

October 10, 2019

Annual Meeting
WWOA

WWTP Effluent Phosphorus Filtration for Point-O-Seven-Five

Eric Lynne | Donohue & Associates, Inc.

Ben Brooks | City of Medford, WI



Presentation Outline

- Background
- Technology Selection
- Performance Guarantee Criteria
- Design Concepts
- Operational Concepts
- Conclusions

Background: WWTP Details

- Existing WWTP
 - 0.6 mgd average and 3.66 mgd firm capacity
 - Activated sludge WWTP
 - Influent fine screening
 - Grit removal
 - A/O Activated sludge with final clarifier(s)
 - Deep bed sand filtration
 - UV disinfection
 - DAF/Aerobic digestion/BFP
 - Permit limit = 0.075 mg/L TP (2024)
 - Studied options for compliance → selected filtration



Background: Existing Sand Filtration Issues



Background: Existing Sand Filtration Issues

- Needed a solution:
 - End of Useful Life (valves, blowers, sand, controls)
 - High Energy (air scour, backwash, effluent pumping)
 - High Backwash Recycle
 - Limited Control
 - Filter Flies
- Saw newly converted filters in Oconomowoc, WI in 2014
 - Facility plan recommended disc filters



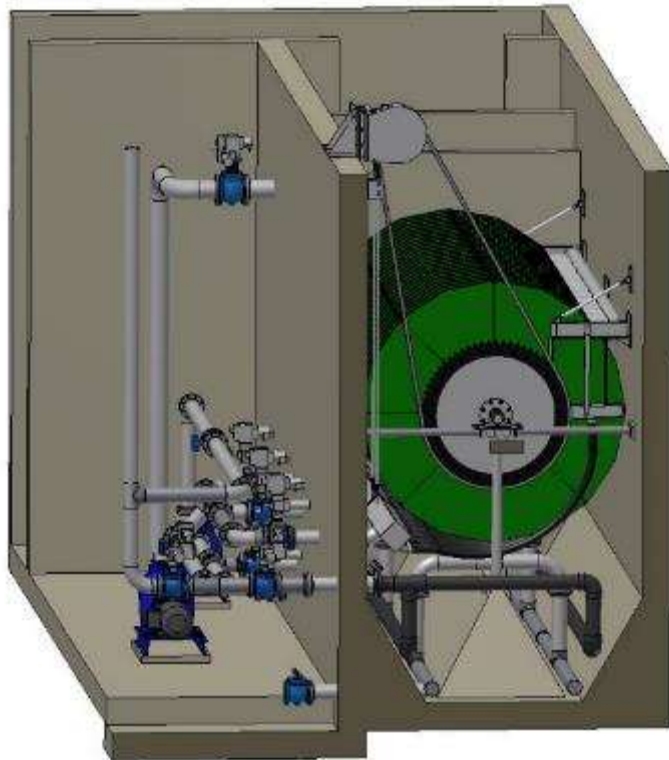
Technology Selection

Aqua vs. Kruger/Westech

- Experience with low TP
 - References / Tour / Pilot / Etc.
 - Single source responsibility
 - Guarantee
- Hydraulics
- Cost
- References
- Proprietary vs. Open



Selected Veolia (Kruger) | 6 |



Performance Guarantee Criteria

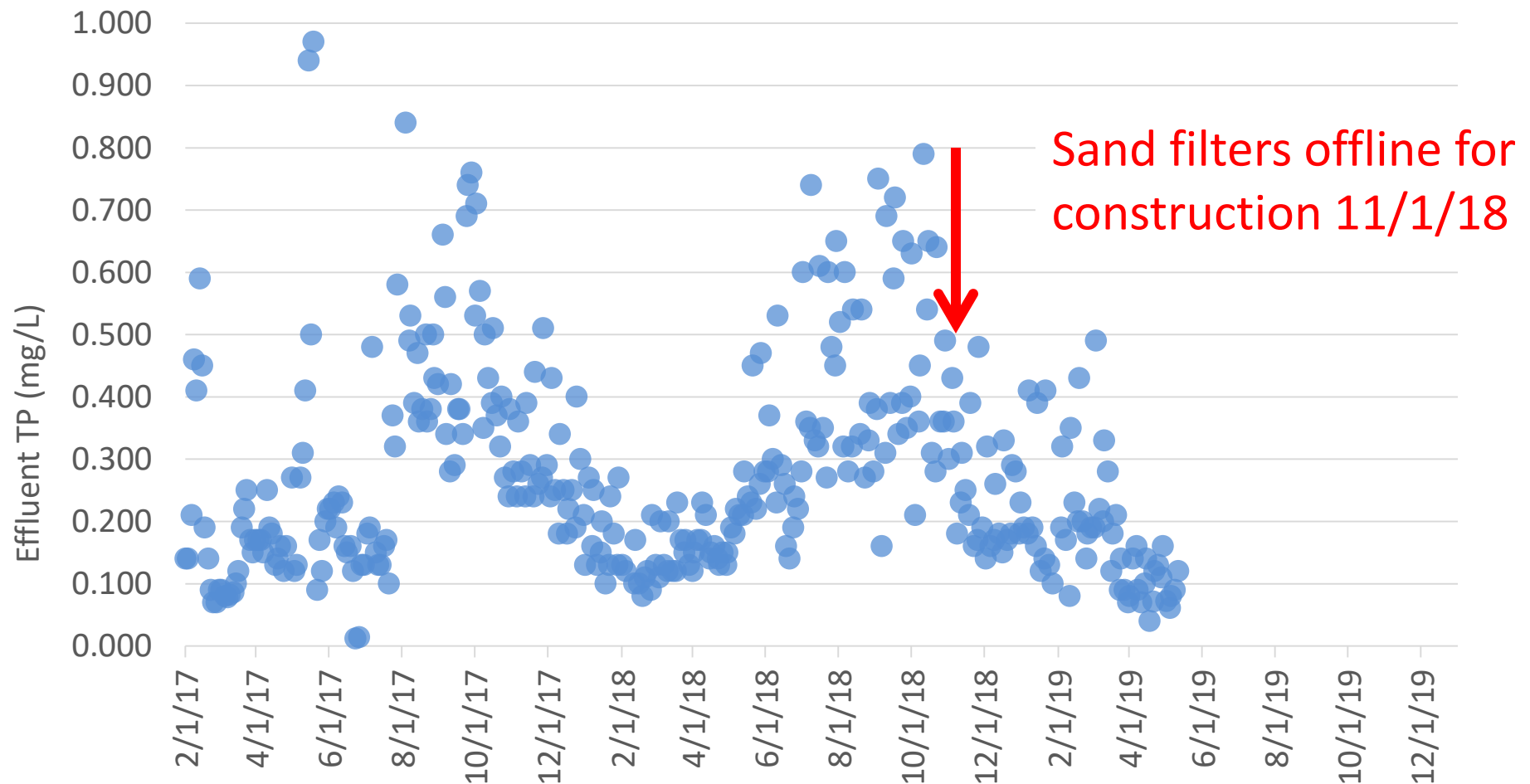
- The basics:
 - How long
 - In-House vs. Commercial Lab
 - mg/L and Flow goals
- The fine print:
 - Who does what: (runs the system, collects samples, pays for analysis)
 - Applied TP
 - sNRP limit
 - Dose limitations

A happy wife lab director, is a happy life.



Design Concepts – Operator Perspective

- Check TP upstream of old sand filters



Design Concepts – Operator Perspective

- **Flow Control / Flexibility for Maintenance**
- Access
- Coagulant Feed Systems
- Polymer Feed Systems
- W3 non-potable supply
- Expandability
- Redundancy in key equipment



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Design Concepts – Operator Perspective

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- Coagulant Feed Systems
- **Polymer Feed Systems (dry vs. emulsion)**
- W3 non-potable supply
- Expandability
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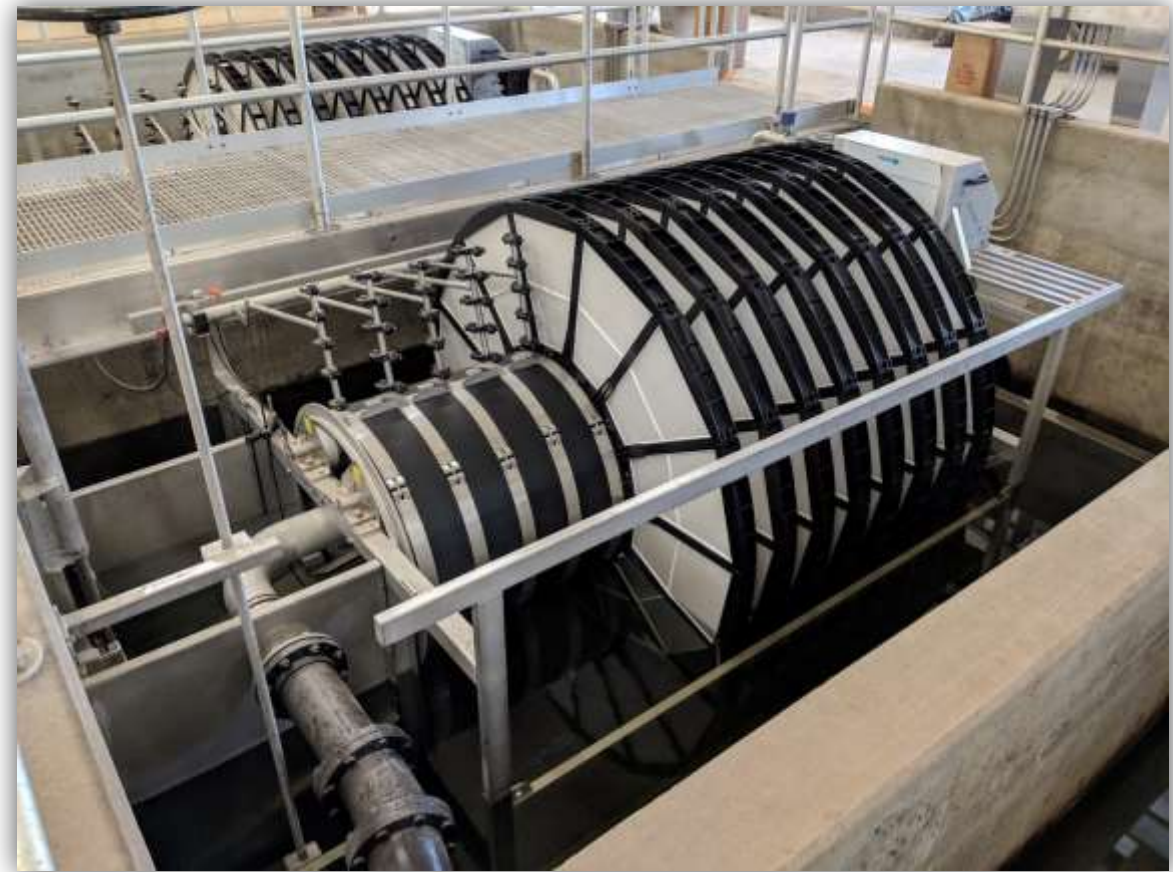
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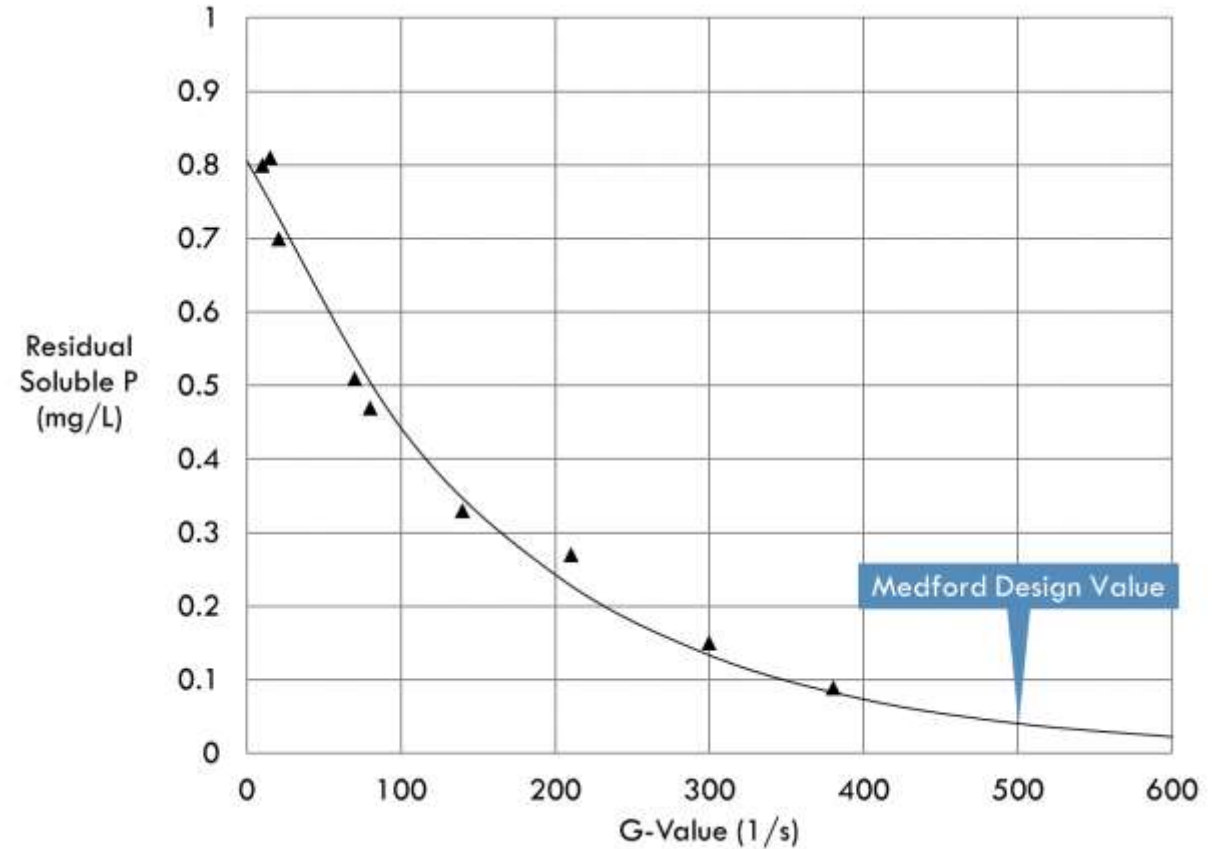
Design Concepts – Engineer Perspective

- Right Size
- Hydraulic Validation
- Rapid Mix G-Factor
- Coag/Floc Zone Dimensions
- Dose Control / Monitoring
- Enclosed vs Open Units



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- **Rapid Mix G-Factor**
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Takacs, et. al

Design Concepts – Engineer Perspective

- Right Size
- Hydraulic Validation
- Rapid Mix G-Factor
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- **Dose Control / Monitoring**
- Enclosed vs Open Units

LOGOUT ORTHO-PHOSPHATE MATRIX MENU

OP 0.045 Sample Interval 60 Seconds

	Ortho-Phosphate	Polymer Dose (mg/L)	Coagulant Dose (mg/L)
Less Than Setpoint #1		0.45	16.00
Setpoint #1	0.06	0.45	21.00
Setpoint #2	0.25	0.60	25.00
Setpoint #3	0.50	0.60	25.00
Setpoint #4	1.00	0.80	30.00

PUMPS Red Background In Active Range
Matrix Control Selected
Constant Dose Control Selected

Change Mode Change Mode

Design Concepts – Engineer Perspective

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- Hydraulic Validation
- Rapid Mix G-Factor
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- **Enclosed vs Open Units**



Startup and Optimization

- **Chemical Dosing (quantity)**
- Floc Control (quality)
- Monitoring (automatic vs. manual)
- Clarifier Upsets (high TSS)
- Bio-P Upsets (high TP)
- Noise

Basic Recipe for 0.075 mg/L TP

- Initial dose 20 mg/L Ferric, start high then back off checking residual orthoP
- Stable polymer dose (0.5 mg/L)
- Monitor floc development in Floc Tank / Filter Inf Well
- Polymer and Ferric need to be balanced or it will blind/backwash

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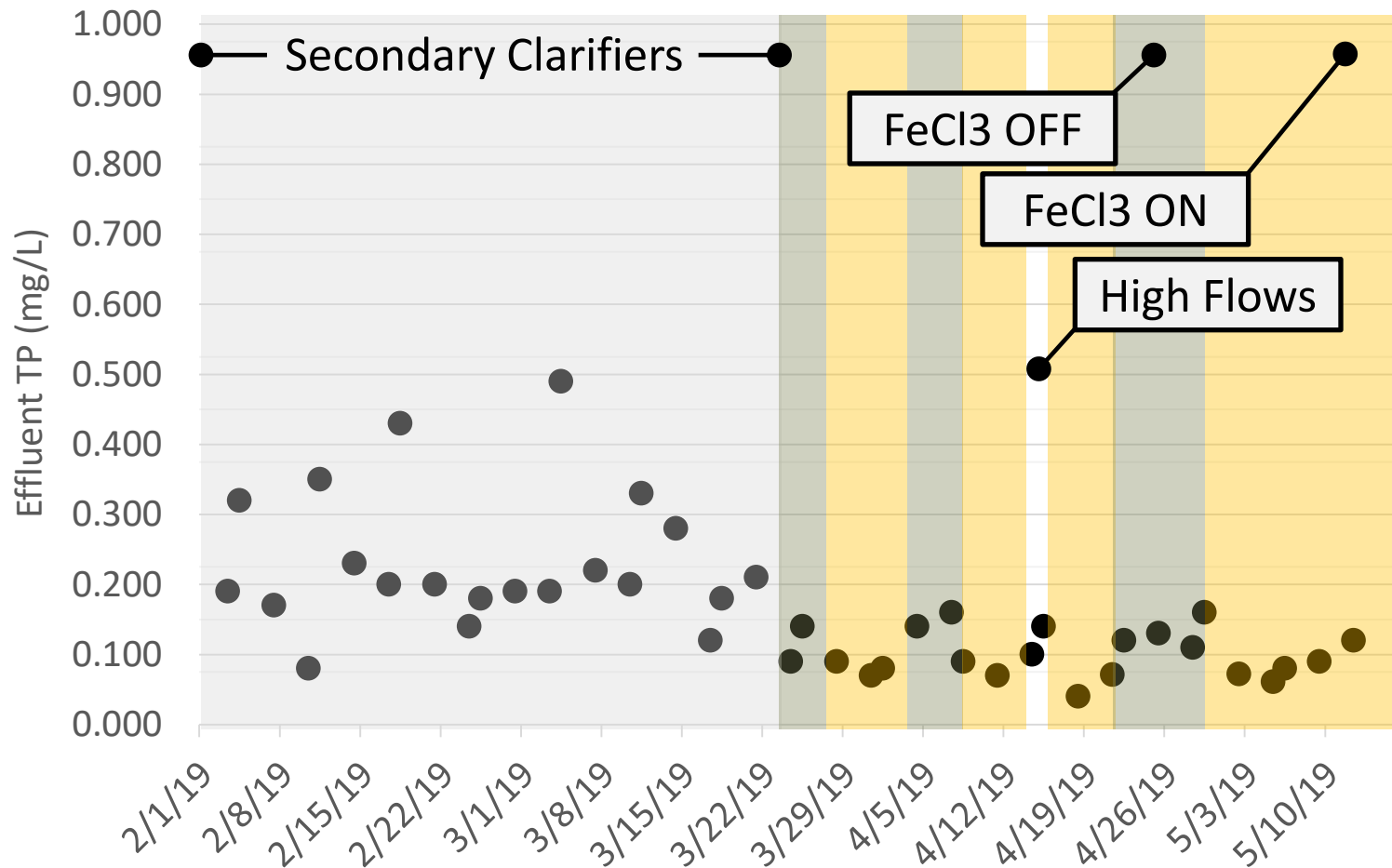
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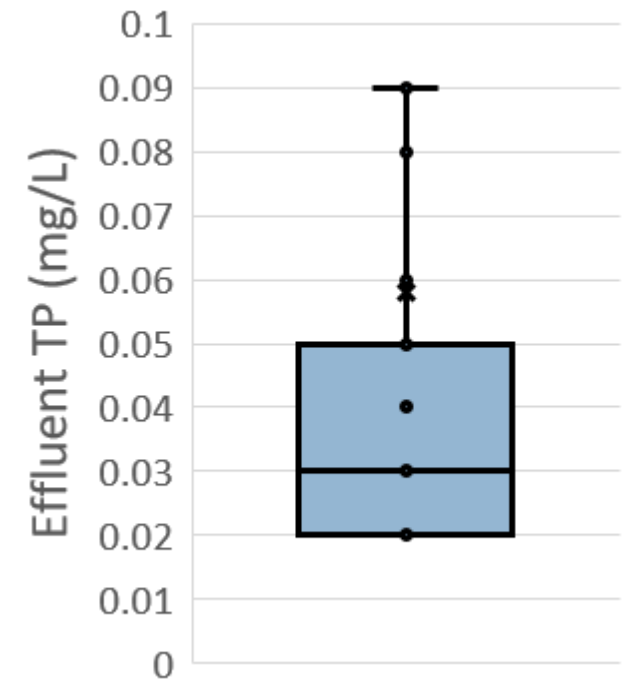
Operational Concepts – Effluent Data

- Medford Startup Data



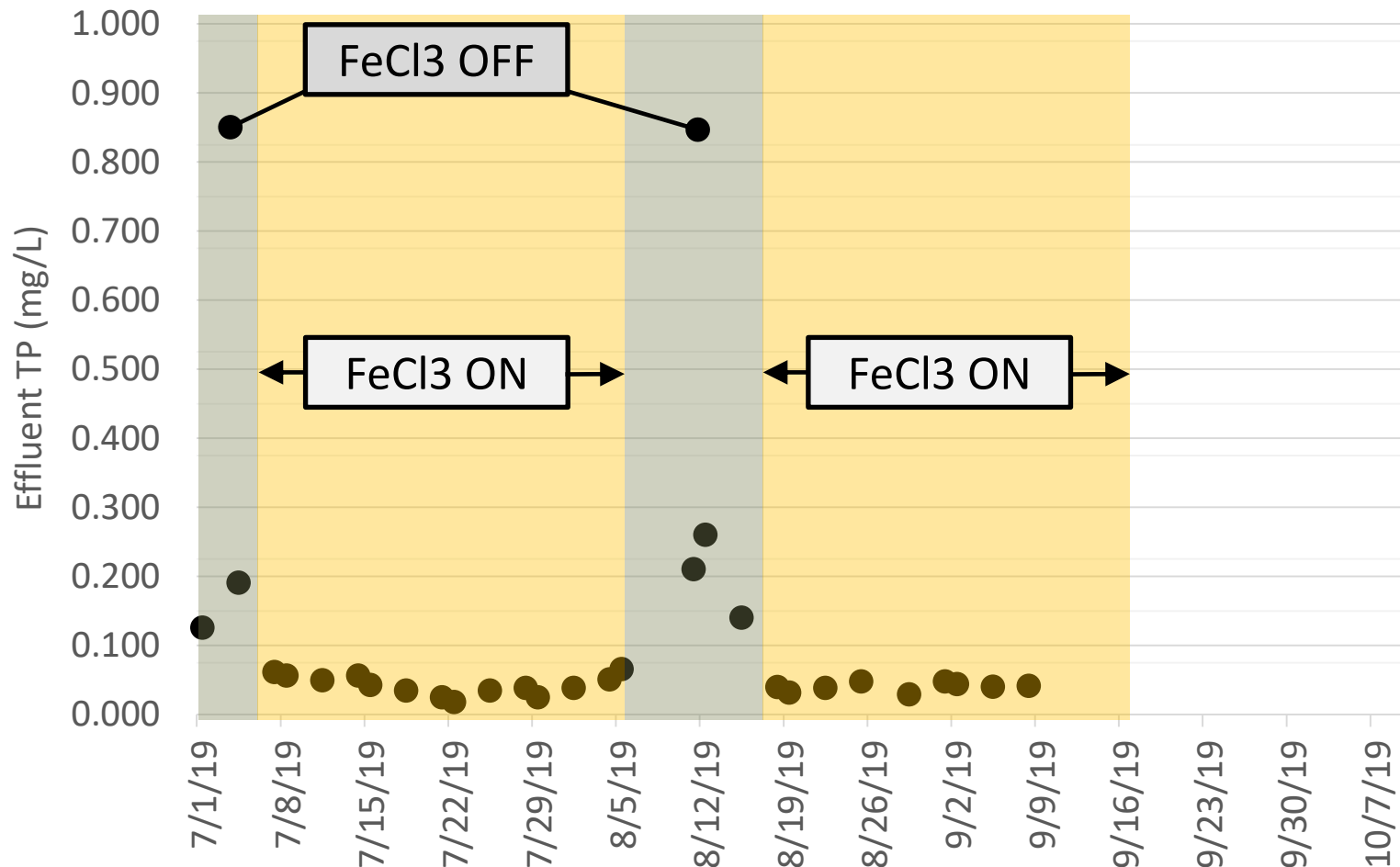
2017 Effluent Data from N. Attleboro, MA Disc Filter

- 0.1 mg/L limit
- 11-15 mg/L FeCl₃ dose
- 0.15 mg/L Polymer dose



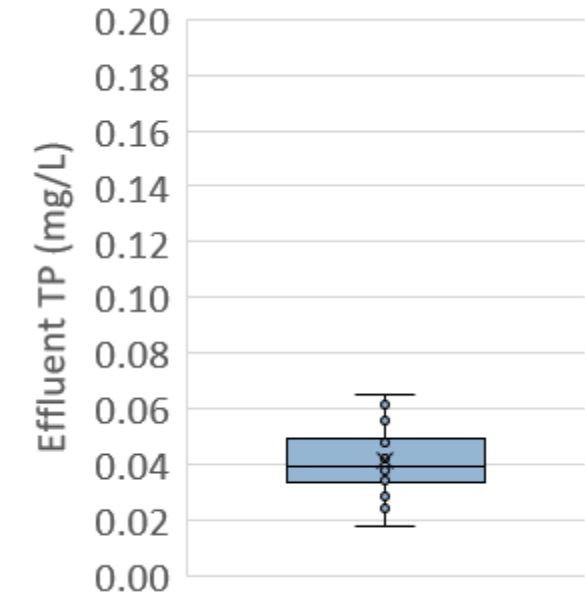
Operational Concepts – Effluent Data

• Medford Startup Data



Operational Statistics

- 0.075 mg/L TP limit
- 19 mg/L FeCl3 dose (23:1 molar ratio)
- 0.5 mg/L Polymer dose
- 0.041 mg/L TP actual 7/7/19-9/8/19



Conclusions

- Still proving itself
- Extensive startup/lab effort
- Not so simple after all
 - Great steady state
 - Attention during Peak Flows/Upsets
- Looking forward to more good effluent
- BFP cake improved

Conclusions (continued)

- Backwash Flow Surges
- Flow vs. Loading Rate
- Analyzer LOD
- Ramifications of Ferric Overdose

Words to live by:

**“I will reserve all comments until startup is complete.”
- John Fales**

Before





Questions and Comments

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Veolia/Kruger Manufacturer Representation:



PETERSON AND MATZ, INC.