

Making the Most of Online Instrumentation to Improve Process Performance & Reduce Costs at the Westfield, MA WRF



Jeff Gamelli, Deputy Superintendent
1/27/2020

Website: cityofwestfield.org

Administration & Permits

Land & Natural Resources ▶

Parks & Recreation ▶

Refuse & Recycling

Stormwater

Wastewater

Water ▶

Home › Departments › Public Works › Wastewater

Wastewater

Water Recovery

- [A Virtual Tour](#)

Understanding Wastewater

- [Understanding Wastewater](#)
- [Spanish Wastewater](#)
- [Russian Wastewater](#)
- [Nepalese Wastewater](#)

Sanitary Sewer Use Rates

Residential

A total of \$341.00 per unit per year (\$85.25 per quarter)

Senior Residential

A total of \$94.30 per year for those permanent Westfield residents 65 years of age or older who own and occupy the unit for which the senior residential rate is claimed.

Commercial-Industrial

Based on metered water usage, \$4.95 per 1,000 gallons subject to a minimum quarterly charge of \$85.25.



Wastewater Division Photo

- *Front Row (Left to right):* Bob Forry, Jim Lewis, Jon Roushia, Ken Gagnon
- *Second Row (Left to right):* Mitch Therrien, Jeff Thayer, Jeff Gamelli
- *Third Row (Left to right):* Don Hawley, Bob Pluta
- *Top:* Chris Hall

Virtual Plant Tour

Home > Departments > Public Works > Water Recovery - A Virtual Tour

Water Recovery - A Virtual Tour

The Wastewater Division of the Westfield Public Works is going through a transformation. With the accomplishment of having reached 100,000 work orders in their work maintenance system, they have upped their game by creating a guided video tour of the Water Recovery Facility and process.

This division of the Public Works department works to protect water quality and prevent pollution by providing wastewater treatment for the City's more than 5,000 wastewater customers. This division operates the city's six million gallon per day wastewater facility as well as 17 booster pumping facilities.

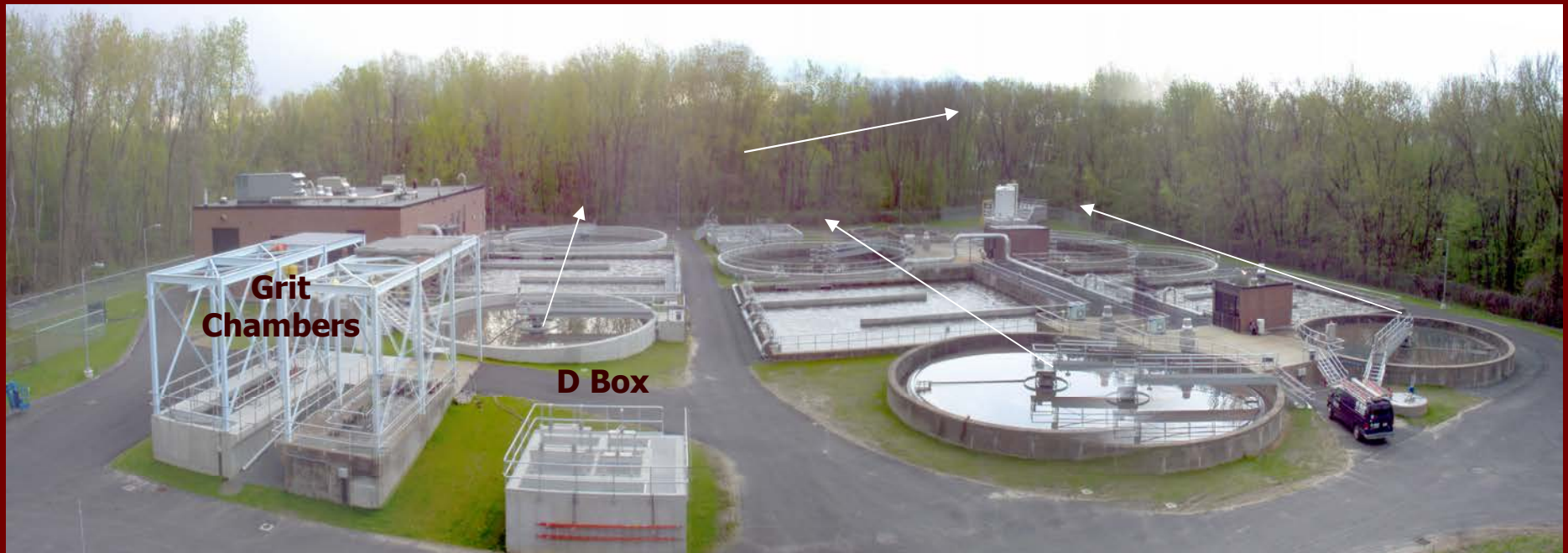
Deputy Superintendent Jeff Gamelli has created a 4 part video series that takes viewers on a walking tour of the Westfield Watery Recovery Center. The first video is more of a slide show, with descriptions printed on the slides. The remaining three are fully narrated and edited to give a 'like being there' experience. Thank you to Jeff Gamelli, Chief Operator Ken Gagnon and the other employees in the Wastewater Division for their contributions.



1. Slide Show: <https://www.youtube.com/watch?v=MGEot4P5zSI>
2. Virtual Tour part 1: <https://www.youtube.com/watch?v=Mmr1w1gL5lg>
3. Virtual Tour part 2: <https://www.youtube.com/watch?v=3TceB94TLml>
4. Virtual Tour part 3: <https://www.youtube.com/watch?v=0xLij9Od1zo>

Treatment Plant Overview

- 6.1 MGD Design, 3.0 MGD Average Flow, \$6,000,000 O&M Budget
- BOD & TSS Limits = 20 mg/L summer, 30 mg/L winter
- Ammonia Limit = 3 mg/L summer, Total Summer Average 2019 = 1.13 mg/L
- Total Phosphorous Limit = 0.46 mg/L summer, 1.0 mg/L winter
- Total Annual Average Effluent Phosphorous= 0.43 mg/L 2019
- Total Annual Average Effluent Nitrogen= 9.9 mg/L 2019
- 3 Treatment Trains, AO process & LE Process Combo, Diffused Aeration
- 18 Sewage Lift Stations, 122 Miles of Gravity Sewer Collection



Bird's Eye View of Facility



Online Instrumentation Monitoring Biological Treatment Process



Effluent Phosphorous Analyzer

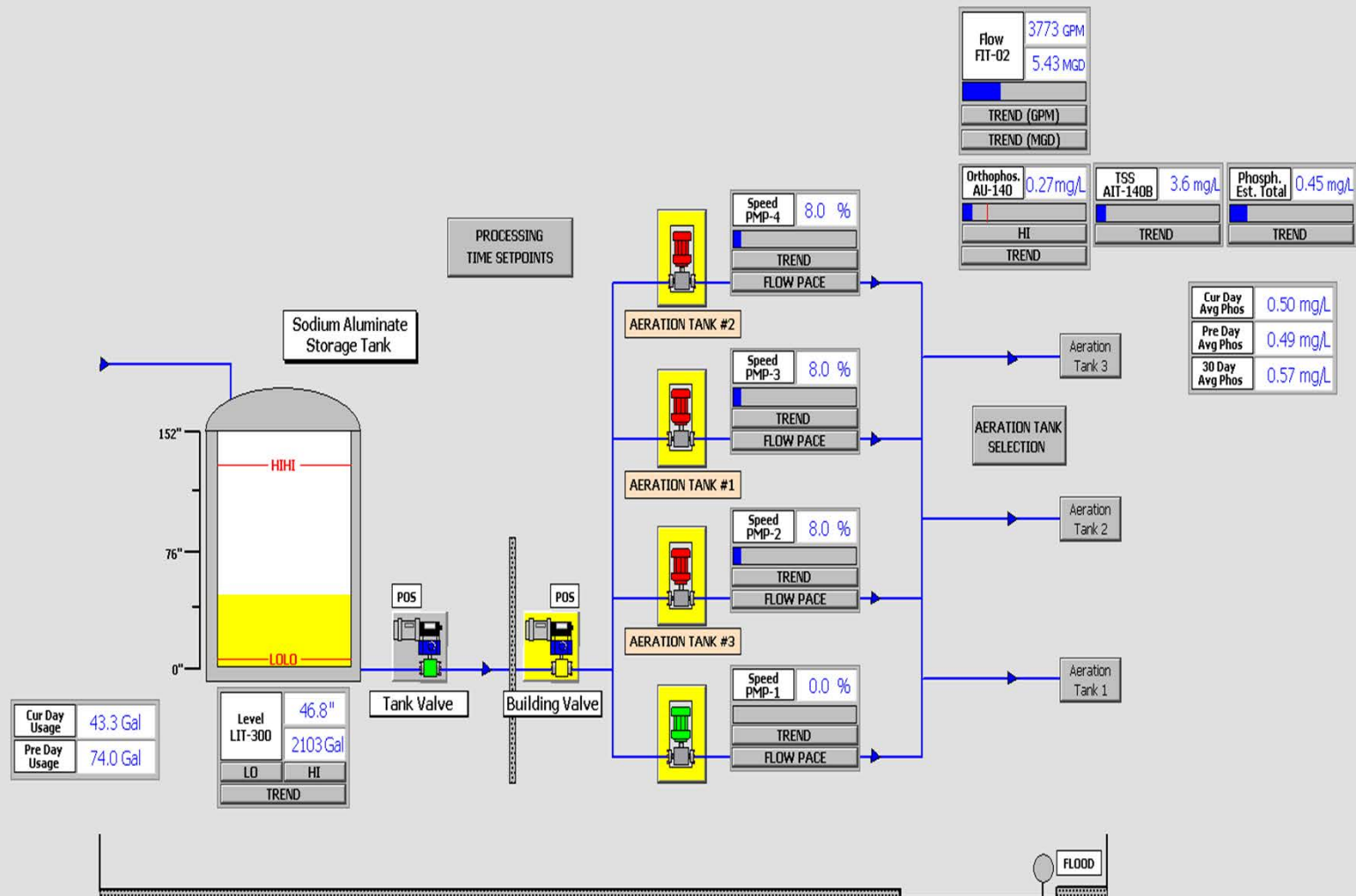
- Installed equipment inside basement gallery (can be outside)
- Installed 70 ft of 2" PVC piping to deliver sample to analyzer
- Recycled a 250 gallon polymer tote to act as the reservoir
- Hach Phosphax Analyzer & TSS probe to estimate Total-P



Effluent Phosphorous Analyzer Video



Total P = Ortho-P + TSS (0.05)



Auto Adjustment Set Points

pop_FCLP_Process_Sp - /Westfield WWTF//Area_WWTF

SODIUM ALUMINATE PROCESSING SETPOINTS

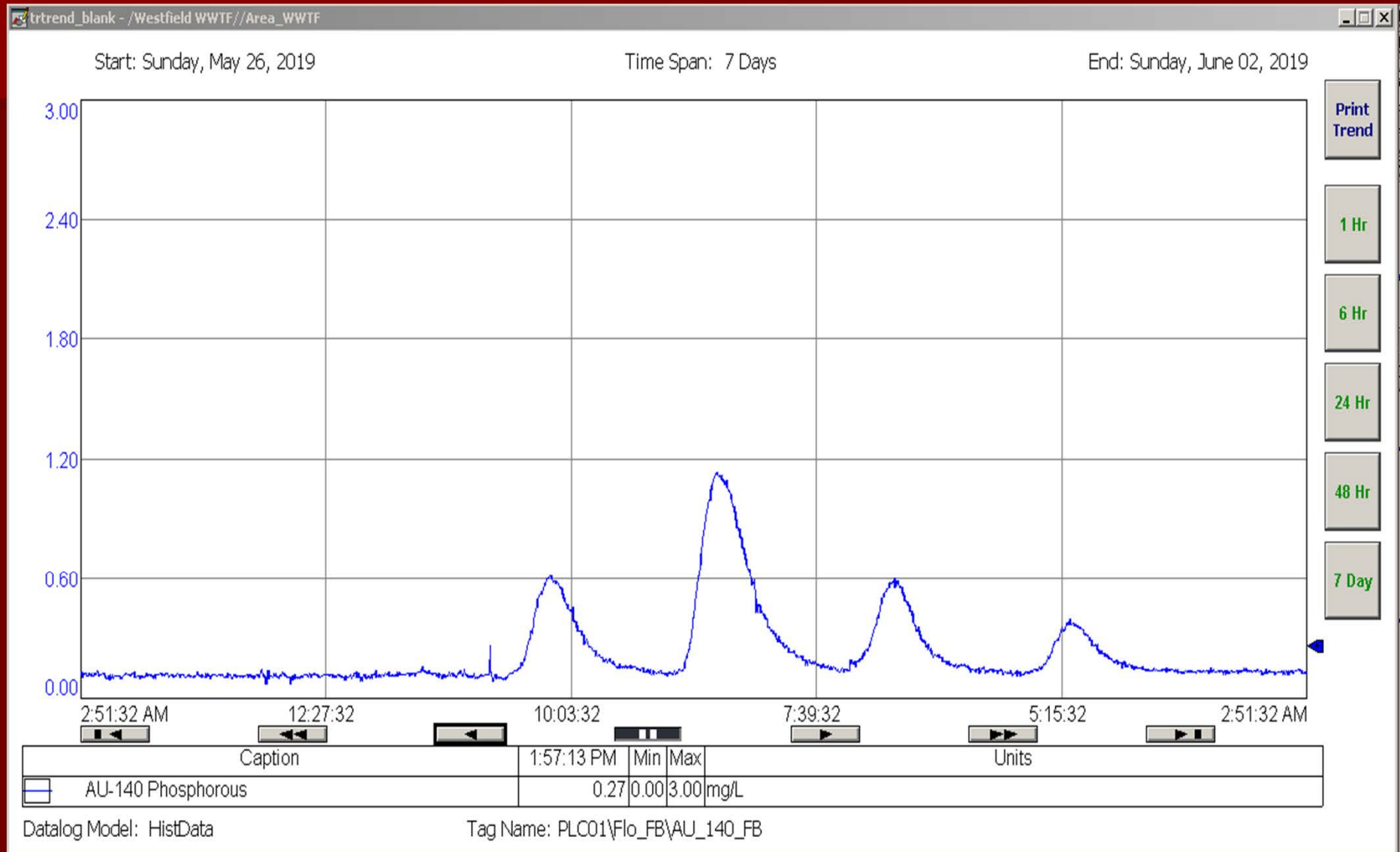
Enable Processing:

	Monday	Tuesday	Wednesday	Thursday	Friday
Process On SP:	0 :00	19 :00	0 :00	0 :00	0 :00
Process Off SP:	5 :00	24 :00	5 :00	0 :00	0 :00
Process Ratio:	1.50	1.50	1.50	1.00	1.00

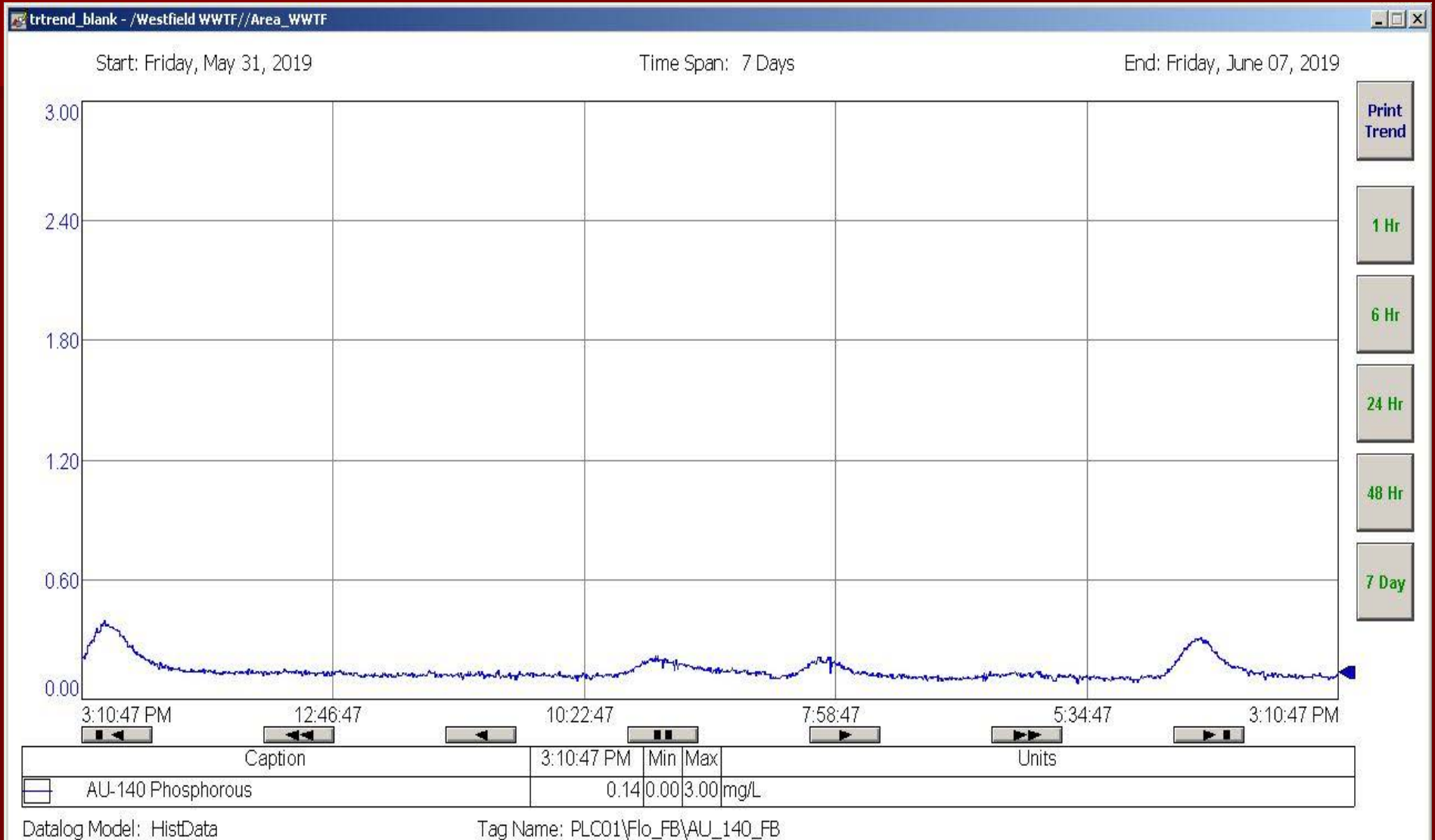
Enable Weekend Processing:

	Saturday	Sunday
Process On SP:	0 :00	19 :00
Process Off SP:	0 :00	24 :00
Process Ratio:	1.00	1.50

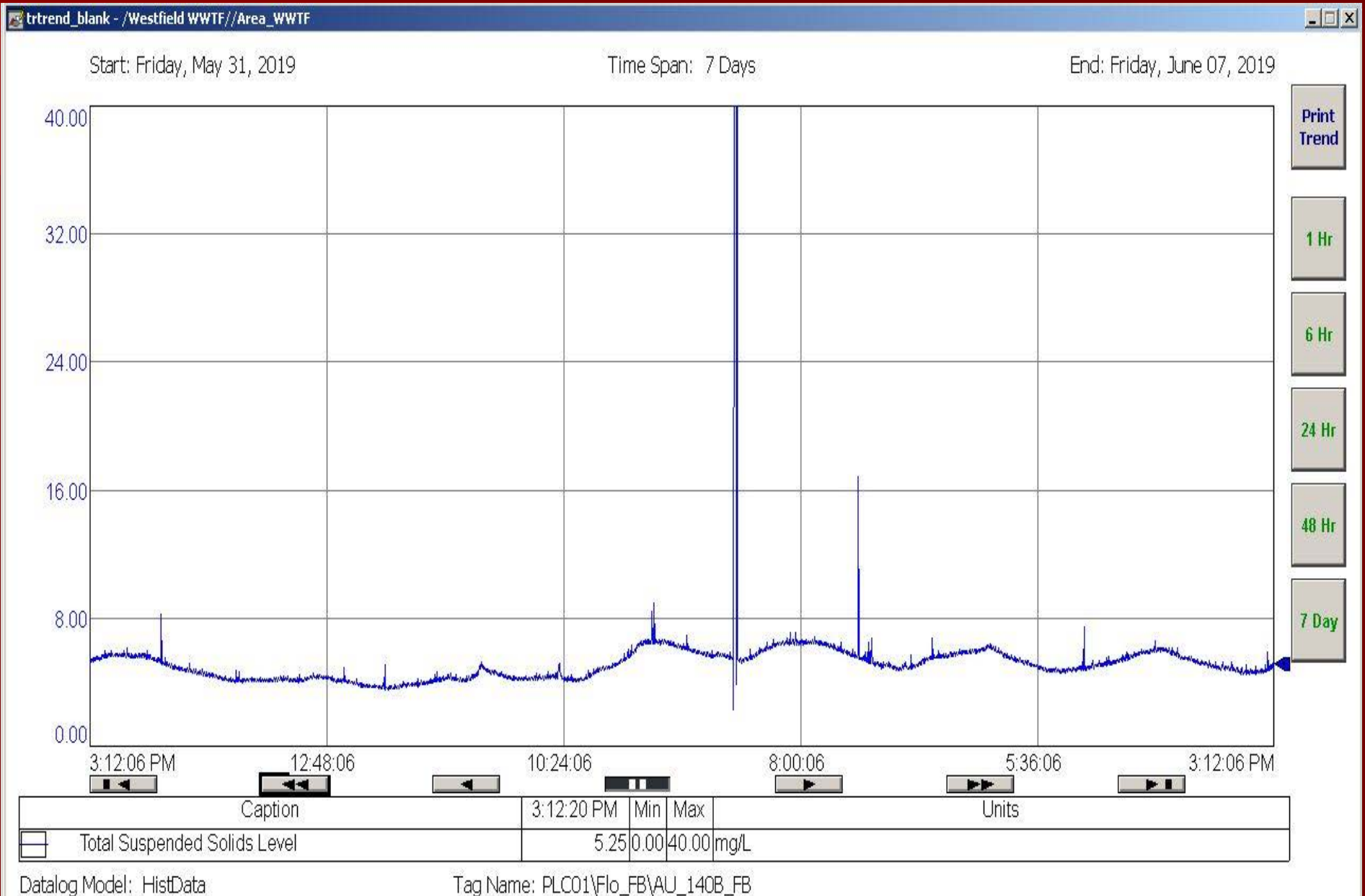
7 Day Effluent Soluble PO4-P Trend Before Auto Adjustment



7 Day Effluent Soluble PO4-P Trend After Auto Adjustment



7 Day Effluent TSS Trend



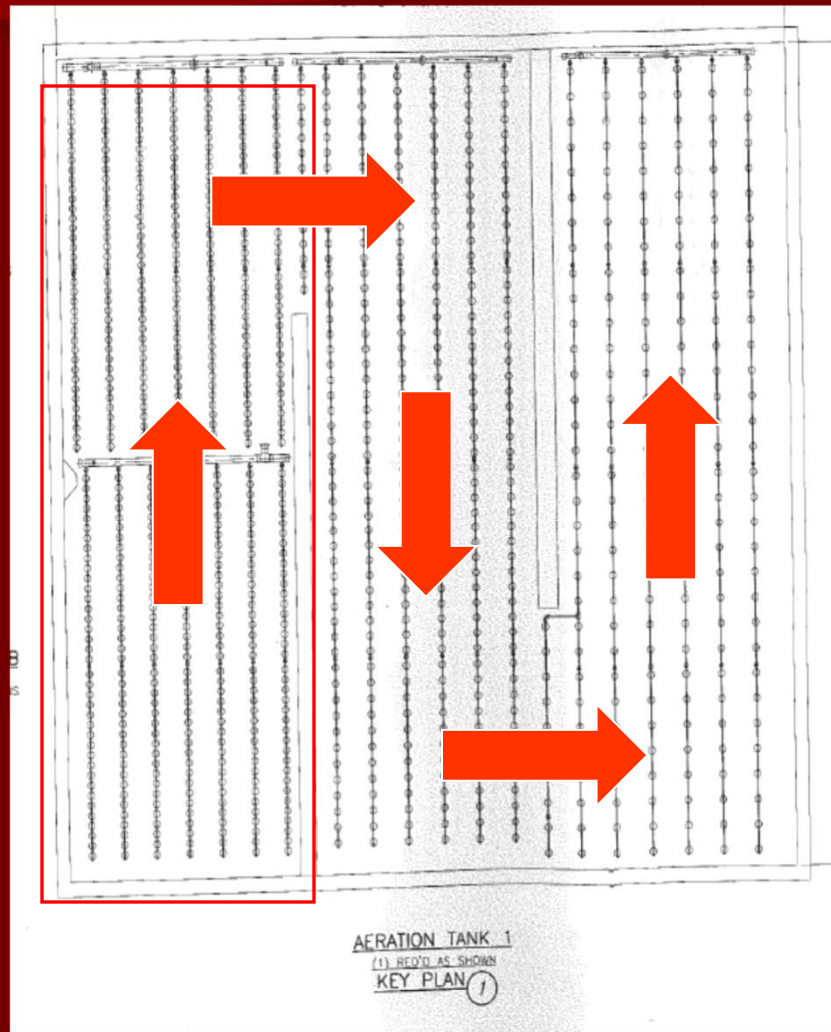
Anoxic/Anaerobic zones for BNR

- Air off zone had no mixing, causing short circuiting
- Too much DO coming back into zone, starting checking ORP
- No effective means of mixing RAS, Primary Effluent, Sodium Hydroxide, and Sodium Aluminate

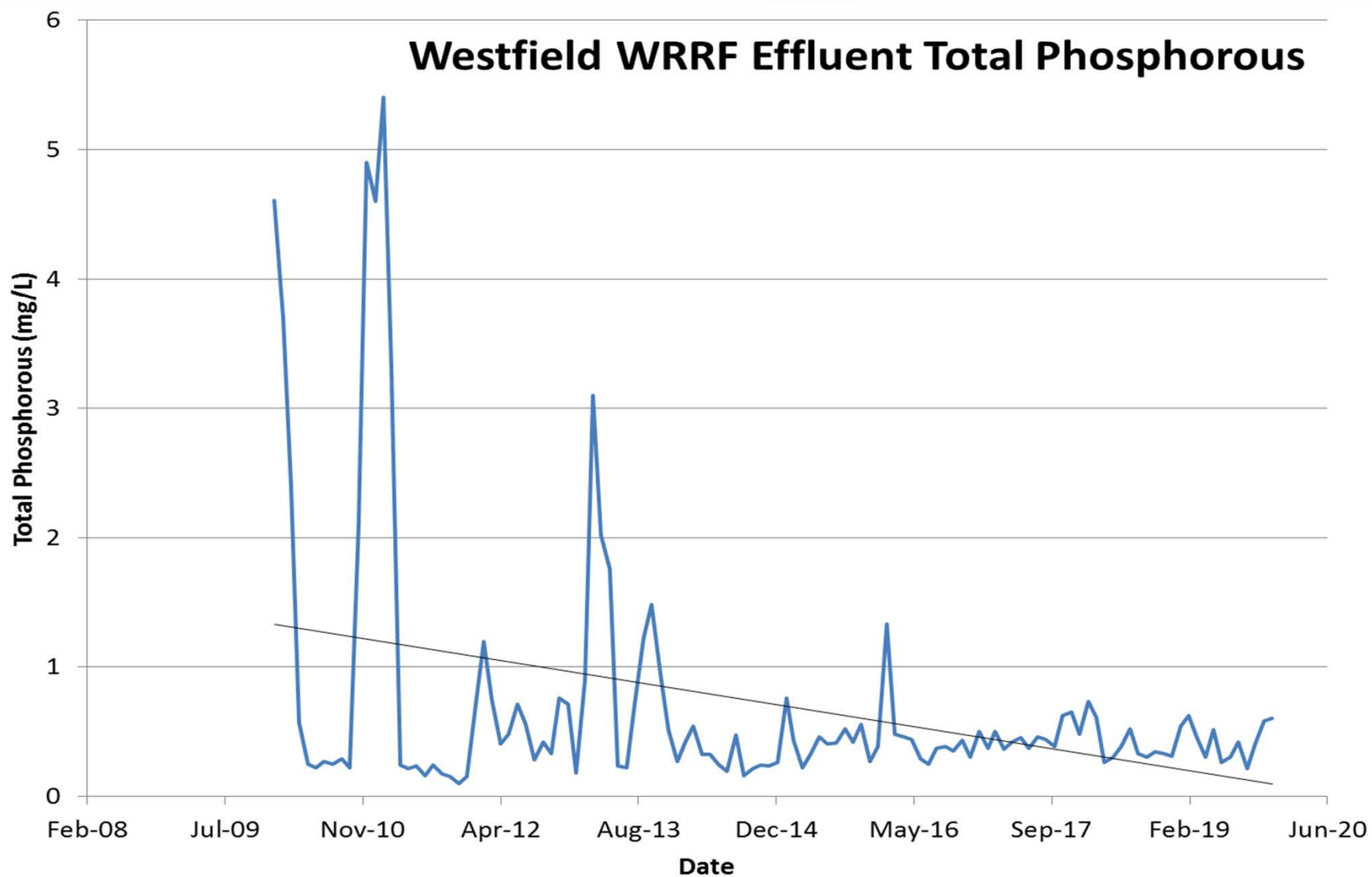


Implement Coarse Bubble Mixing

- Utilized existing equipment and air to implement mixing and save thousands \$\$\$
- Plugged ten diffusers in a row with stainless screws, skipped one, then continued the pattern
- Cut the "skipped" membrane diffuser in the center with an X

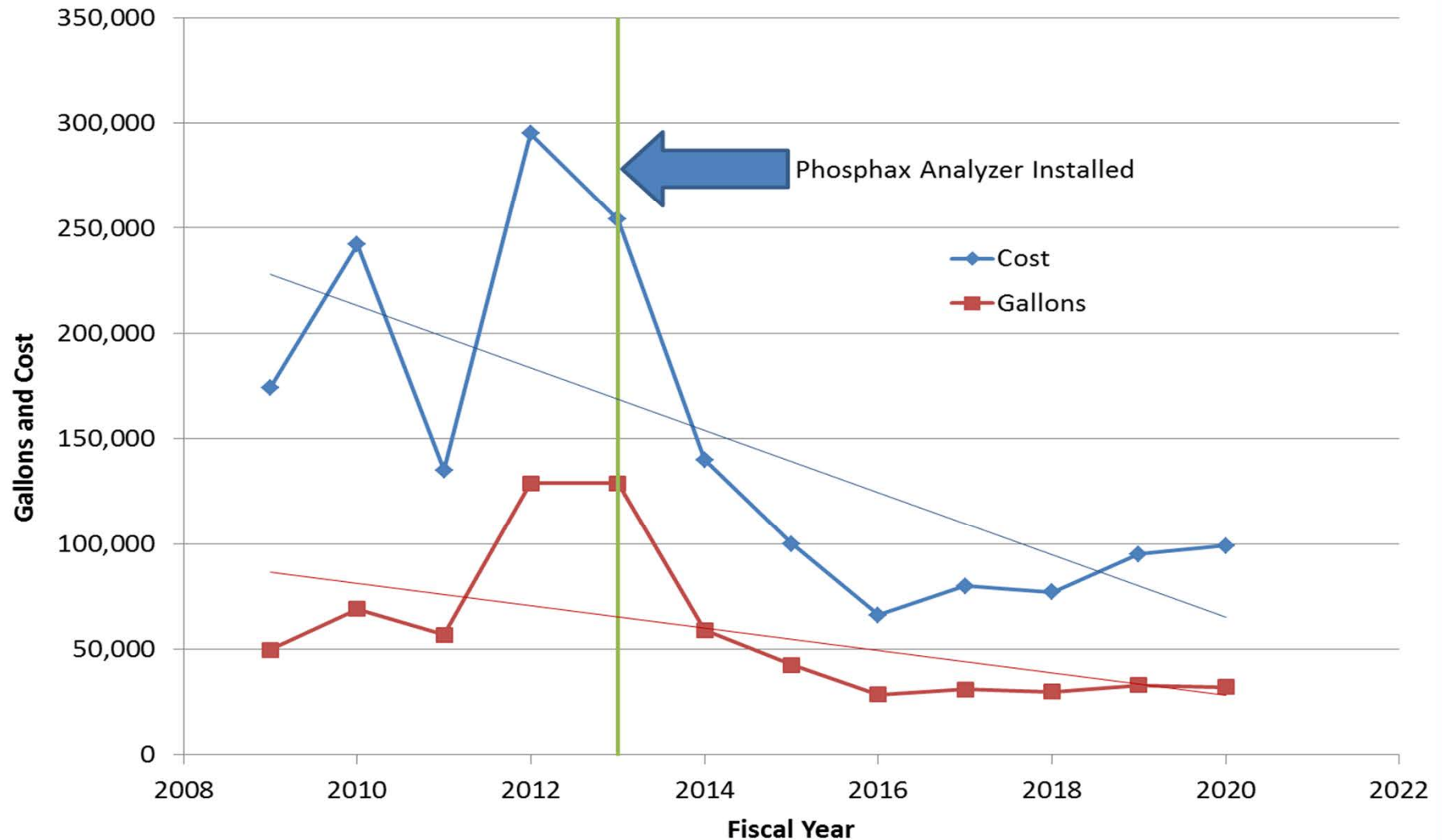


Total Effluent Phosphorous Trend



Chemical Phosphorous Removal

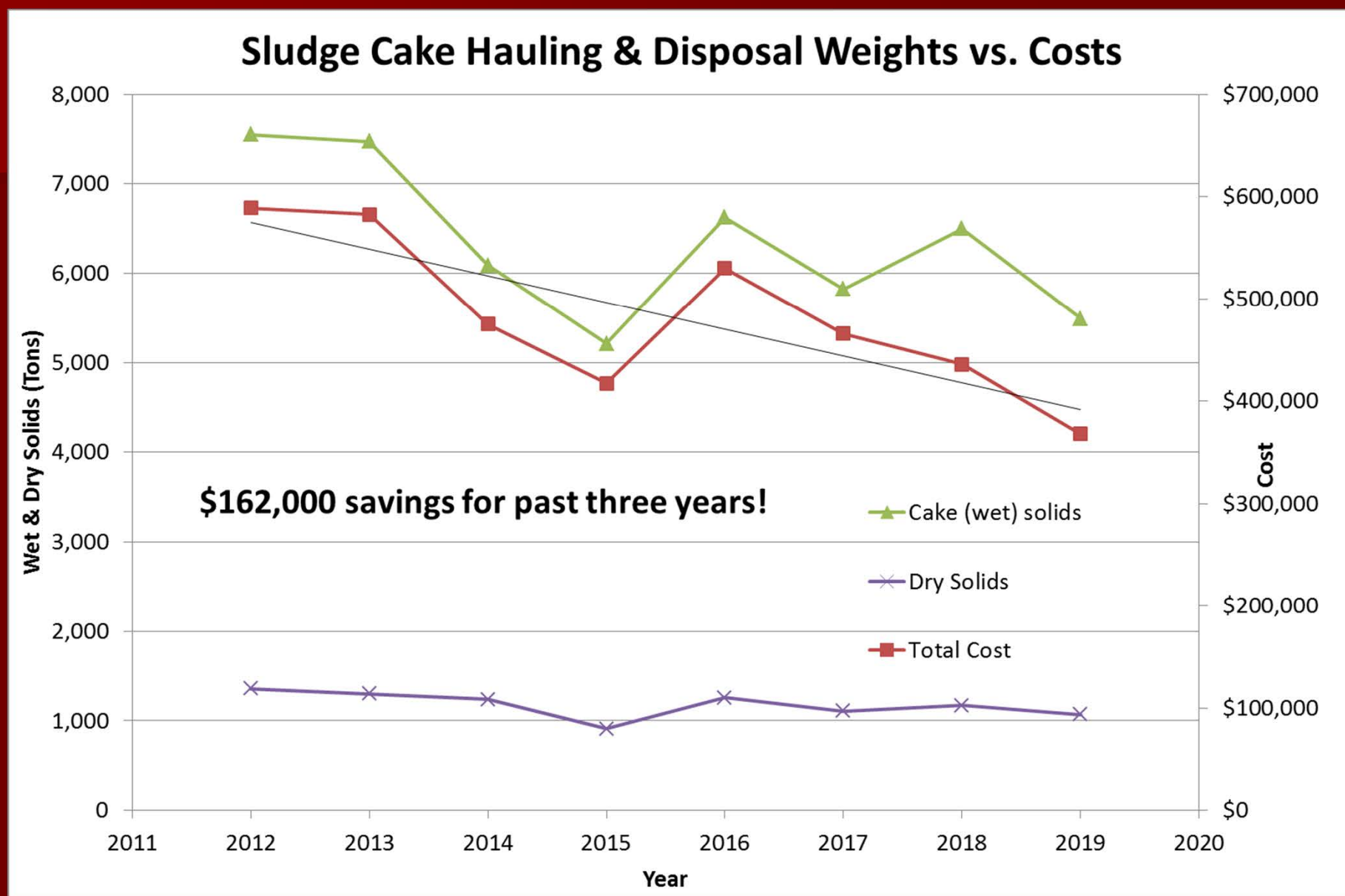
**Westfield WRRF Annual Phosphorous Removal
Chemical Cost vs. Volume**



Phosphax Analyzer Payback

- Capital Equipment Cost = \$21,000
- SCADA Integration Cost = \$5,000
- Annual Maintenance Cost = \$2,257
- Annual Chemical Savings = \$150,000
- Payback = 2.2 Months

Chemical Reduction helps Sludge Reduction



Ammonia Based Aeration Control "ABAC"

- Utilize real-time data from Hach ISE Ammonium probe to optimize D.O. in aeration tanks
- Meet same standards with less energy & chemicals
- D.O. reduced from 2 mg/L to 1 mg/L during pilot test
- 20% reduction in Caustic = \$10,000/year saved
- 13% reduction in aeration energy = \$6,000/year saved
- Ammonia set point "trims" D.O. set point
- Ammonia trending up = raises D.O. set point
- Low Ammonia = minimum D.O. set point

Ammonium Probe Monitoring $\text{NH}_4\text{-N}$ in Bio Reactor



Ammonium Probe Payback

- Capital Equipment Cost = \$10,000
- SCADA Integration & Pilot Testing Cost = \$75,000
- Annual Maintenance Cost = \$3,500
- Annual Energy & Chemical Savings = \$16,000
- Payback = 6.8 years

Questions?

