Useful Tool for Capital Improvements Planning

• Phosphorus data and facilities review:
  • Meet interim permit limit with minor operational changes?
  • Meet future (advisory) stringent limit with minor facility changes?
  • Other facility improvements needed?

• Communication tool
  • Budgeting
  • Support for rate increases

• Is future advisory phosphorus limit correct?
  • Stream monitoring
ONR Process May Benefit from Collection of Additional Information

CPR Lab Testing
- Ferric or Alum

BPR Bench Scale Testing
- VFA Addition

Additional WW Characterization
- Rd CBOD
- VFA
- NO₃-N

Process Modeling
Potential Low-Cost BPR Modifications
Potential Low-Cost BPR Modifications

- Influent
- Anaerobic
- Anoxic
- Aerobic
- Recycle
- Clarifier
- Effluent
- Return Sludge
Potential Low-Cost Flocculation Modifications

Influent → Rapid Mix and Flocculation → Clarifier or Filter → Effluent

Diagram showing the process flow from Influent to Effluent with intermediate steps such as Rapid Mix and Flocculation and Clarifier or Filter.
A Complete ONR Provides Several Functions

- Optimizes P removal (through optimization plan)
- Sets the stage for facilities planning
- Optimizes WWTP for other changes (flows, loadings, etc.) if necessary
- Proactively address aging equipment or constrained site
- Basis for potential wastewater rate adjustments
- Better position for subsequent grant/loan funding, if available
When Should Stream Monitoring Be Conducted?

• During ONR phase (as soon as practical)

• When upstream conditions include:
  • Higher stream flows
  • Lower phosphorus concentrations expected
  • Little or no existing data

• When downstream conditions include…
  • Limited aquatic life (LAL)/ephemeral stream/wetlands
    • Where WQC Changes
  • Little or no existing data

• Other considerations
  • Variance or site-specific standard
  • Watershed Adaptive Management option
Example of Recommended Stream Monitoring Situation

Effluent limit has potential to change from 0.1 to 1.0 mg/L
Facilities Planning
Facilities Planning Provides Opportunity to Evaluate All Options and Combinations

- TMDL-Based Limit
- Water Quality Trading
- Lagoon Variance
- Other Variance/Standard
- Treatment
- Watershed Adaptive Management

Facilities Plan

Best Option(s)
Facilities Plan Should be Executed in Phases

- Eligibility for Options
- Brainstorming
- Costs

- Benefits
- Affordability
- Best Mix

- Draft Plan
- Apply for: Pilot Testing, AM Plan, Variance
- Final Plan
Determine Eligibility for Various Options

- Variance or Site Specific Standard?
- Watershed Adaptive Management?
- Water Quality Trading?

*WDNR’s PRESTO or similar tools
However, Other Tests Could Be Used for Watershed AM

“…the permittee demonstrates that the applicable phosphorus criterion cannot be met in the watershed without the control of phosphorus from nonpoint sources.”
Adaptive Management Has Several Advantages

• Buys time: until TMDL can be implemented; until new total nitrogen and ammonia criteria are adopted

• Can potentially work with other point sources in Watershed (WWTPs and MS4s)

• Improves surface water quality more quickly/thoroughly than WWTP treatment alone

• Lowest total present worth cost alternative for many
Adaptive Management Has Some Drawbacks

• Need to spend public funds outside of municipal boundaries

• May not see improvements in upstream water quality in 5 -15 years
  – Need to comply with recalculated WQBEL at end (~20 yrs); so may be a delay tactic not a final solution
Water Quality Trading is an Option for Compliance with any WQBEL

- Partner with Other Sources of P in Watershed to implement BMPs, restore wetlands, etc.
- Point or nonpoint sources
- USEPA Toolkit and Handbook are available
- WDNR Framework (July 2011) is available; also statutes. Related rules are pending.
- More formal/permanent than AM
Brainstorming Other Options

• Regionalization
• Effluent reuse
• Groundwater discharge
• New technologies
• Phosphorus recovery
Cost-Benefit Analysis: Look for a “Knee” in the Treatment Cost Curve

Example: Small Facility

- Phosphorus Concentration
  - Lower Limit
  - Higher Limit

Additional PV Cost

- $0
- $1,000,000
- $2,000,000
- $3,000,000
- $4,000,000
- $5,000,000
### Potential Options to Consider in “Best Mix”

<table>
<thead>
<tr>
<th>Watershed AM</th>
<th>Water Quality Trading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal is to meet WQ criteria</td>
<td>Goal is to comply with limit</td>
</tr>
<tr>
<td>1:1 “Trade Ratio”</td>
<td>2:1 Trade Ratio (Typical)</td>
</tr>
<tr>
<td>Monitoring Required</td>
<td>No Monitoring Required</td>
</tr>
<tr>
<td>Extra 10 Years in Schedule</td>
<td>Doesn’t Extend Schedule</td>
</tr>
<tr>
<td>Written Plan Required</td>
<td>No Plan Required</td>
</tr>
<tr>
<td>Unique to Wisconsin (for now)</td>
<td>Nationwide (Clean Water Act)</td>
</tr>
</tbody>
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Why Review a Draft WPDES Permit?

- **DNR makes mistakes/errors:**
  - Calculations
  - Application of rules/interpretation
  - Varying methods across DNR regions

- **You can affect your permit requirements!**
  Negotiate changes.

- **Commenting now can help the Utilities’ position for future permits.**
  - Begin planning/organization efforts.
Request Variances As Necessary

- Lagoon Variances – NR 217.19
  - Request during application period
  - Amend application if in backlog
Affordability Analysis is Somewhat Prescribed
Closing Thoughts
Closing Thoughts - Potential Concerns with Wisconsin’s Permitting

• Plans and specifications deadline in first permit term is too soon
  • Not enough time following facilities planning
  • Phosphorus limit could change in second permit term
  • Requires design of WWTP improvements prior to knowing if limit will change

• WDNR may revoke and reissue or modify a permit to incorporate new limits sooner than permit expiration date
  • Rock River Basin example
Additional Closing Thoughts

- Use early required documents such as ONR as a tools for:
  - Cost optimization
  - Creative review of options
  - Thorough planning
  - Effective communication

- Consider other upcoming regulations

Good Luck!
Questions