THE PHOSPHORUS JOURNEY: ONE PLANT'S STORY

WWOA 50th Annual Conference
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Ruekert & Mielke, Inc.

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Topics Covered

1. Background
2. Preliminary Studies
3. Permit Compliance Schedule
4. Optimization
5. Summary

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Background


Washington County
Pop. 14,258
Large Industrial Base
Dairy
Tannery
Metal Finishing
Montello
Endeavor
Du Lac
Plymouth
Waupun
Lomira
Oostburg
Fox Lake
Portage
Pardeeville
Cambria
Random Lake
Kewaskum
Mayville
Beaver Dam
Horicon
West Bend
Juneau
Fall River
Port Washington
Hartford
Grafton
Watertown
Menomonee Falls
Oconomowoc
Madison
Lake Mills
Delafield
Milwaukee
Waukesha
Fitchburg
Stoughton
Fort Atkinson
Oak Creek
Belleville
Edgerton
Whitewater
New Glarus

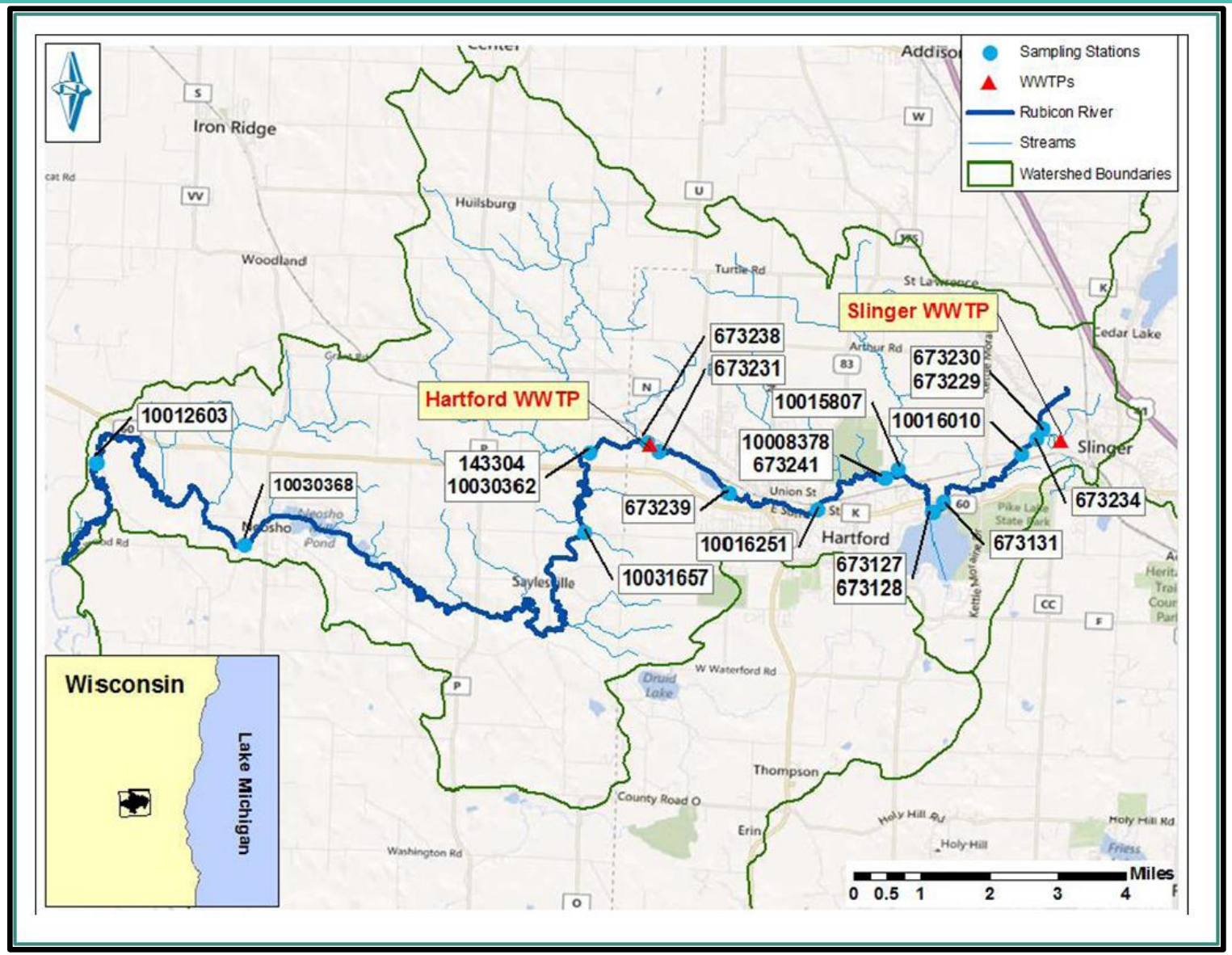
Background

Water Pollution Control Facility

- Activated Sludge
- Extended Aeration
- Advanced Treatment
  - Nitrification/Denit.
  - Tertiary Filters
- Design ADF: 3.4 MGD
- New Permit July 2012
  - Interim P Limit: 0.6 mg/L
  - Final P Limit: 0.075 mg/L
- Discharge to Rubicon River → Rock River

Preliminary Studies

Combine with the Village of Slinger?



Preliminary Studies

Watershed

Solution

Feasibility

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Preliminary Studies

Watershed Solution Feasibility

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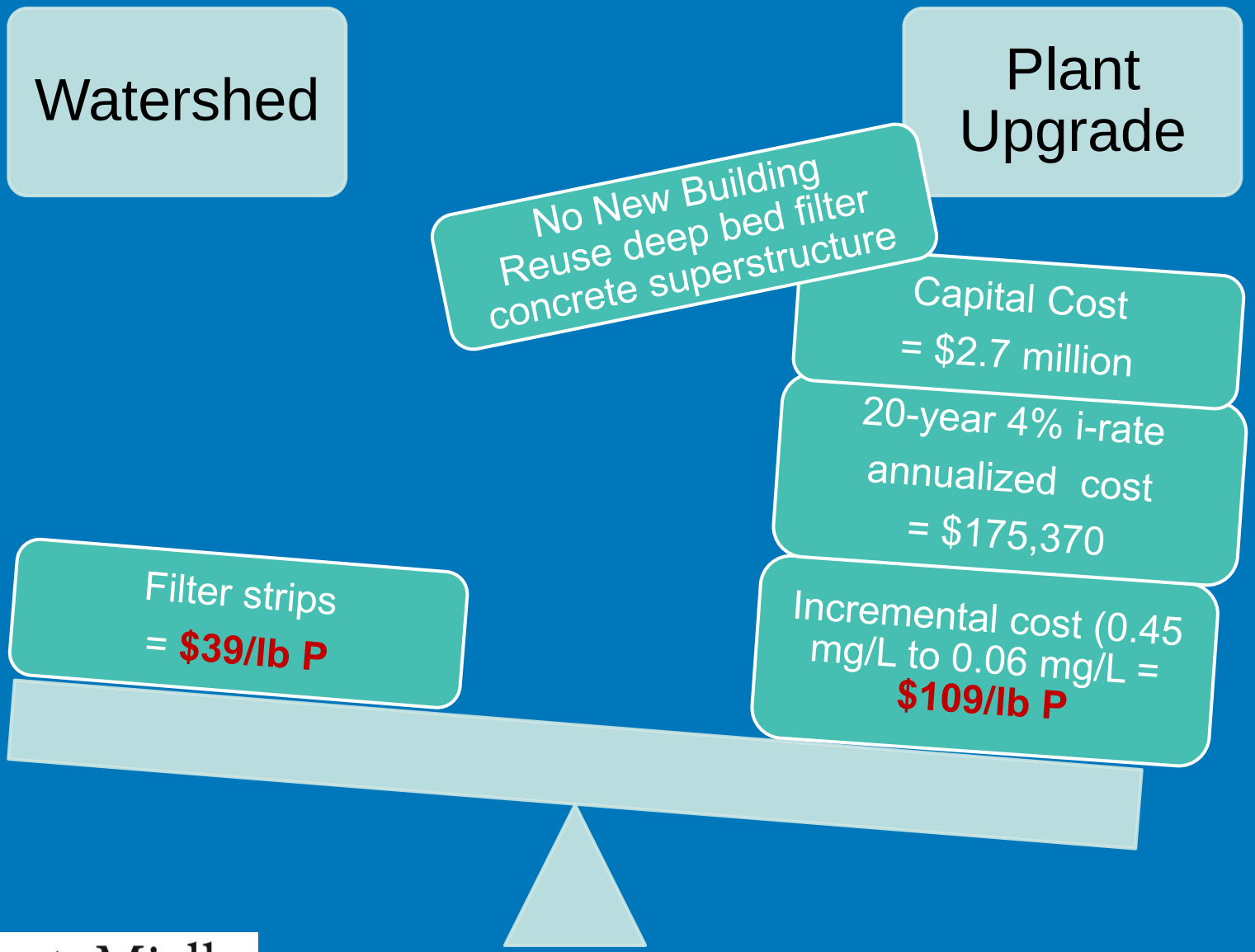
Preliminary Studies
Watershed Solution Feasibility



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Permit Compliance Schedule

Operation and Needs Review/Optimization

Due June 30, 2013

"…report shall evaluate collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that would enable compliance with the final phosphorus WQBEL or some improved level of effluent quality…"

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Permit Compliance Schedule

Facilities Planning Status Report

Due June 30, 2014

This report shall provide an update on the permittee's progress in evaluating feasible alternatives which may include: facility upgrading, consolidation with other sewerage systems, alternative effluent discharge locations, an Adaptive Management Plan, Water Quality Trading plan or a water quality standards variance

Permit Compliance Schedule

Preliminary Facilities Planning

Due June 30, 2015

- Ultrafiltration
- Disk Filtration (cloth)
- Disk Filtration (membrane)
- Ballasted Sedimentation
- Continuous Backwash Filter
- Rare Earth Product/Biological P Removal

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Permit Compliance Schedule

Preliminary Facilities Planning

Process	Equipment Cost
Ultrafiltration	$4,567,000
Disk Filtration (cloth)	$974,000
Disk Filtration (membrane)	$1,026,000
Ballasted Sedimentation	$1,153,000
Continuous Backwash Filter	$1,950,000
Rare Earth Product/Biological	$0

Use Anthracite Filters Concrete Superstructure, No new Bldg.

Permit Compliance Schedule

Final Facilities Planning

Due June 30, 2016

- Bio P / Rare Earth Product Alternative
  - No Further Updates Needed
- Backup Plan – Bio P with Disk Filtration (cloth or membrane)
- Backup Plan – Bio P Coupled with WQT
  - 0.15 mg/L TP➔0.075 mg/L TP

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Optimization

On-line Ortho P Analyzer

- Secondary clarifier effluent
- Heavy industrial loading
- In place July of 2014

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Optimization

Constant Chemical Feed

- Replaced pump with smaller unit
- Continuous operation instead of intermittent
- In place July of 2014

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Optimization

Industrial Coordination

- Grande Cheese
- Hartford Finishing

Went to P-Free Products

Effluent 100 mg/L➔40 mg/L

Hartford Finishing Inc

GRÄNDE® CHEESE COMPANY

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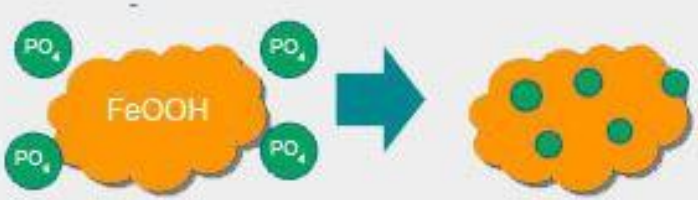
Optimization

Rare Earth Product

SorbX-100 rare earth technology forms strong, crystalline bonds with phosphorus.

SorbX -100 reacts to form a phosphate precipitant.

Traditional coagulants form amorphous "clouds" in solution. Phosphorus is easily released back into solution.



Iron reacts to form a phosphate adsorbent.

SorbX-100 has a unique mode of action resulting in rapid and stable precipitation of phosphorus. SorbX-100 generates less chemical sludge than other coagulants due to its high reactivity with phosphate based compounds.

Optimization

Rare Earth Product

Advantages

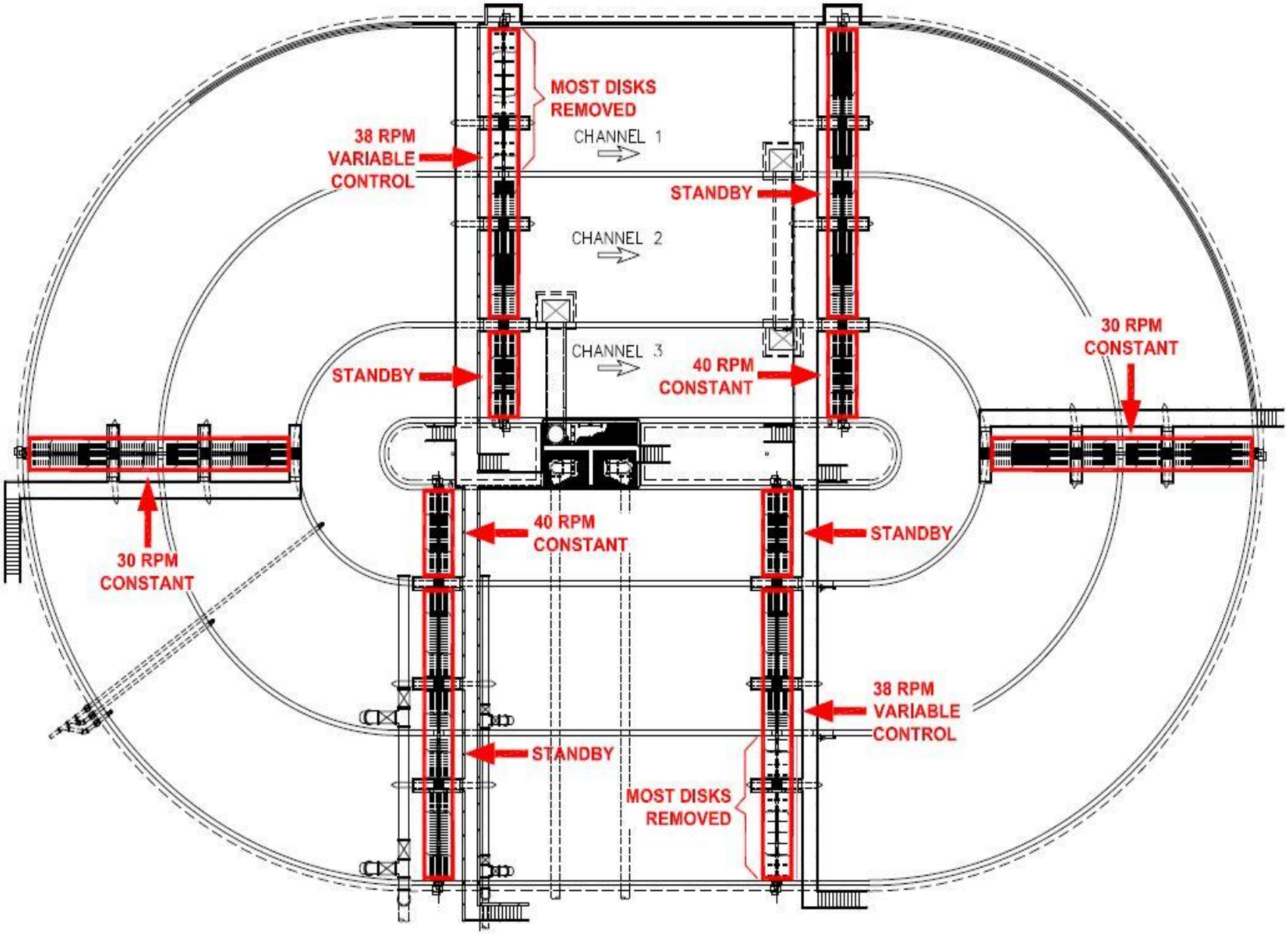
- Less sludge produced
- Thicker MLSS conc.
- More efficient than ferrous chloride
- Lower SVI
- NP water, no smell

Disadvantages

- Higher unit cost
- Unknown market stability and distribution network
- Unknown future pricing
- Few competitors

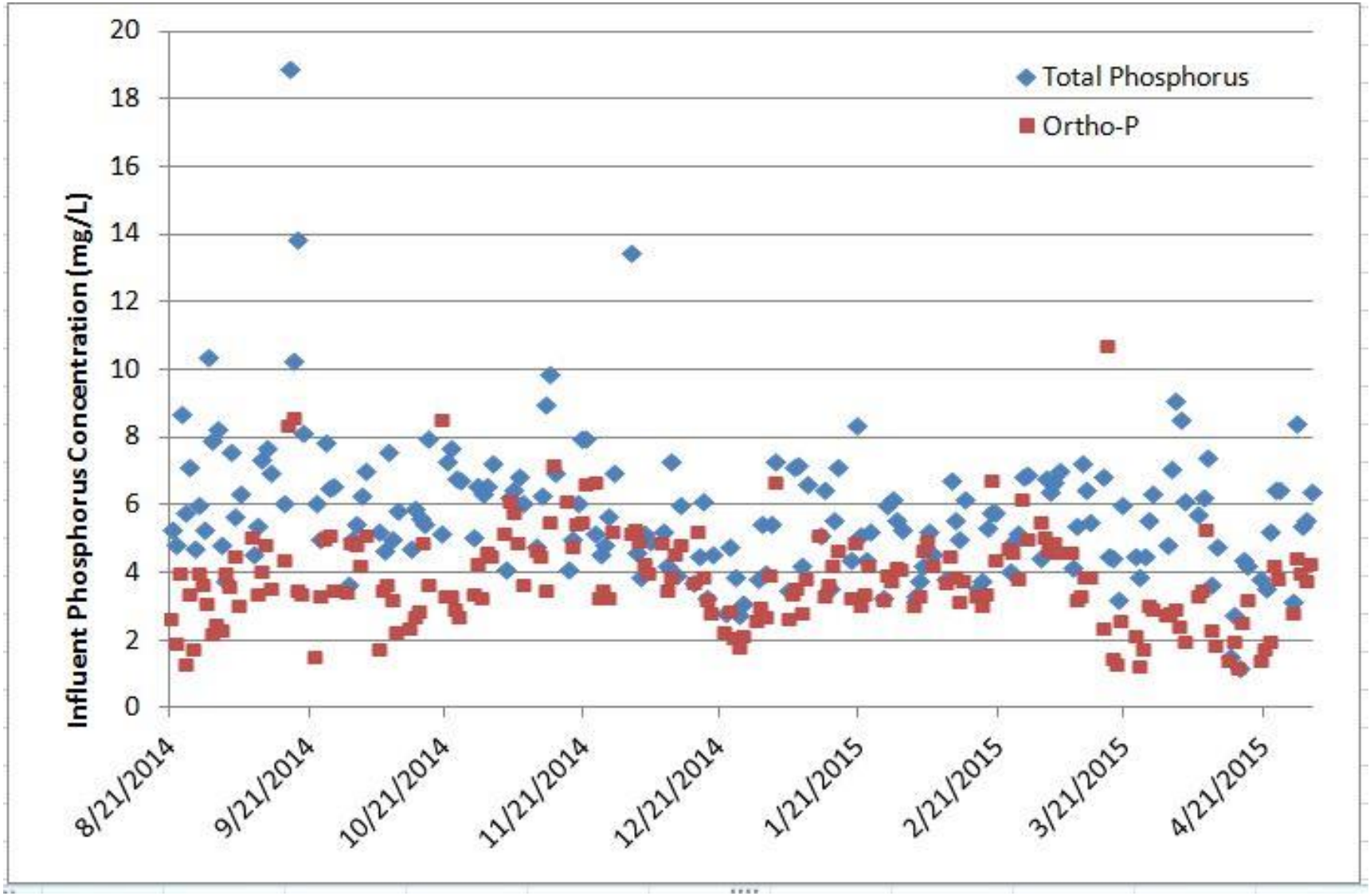
Optimization

- Bio P in Ditch
  - Relative DO deficit
  - ORP
  - Remove discs in outer
  - Mixing OK
  - Save energy

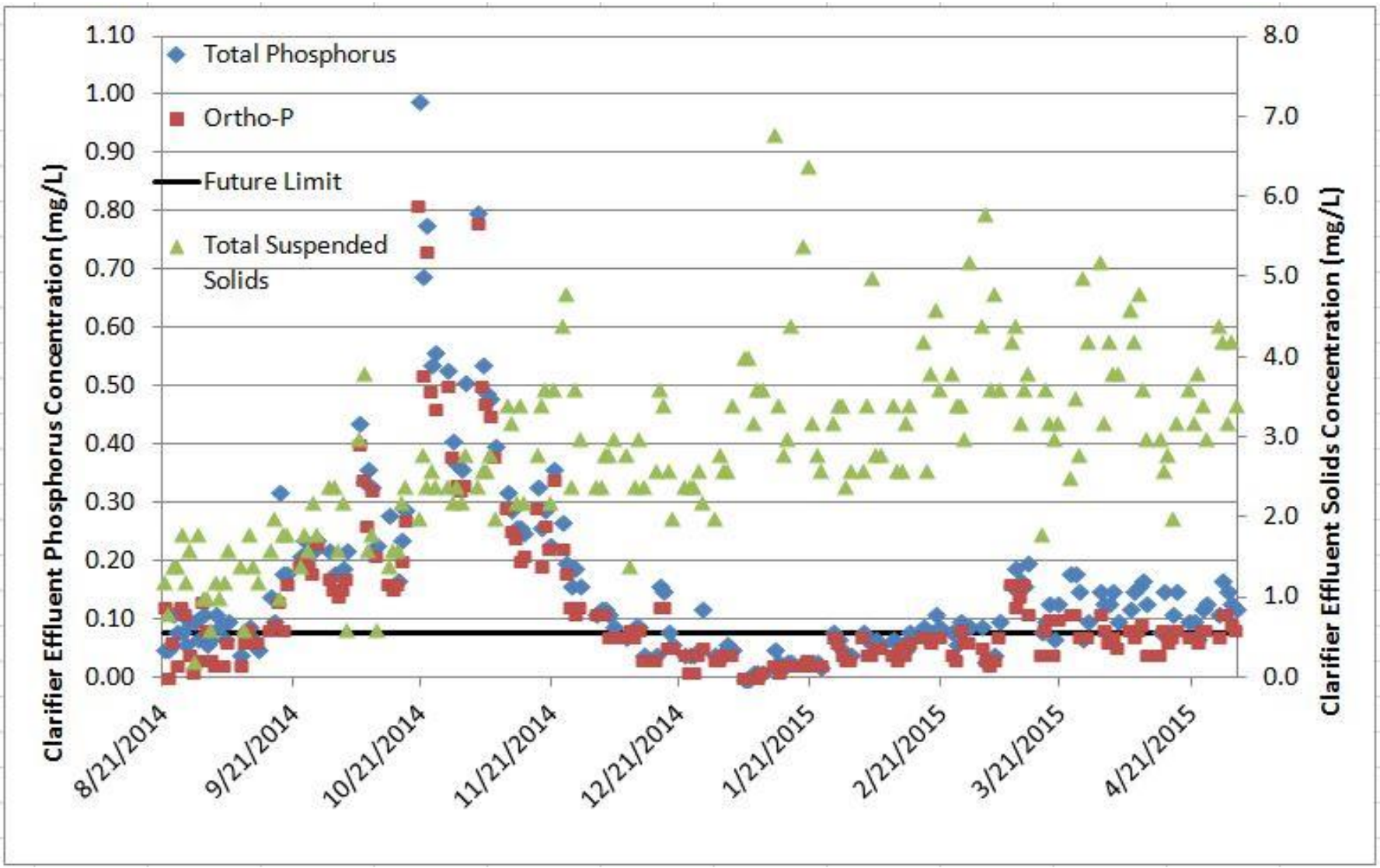


AERATION BASIN NO SCALE

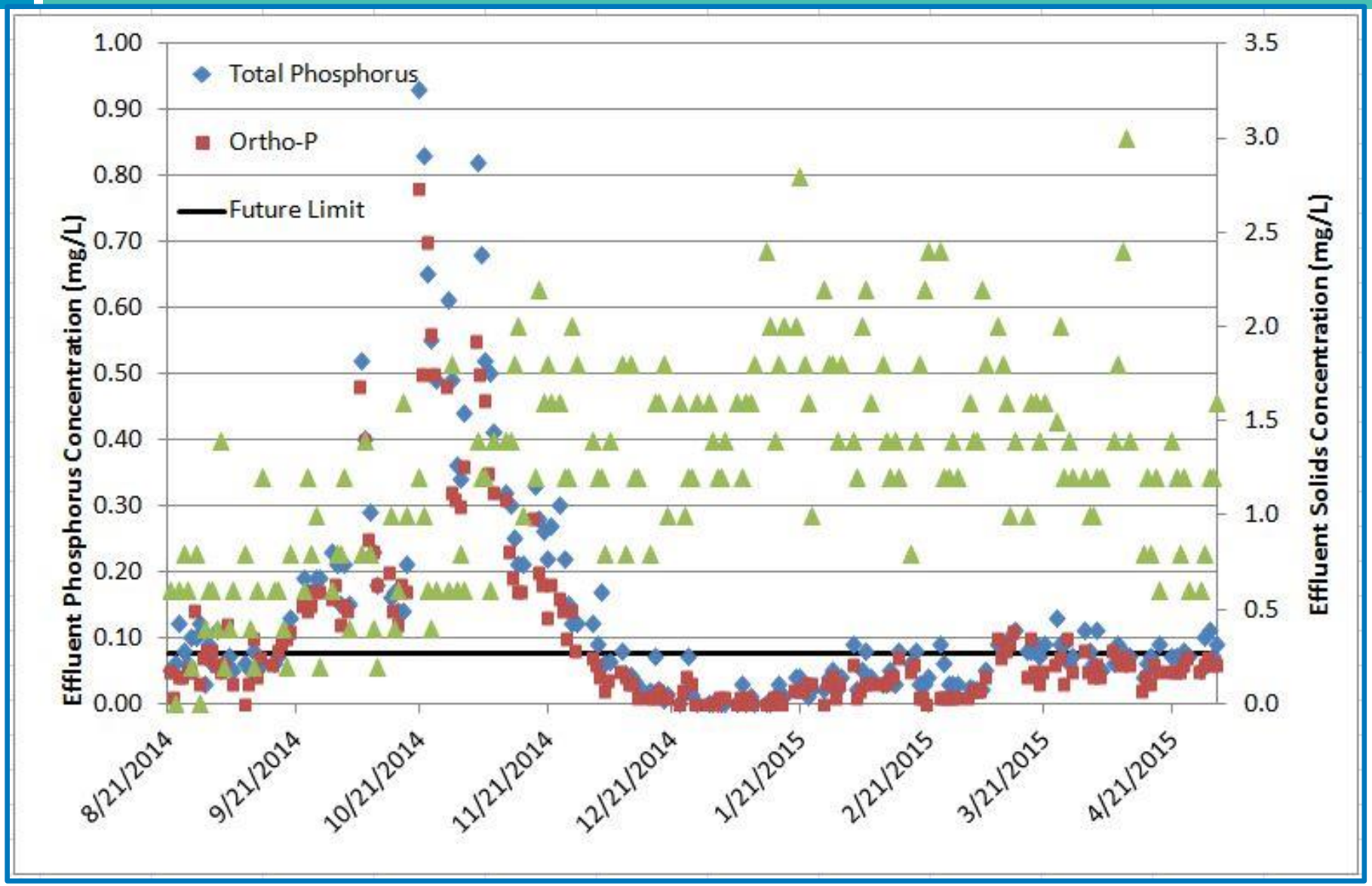
Optimization-Pilot Data



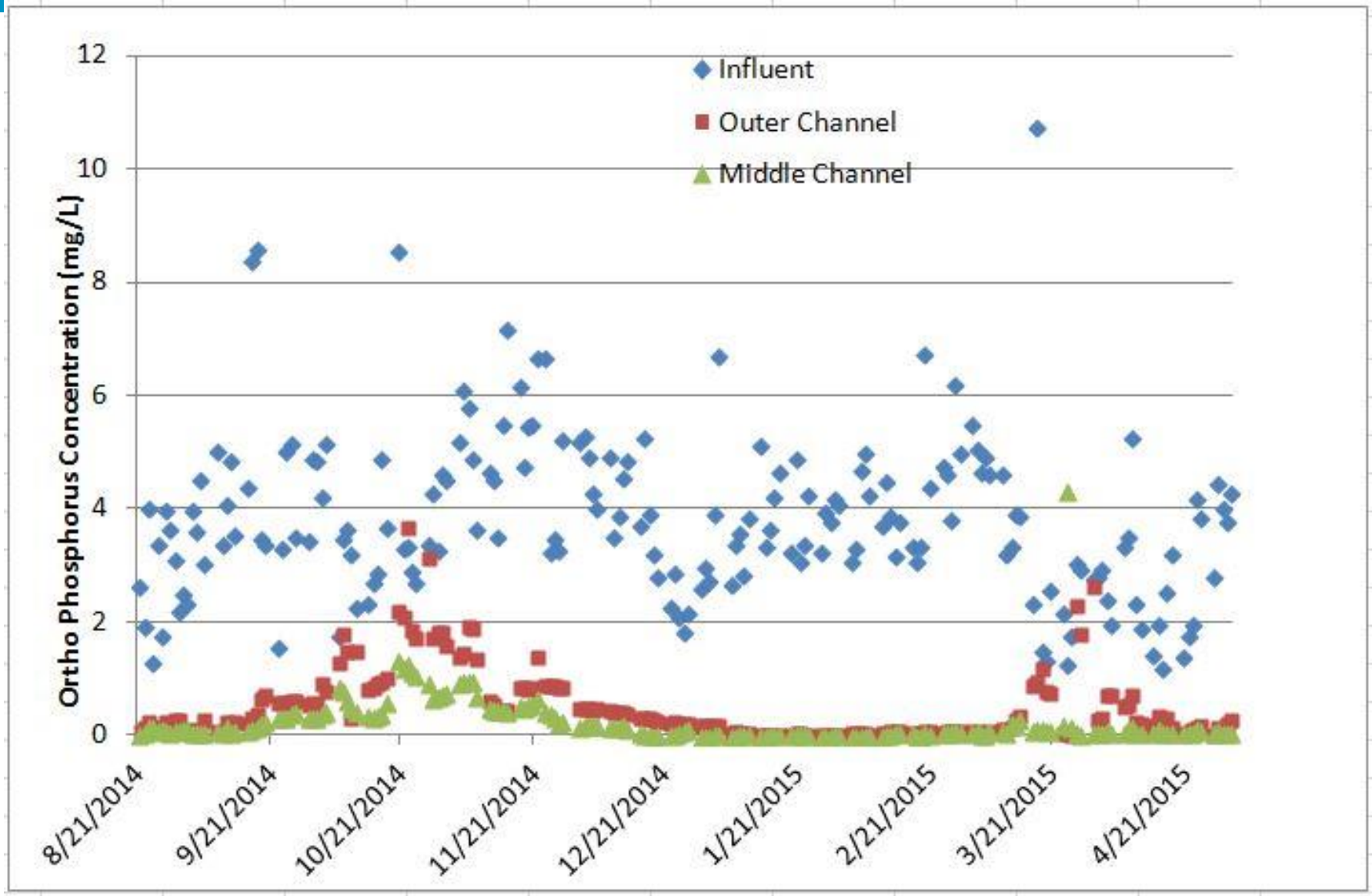
Optimization-Pilot Data



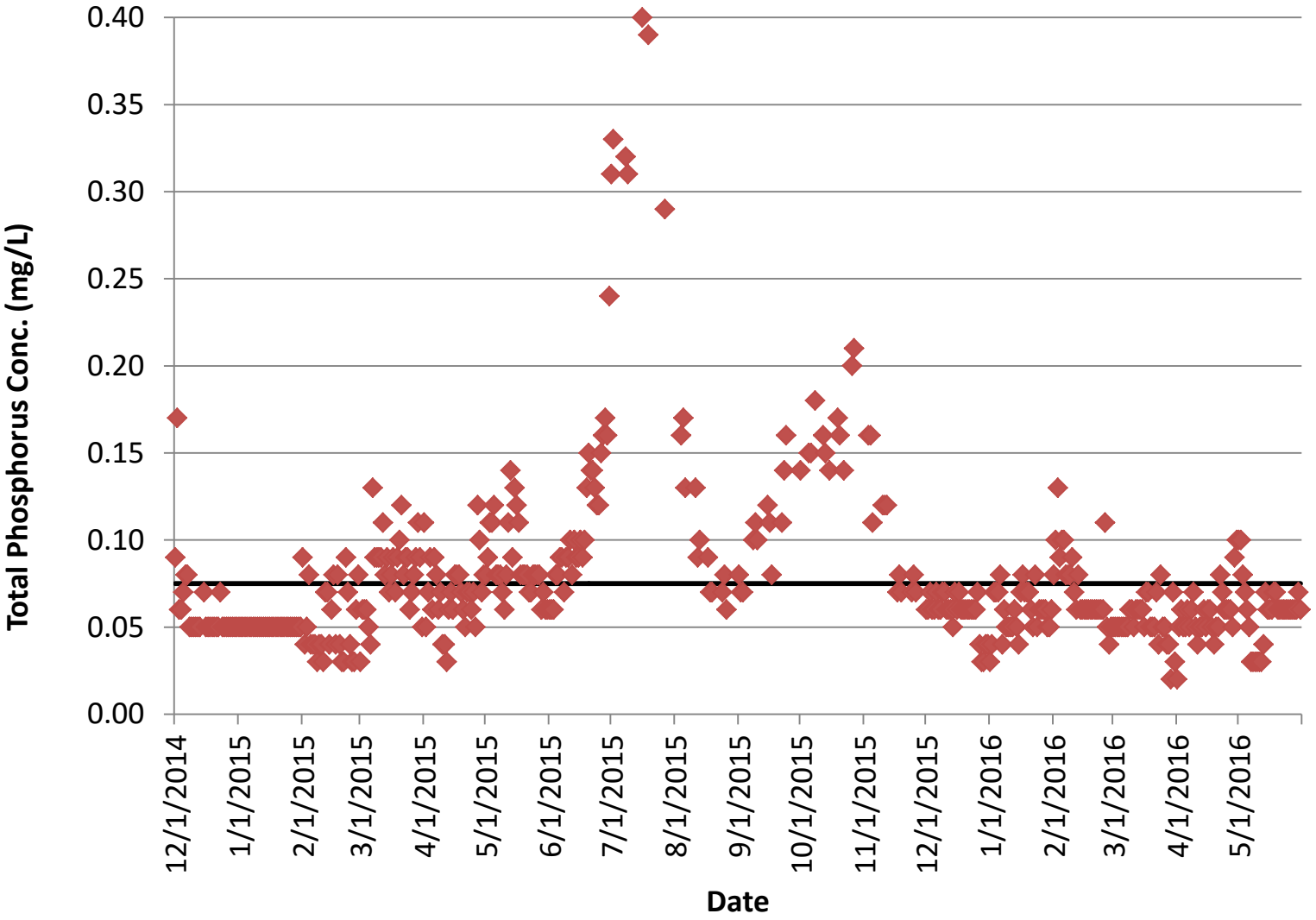
Optimization-Pilot Data



Optimization-Pilot Data



Optimization – DNR Data



Summary

- Plant demonstrated it can meet 0.075 mg/L consistently
  - Rare earth, Bio P
  - ORP variable
- Optimization takes time
  - Seasonal fluctuations

Summary

- Bio P and Rare Earth
  - No Add'l Upgrades
- Backup Bio P and Disc Filter
  - Membrane
  - Cloth
- Backup Bio P with WQT
  - 0.15 mg/L TP➔0.075 mg/L TP
- Expect New Permit 2017
  - 0.075 mg/L TP

QUESTIONS?

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