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2018 NEWEA Annual Conference

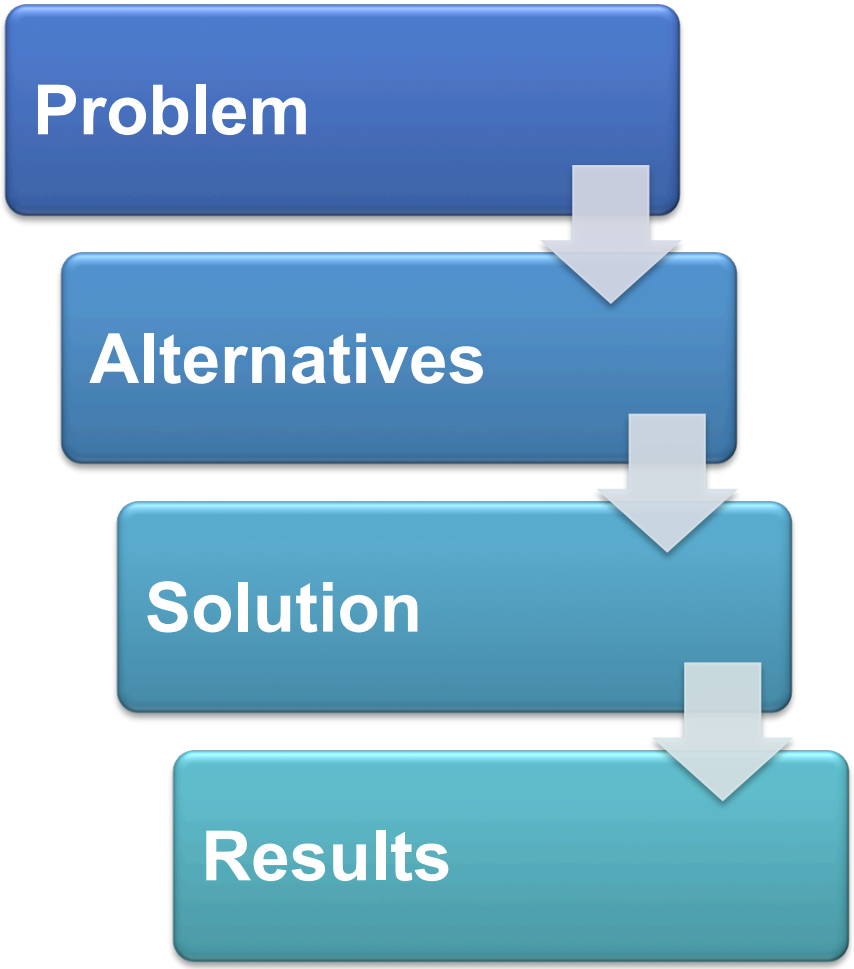
Improving Nutrient Removal of Existing Wastewater Facilities Using Cyclical Aeration and Chemical Addition

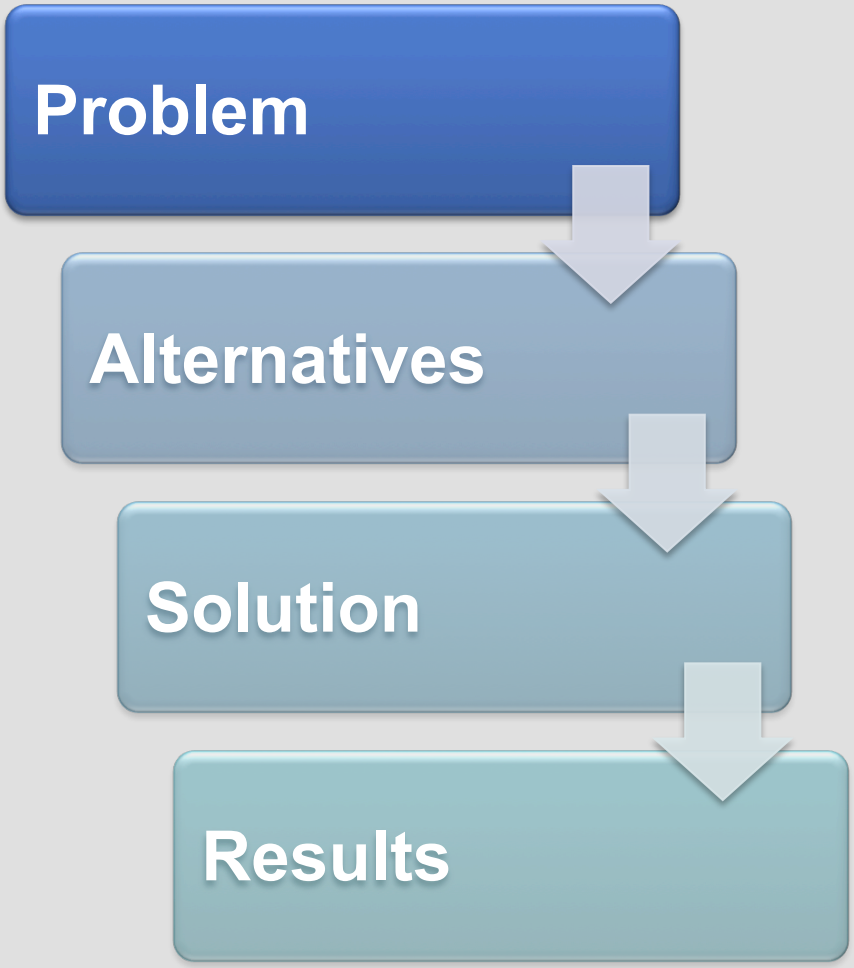
Presented by:

Rachel Schnabel and Stephanie Baldino

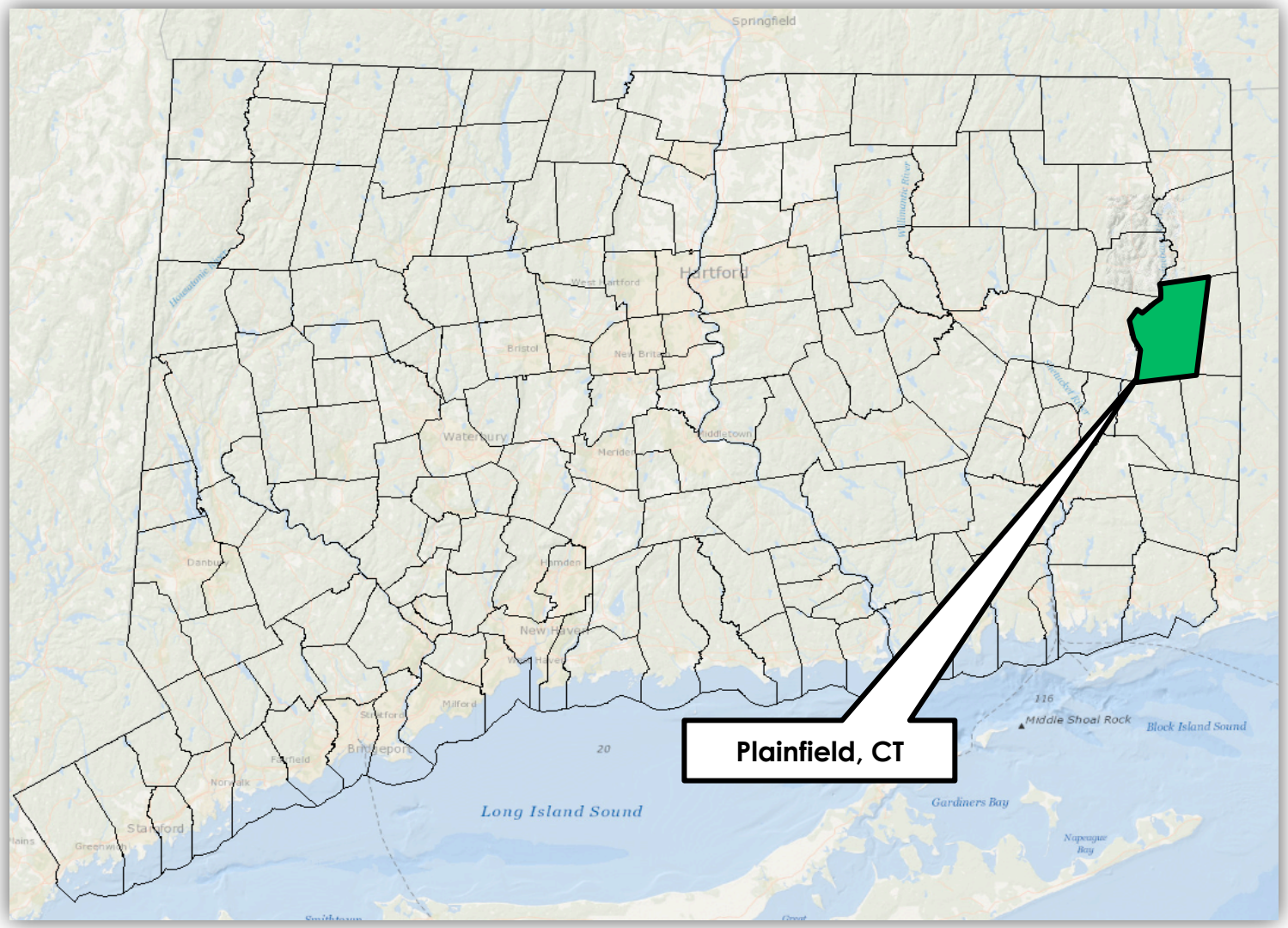
January 23, 2018

Presentation Outline




Problem
Alternatives
Solution
Results

Connecticut



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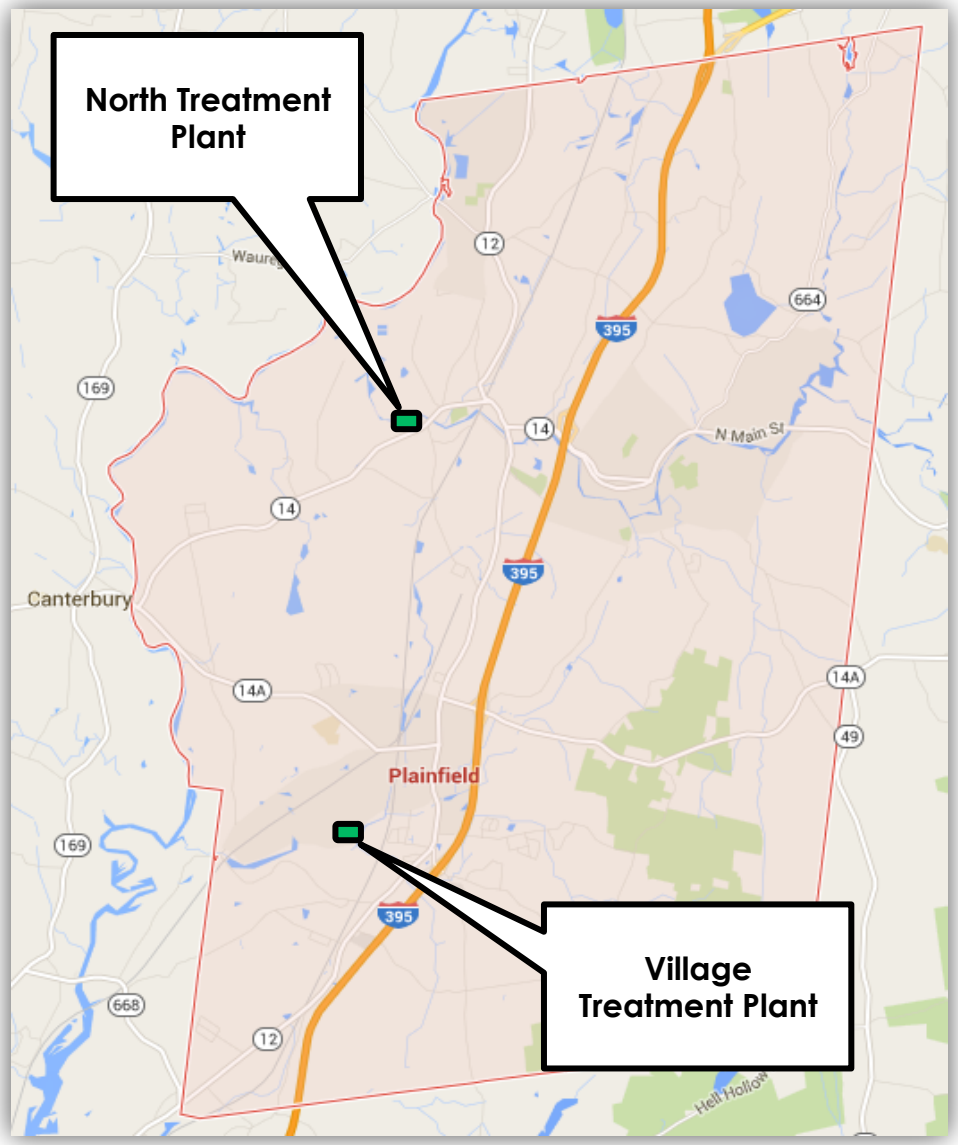
Town of Plainfield

- **Area: 43 Square Miles**
- **Population: 15,400**
- **Villages:**
  - **Plainfield**
  - **Moosup**
  - **Wauregan**
  - **Central Village**



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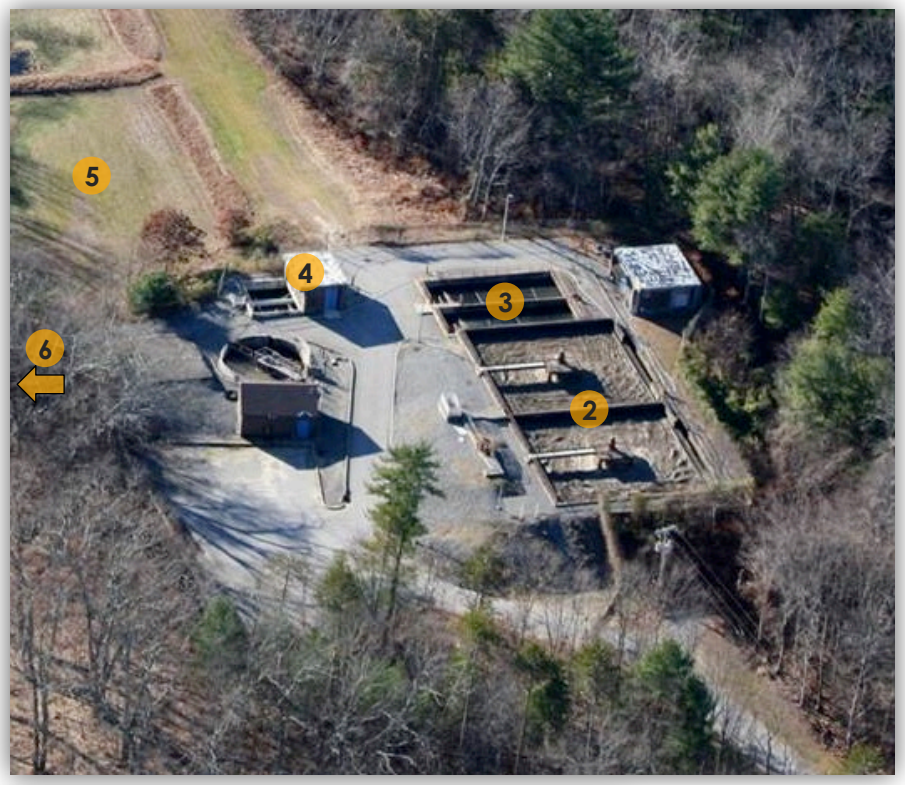
Village Plant

Village Plant



1. Headworks
2. Aeration Tanks
3. Secondary Clarifiers
4. Disinfection Facility
5. Rapid Infiltration Sand Beds
6. Receiving Water (*Mill Brook*)

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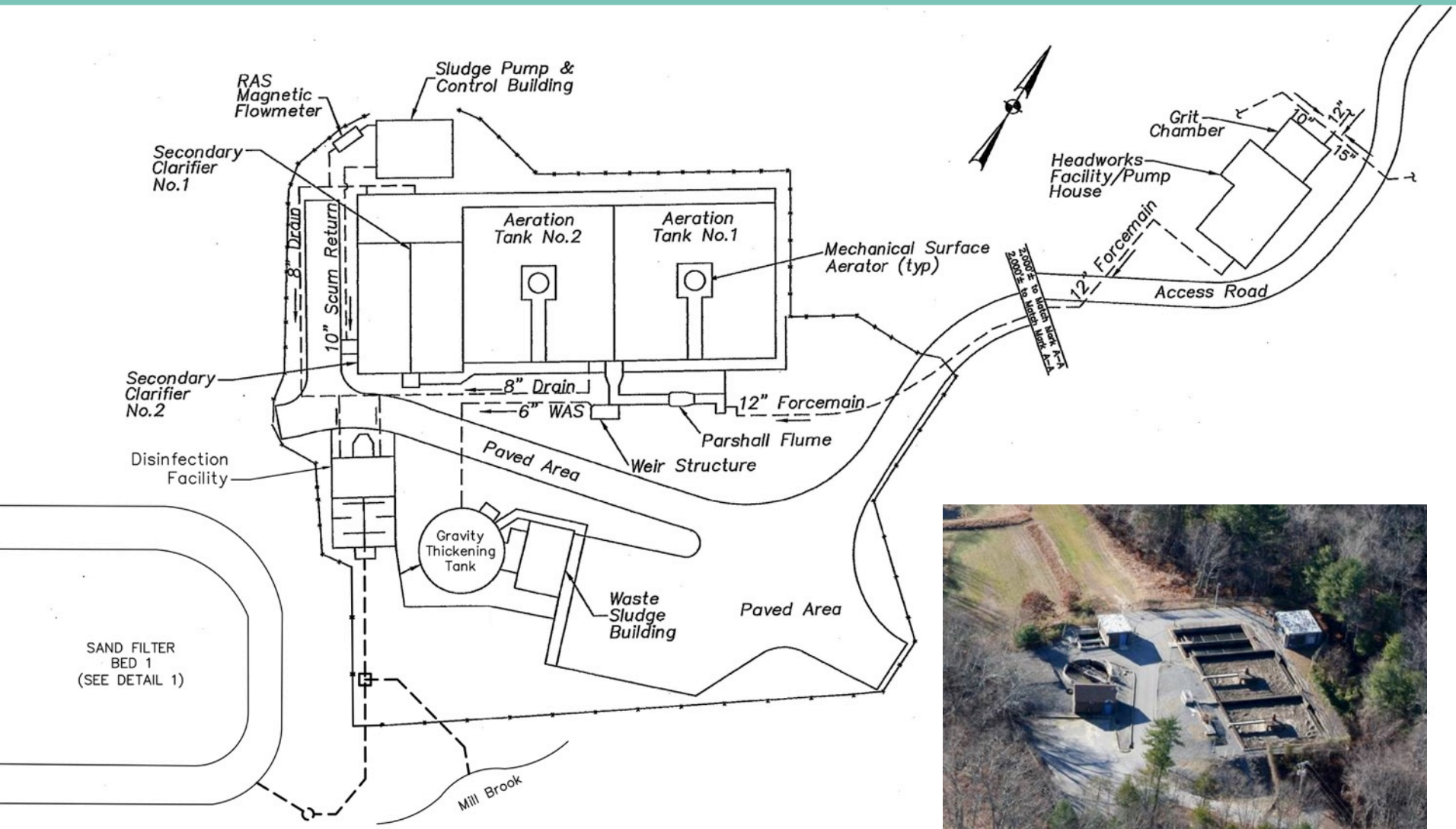
Village Plant



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North Plant

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North Plant

North Plant

1. Headworks
2. Primary Clarifiers
3. Aeration Tanks
4. Secondary Clarifiers
5. Disinfection Facility
6. Receiving Water (*Moosup River*)

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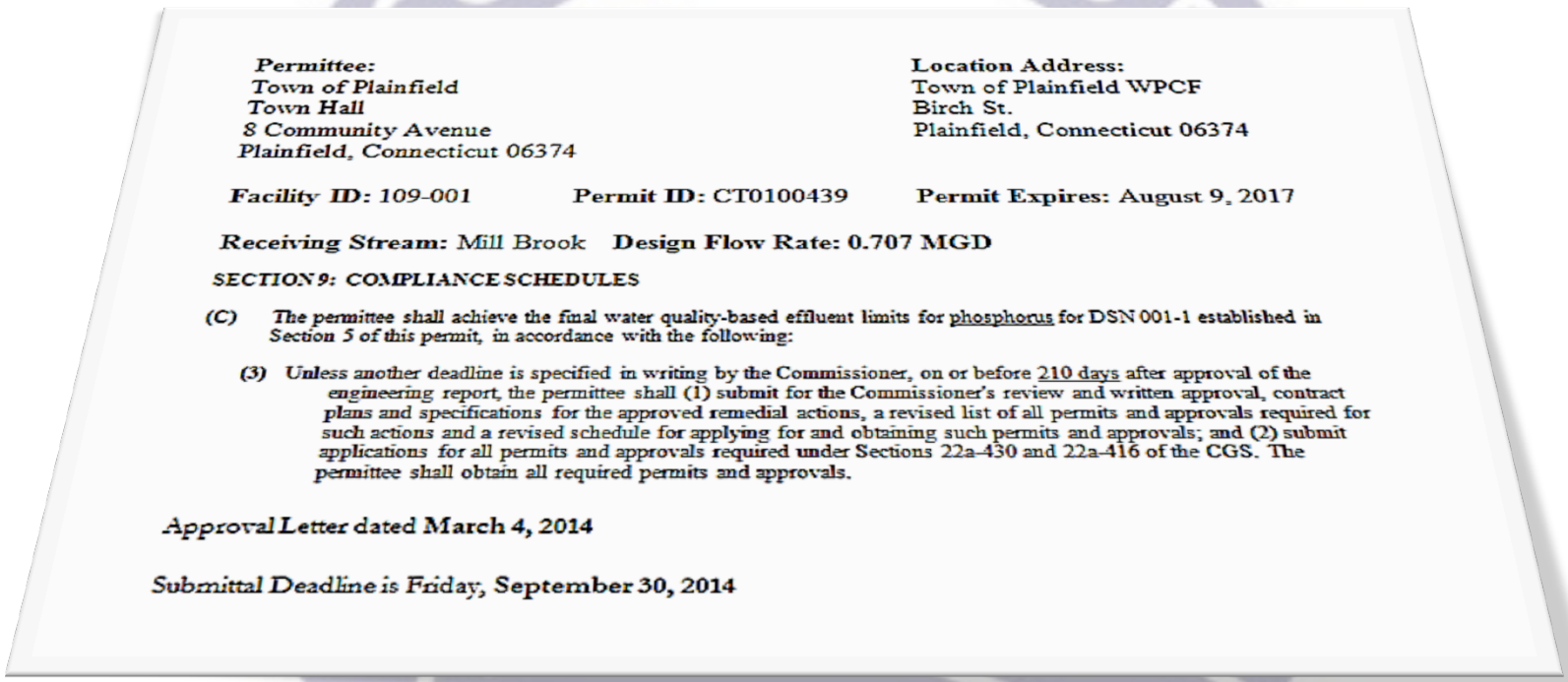
New Regulations – Village Plant



Permittee:
Town of Plainfield
Town Hall
8 Community Avenue
Plainfield, Connecticut 06374

Location Address:
Town of Plainfield WPCF
Birch St.
Plainfield, Connecticut 06374

Facility ID: *109-001* **Permit ID:** CT0100439 **Permit Expires:** August 9, 2017

Receiving Stream: *Mill Brook* **Design Flow Rate: 0.707 MGD**

SECTION 9: COMPLIANCE SCHEDULES

(C) *The permittee shall achieve the final water quality-based effluent limits for phosphorus for DSN 001-1 established in Section 5 of this permit, in accordance with the following:*

(3) *Unless another deadline is specified in writing by the Commissioner, on or before 210 days after approval of the engineering report, the permittee shall (1) submit for the Commissioner's review and written approval, contract plans and specifications for the approved remedial actions, a revised list of all permits and approvals required for such actions and a revised schedule for applying for and obtaining such permits and approvals; and (2) submit applications for all permits and approvals required under Sections 22a-430 and 22a-416 of the CGS. The permittee shall obtain all required permits and approvals.*

Approval Letter dated **March 4, 2014**

Submittal Deadline is Friday, **September 30, 2014**

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New Regulations – Village Plant

Effective August 10, 2015

	Influent Average 2009-2013	Effluent Average 2009-2013	New Regulation
Phosphorus	19 lbs/day	8.6 lbs/day	2.51 lbs/day
Nitrogen	41 mg/L	11 mg/L	6 mg/L

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New Regulations – North Plant

Effective June 1, 2019

	Influent Average 2009-2014	Effluent Average 2009-2014	New Regulation
Phosphorus	27.1 lbs/day	16.8 lbs/day	3.86 lbs/day
Nitrogen	37.7 mg/L	15.1 mg/L	7.5 mg/L

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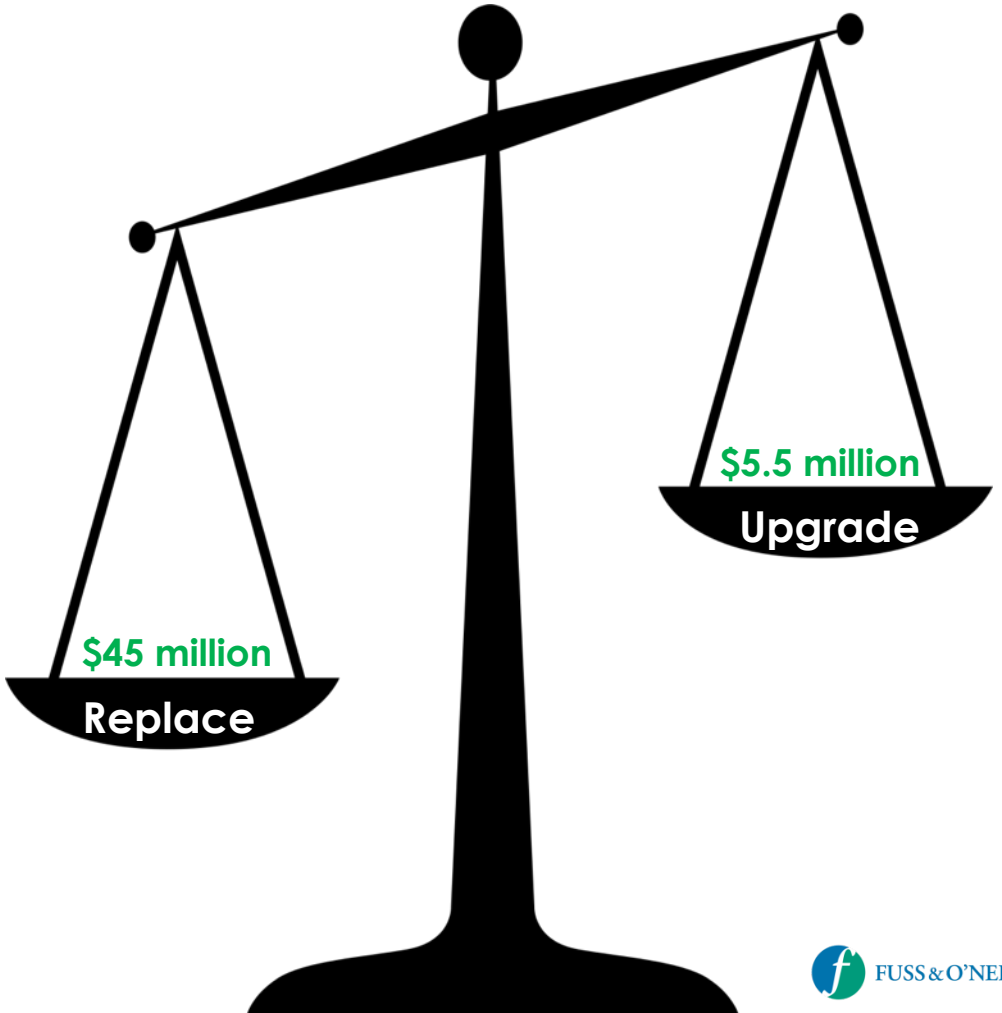
Cost Effective Solution

- ***Draft Facilities Plan Update*, February 2011**
  - **Combine Treatment Facilities**
  - **$45 Million**

- ***Engineering Report to Achieve Phosphorus Compliance*, May 2013**



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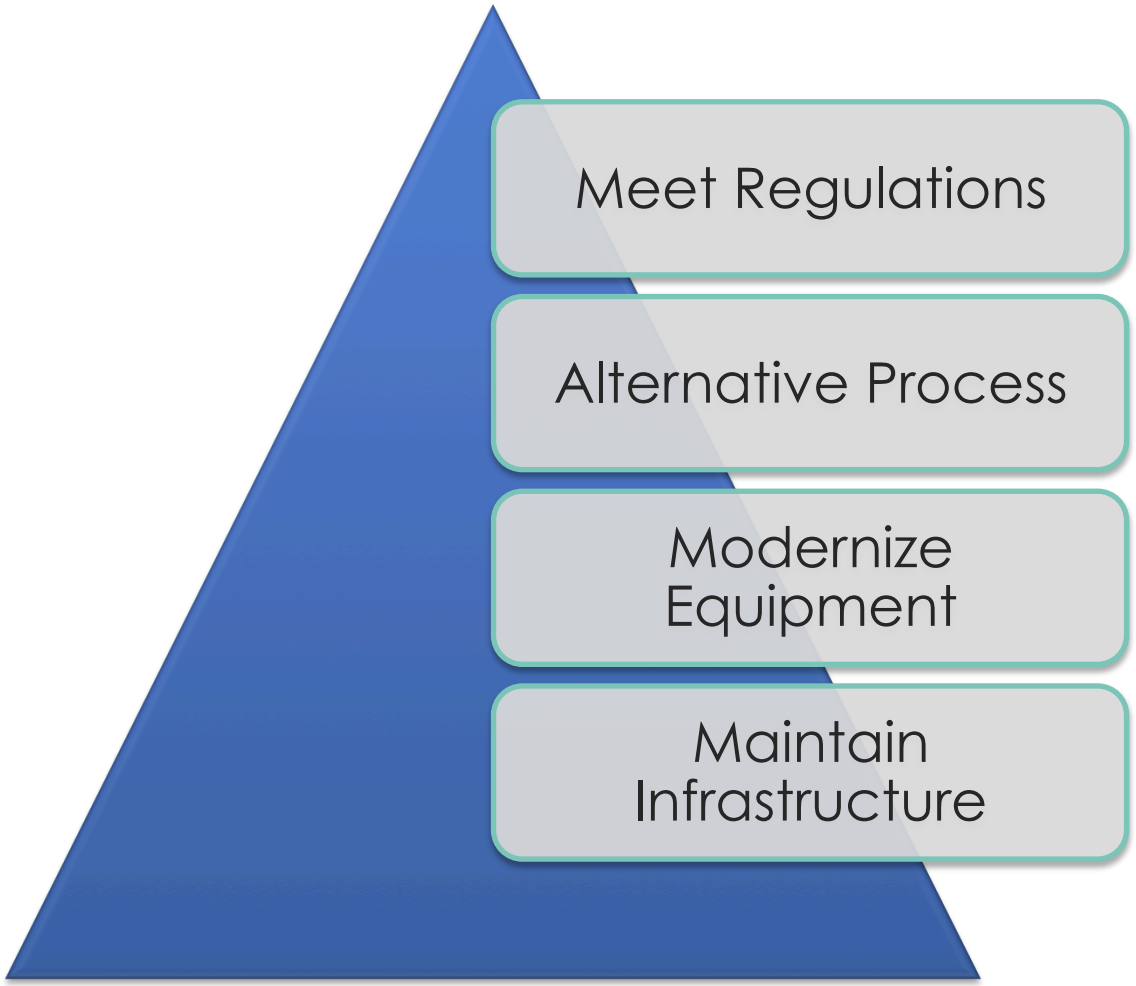
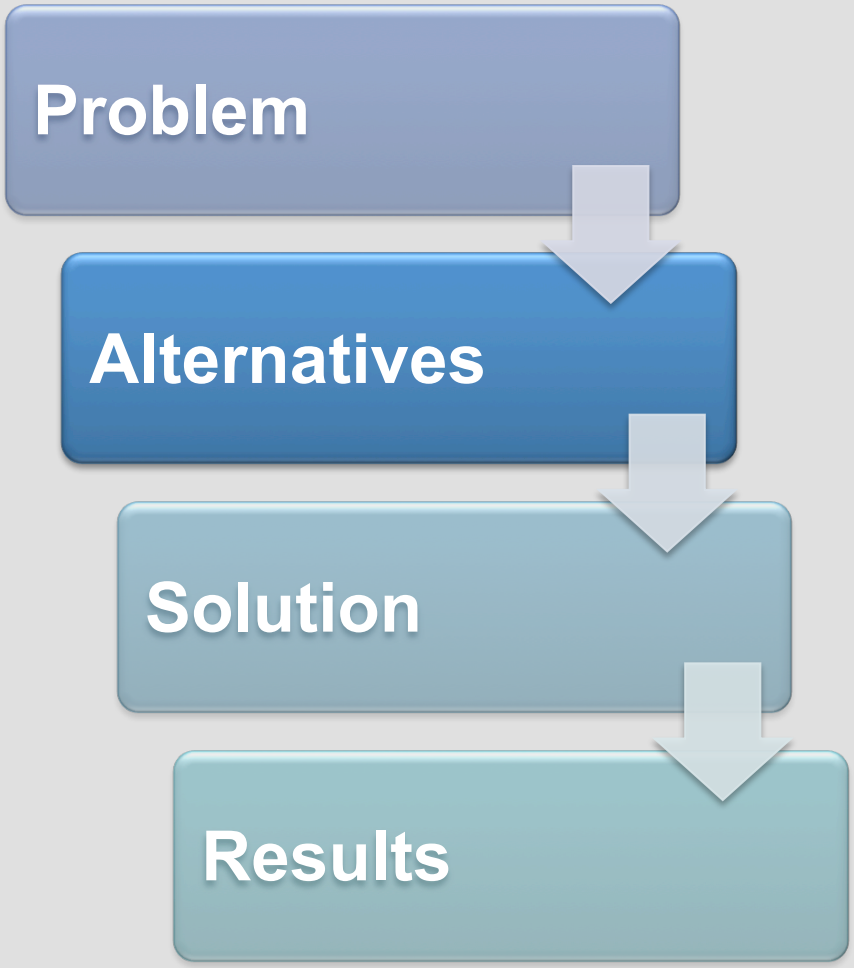
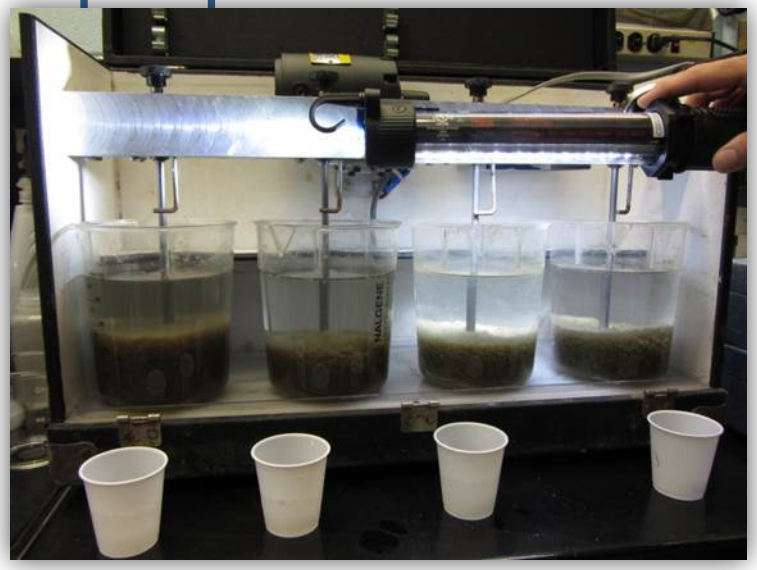
Cost Effective Solution

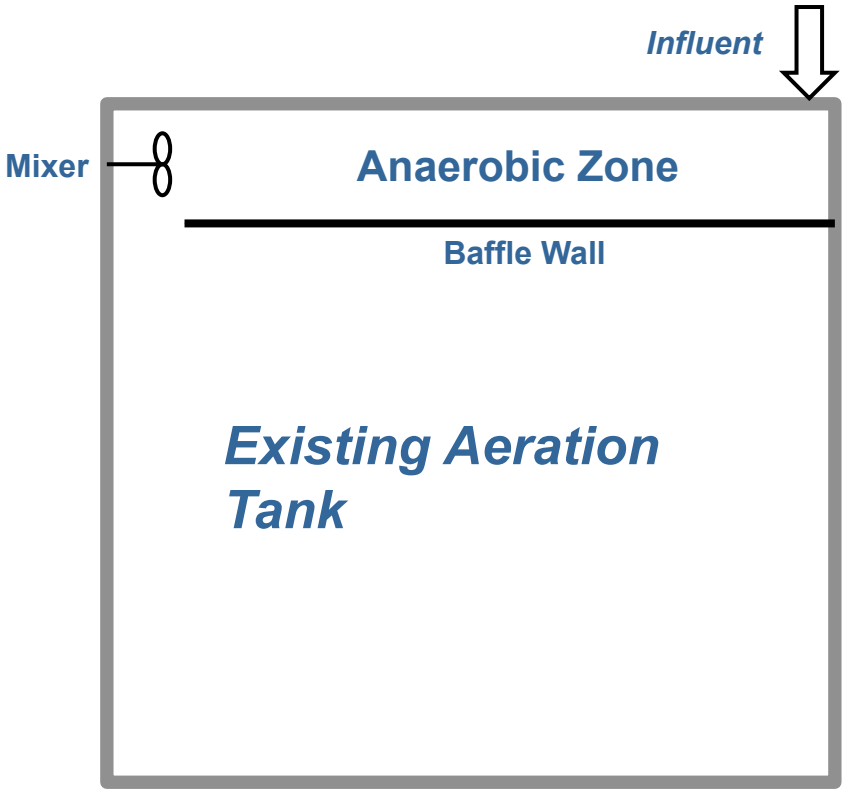



Problem
Alternatives
Solution
Results

Phosphorus Removal

- New Mechanical Screen
- Anaerobic Zone
  - Phosphorus Accumulating Organisms (PAOs)
- Chemical Addition
  - Precipitate dissolved phosphorus





Nitrogen Removal Alternative Processes

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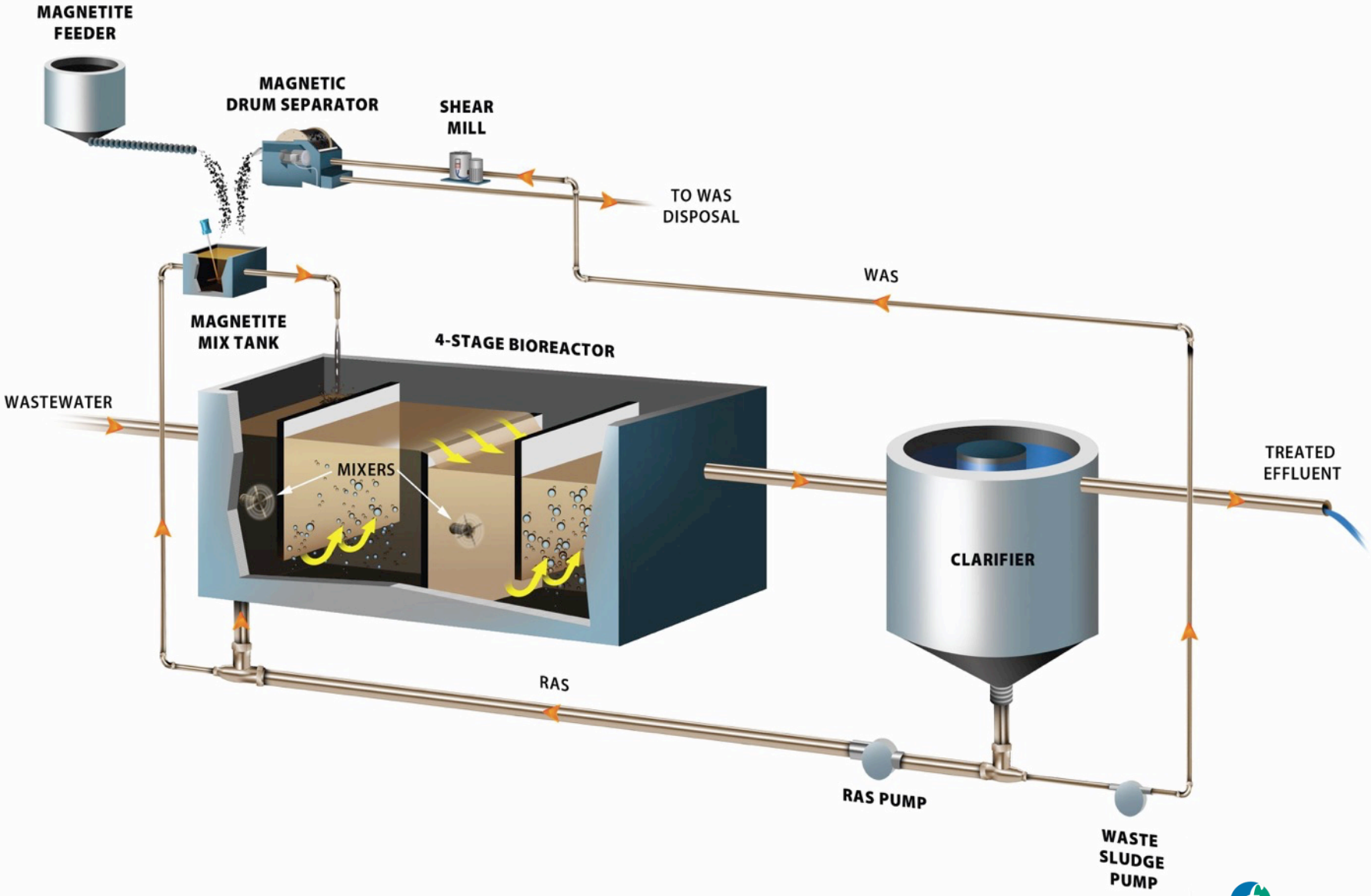
Ballasted (BioMag™)



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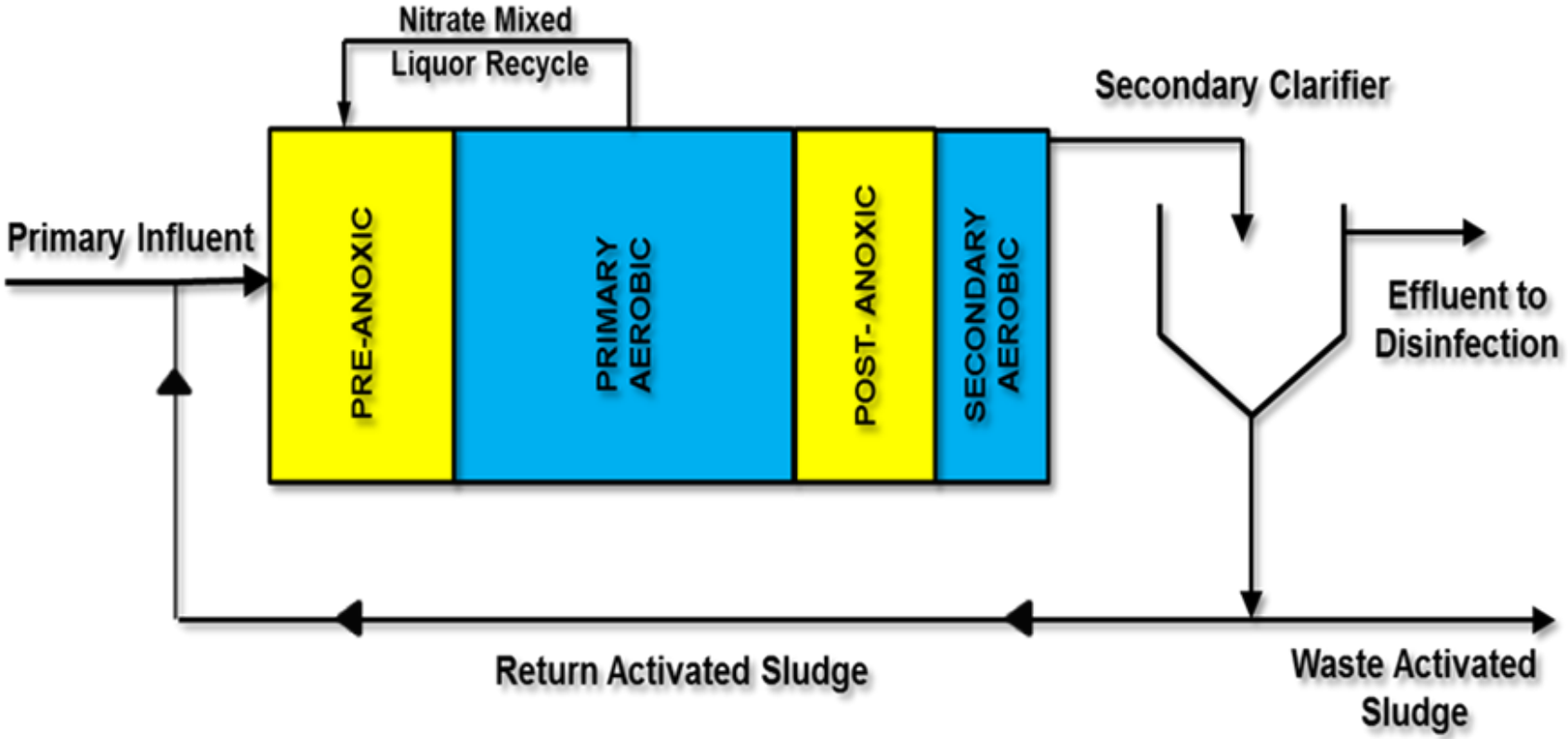
Biological Nutrient Removal (MLE)



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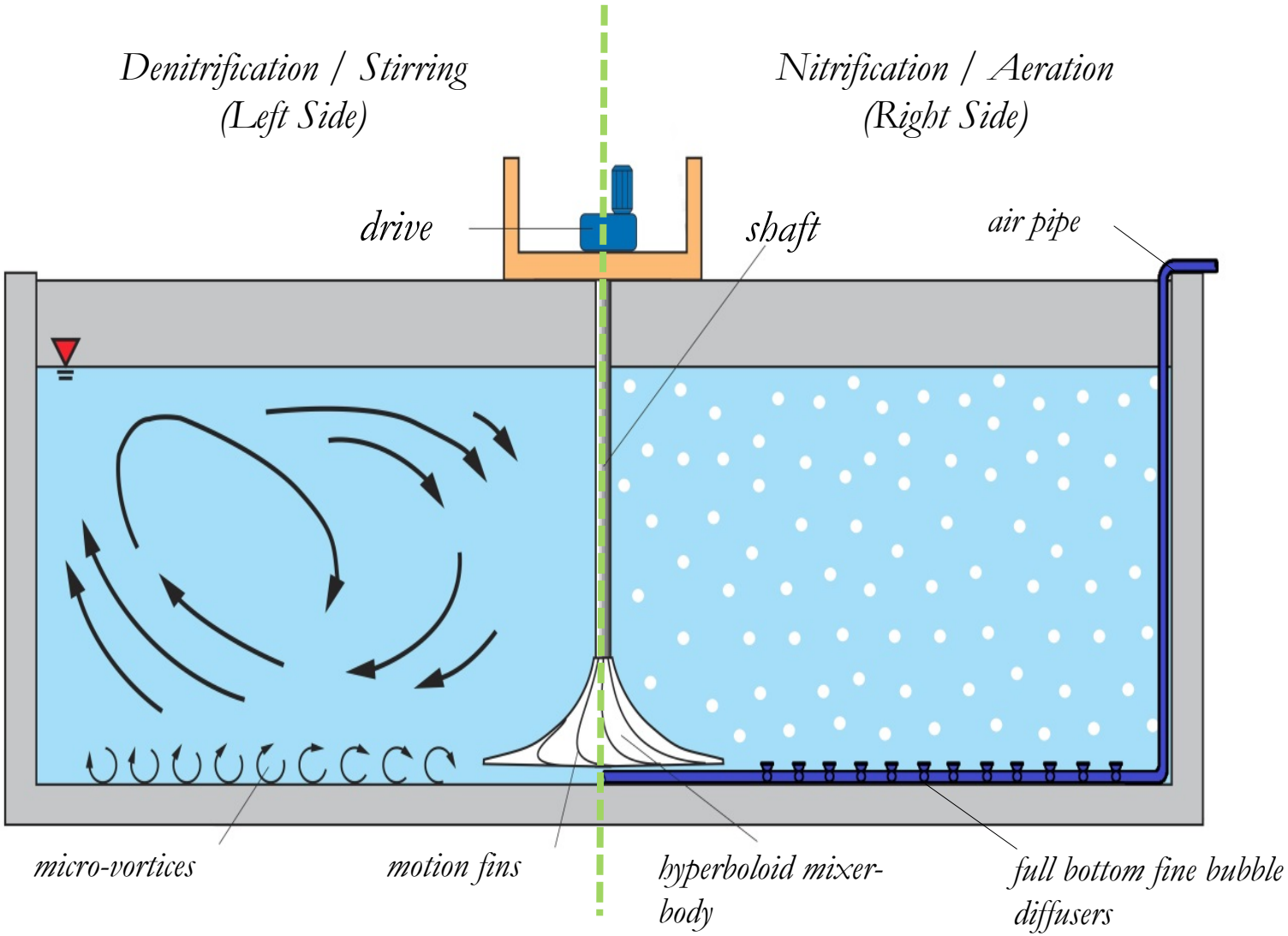
Cyclical Aeration



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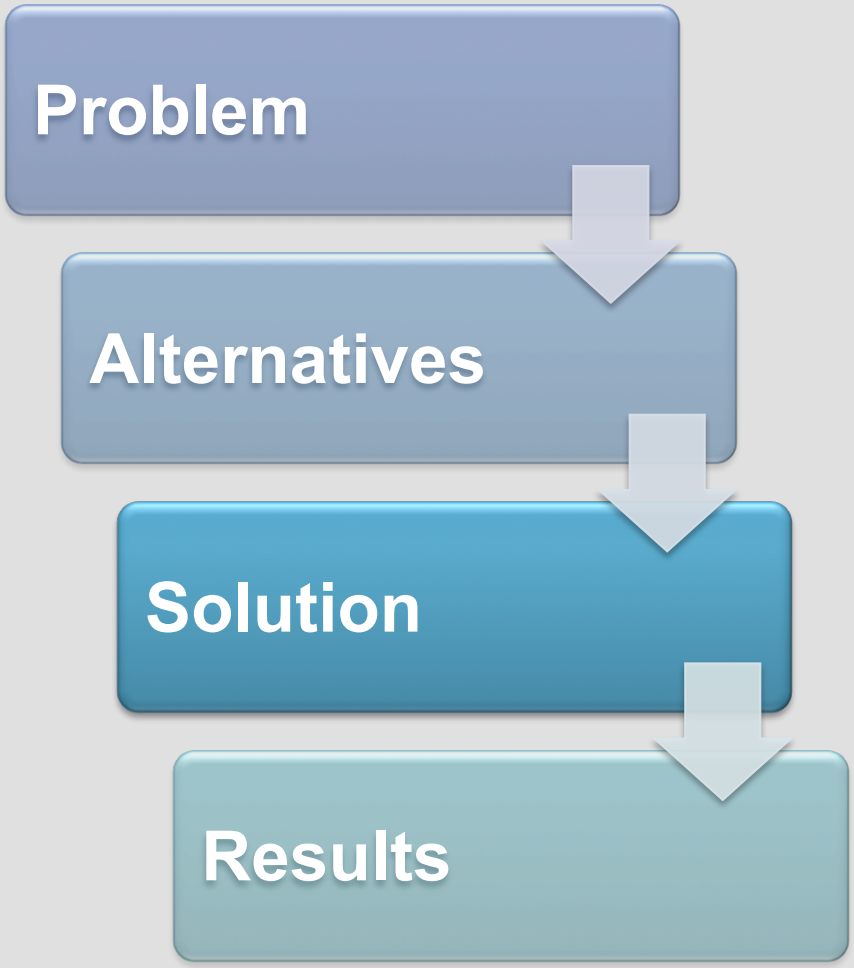
Cyclical Aeration


Problem
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Results

New Influent Fine Screening

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Aeration Tank Demo Work

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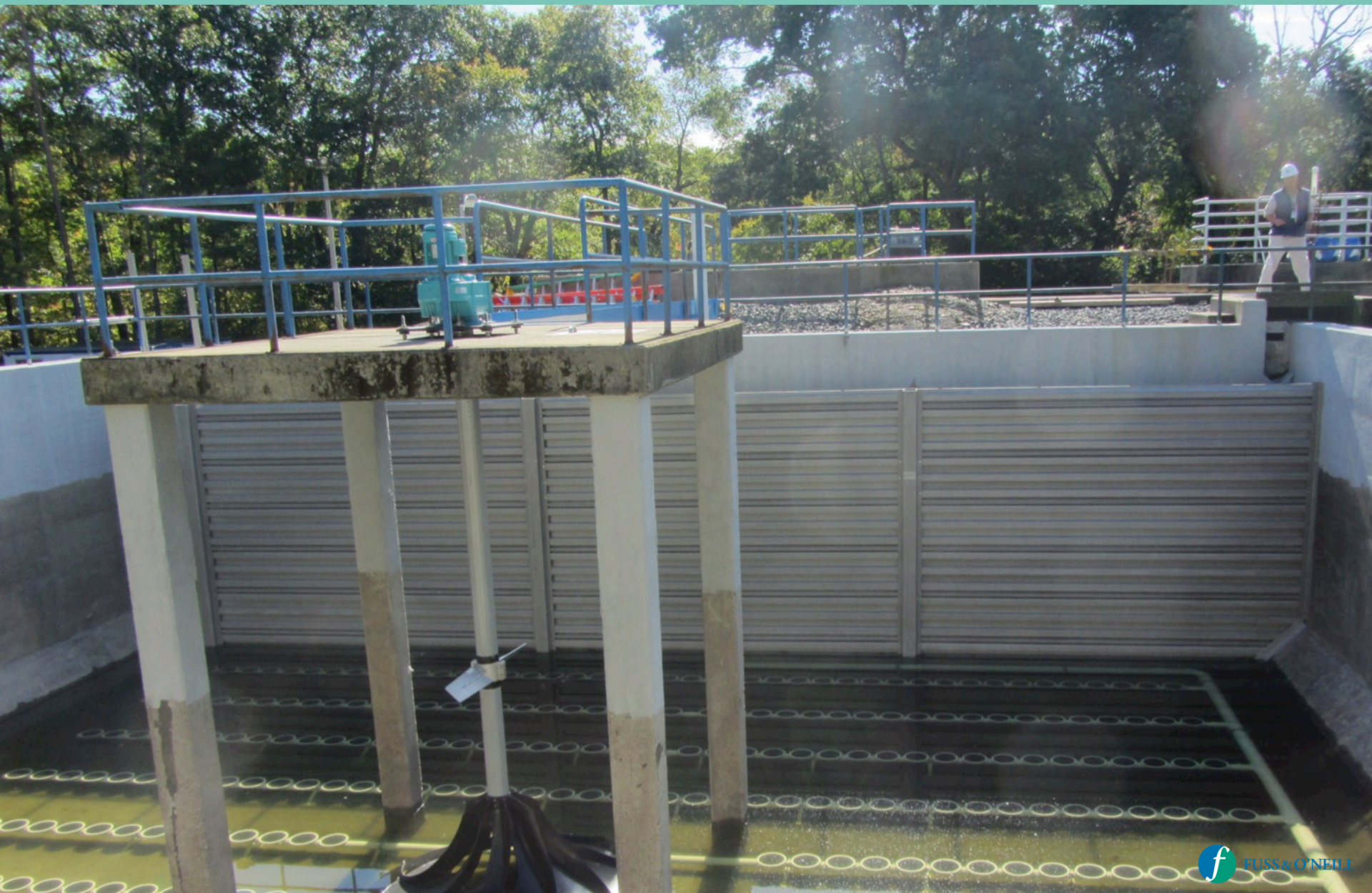
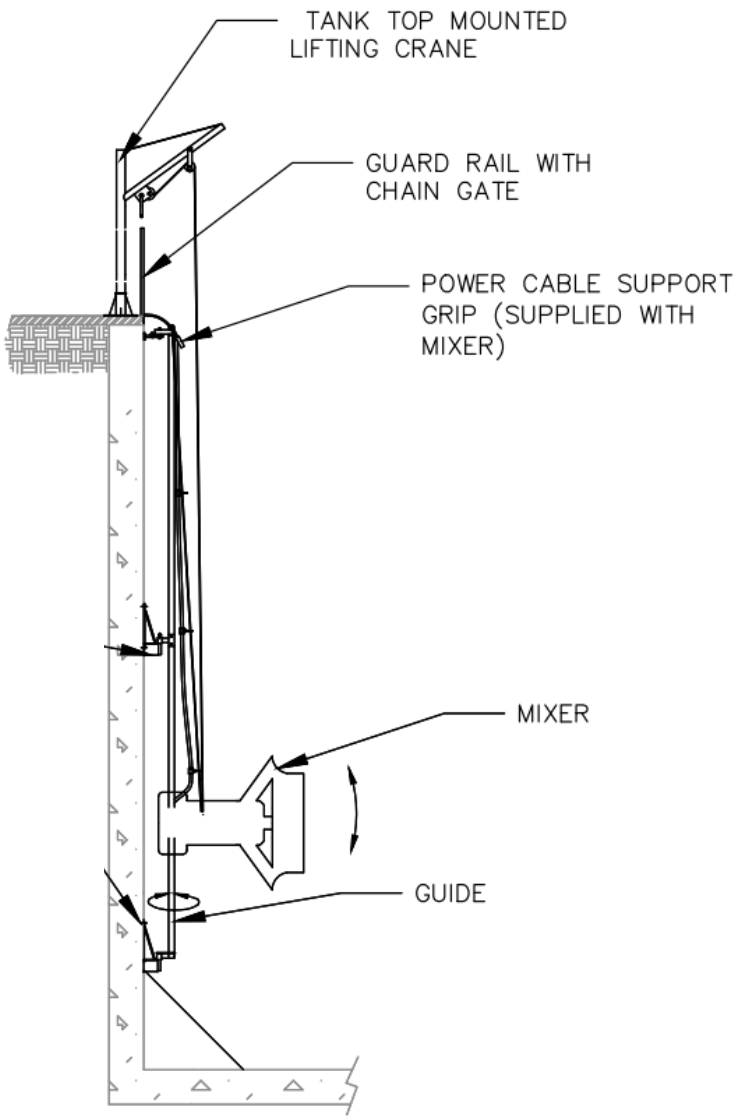
New Anaerobic Zone



New Anaerobic Zone

New Anaerobic Zone



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New Diffused Aeration & Anoxic Mixers

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New Diffused Aeration & Anoxic Mixers

New Diffused Aeration & Anoxic Mixers

New Blowers for Aeration System

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New Control System

DO

Nitrate

pH

ORP

- New pH, DO, and Nitrate/ORP sensors provide feedback to control panel.
- The control system is programed to prevent the anoxic mixers and blowers from running simultaneously.

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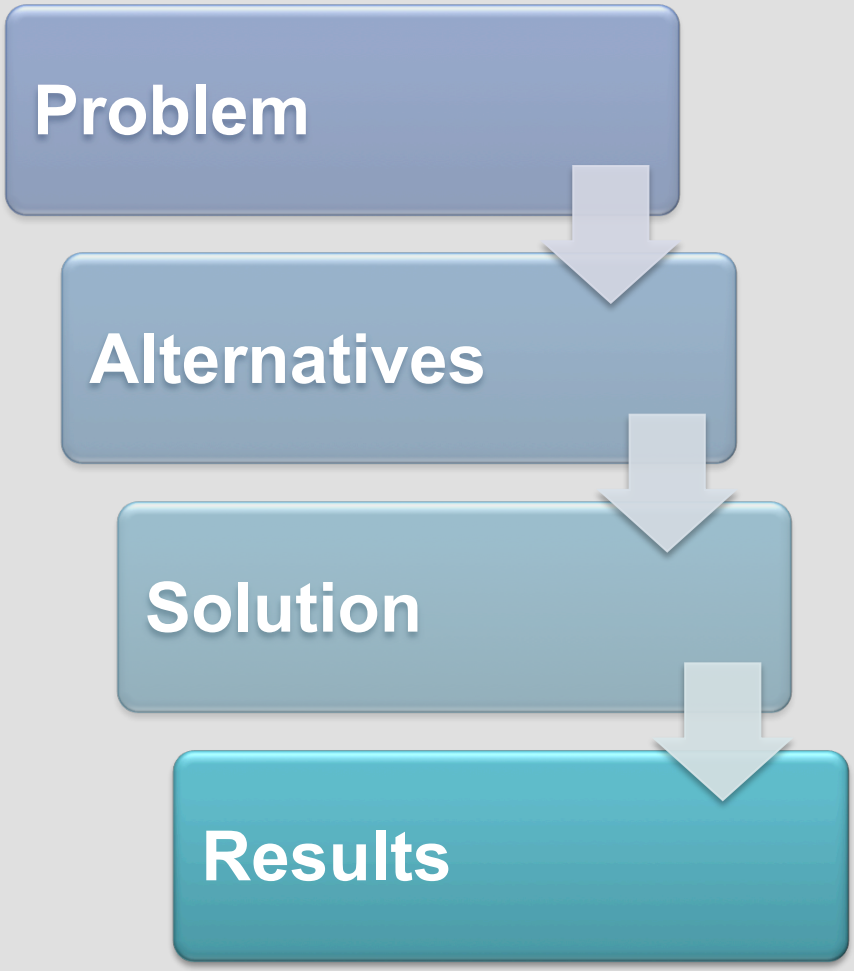
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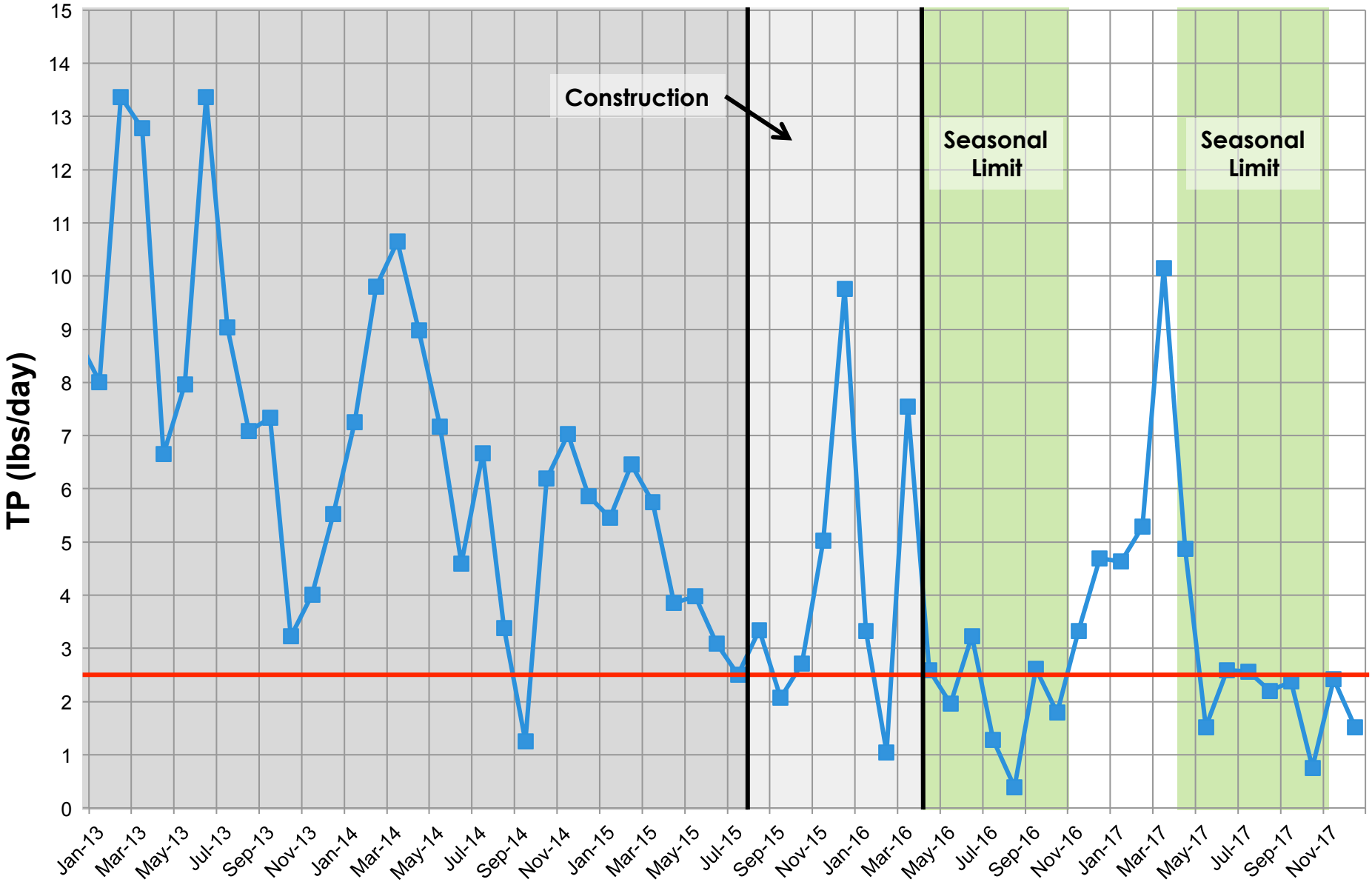
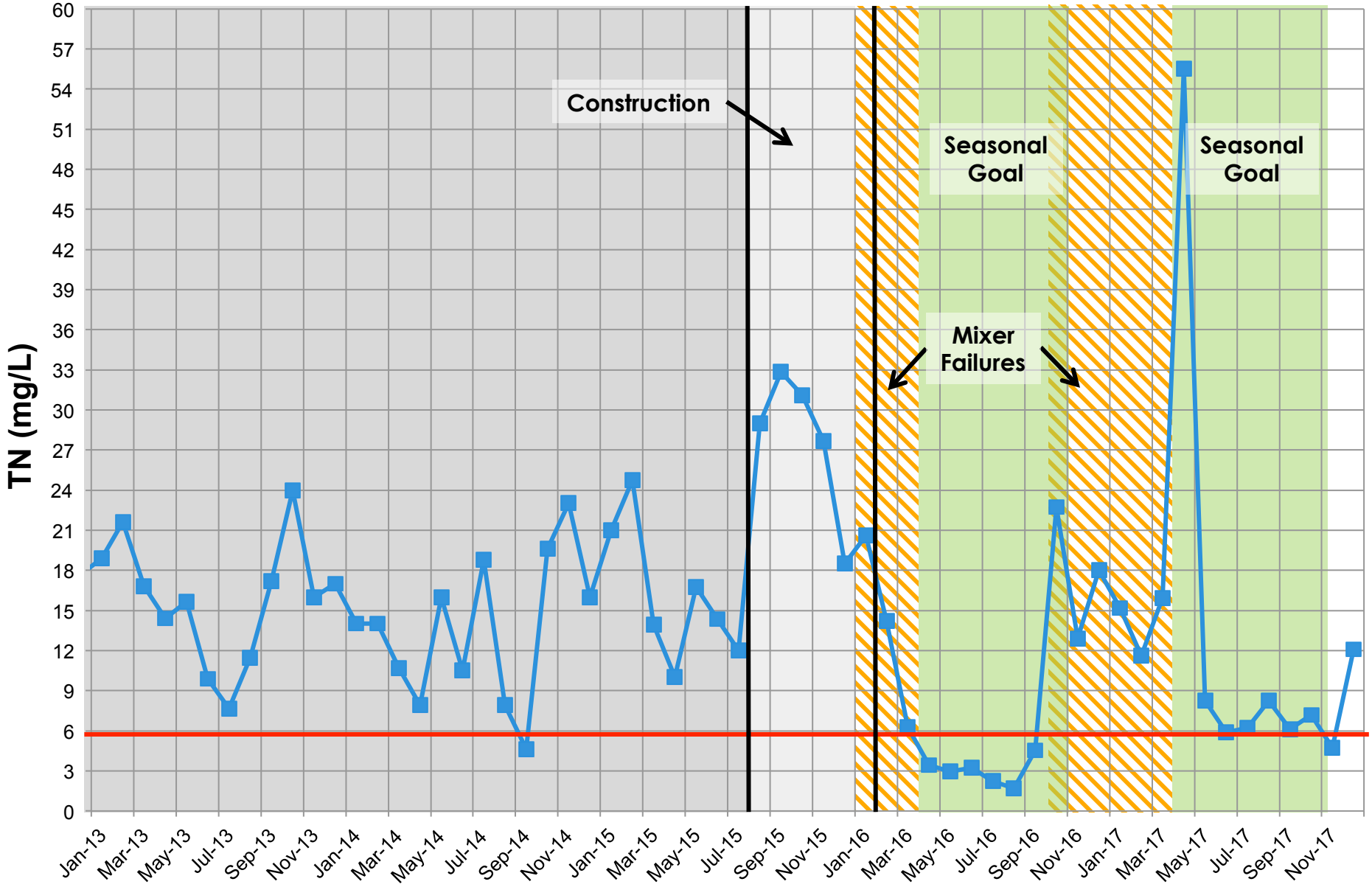
Village Plant Mechanical Aeration (Before)

Village Plant Cyclical Aeration (After)

Village Plant Effluent Phosphorus Load



Village Plant Effluent Nitrogen Concentration

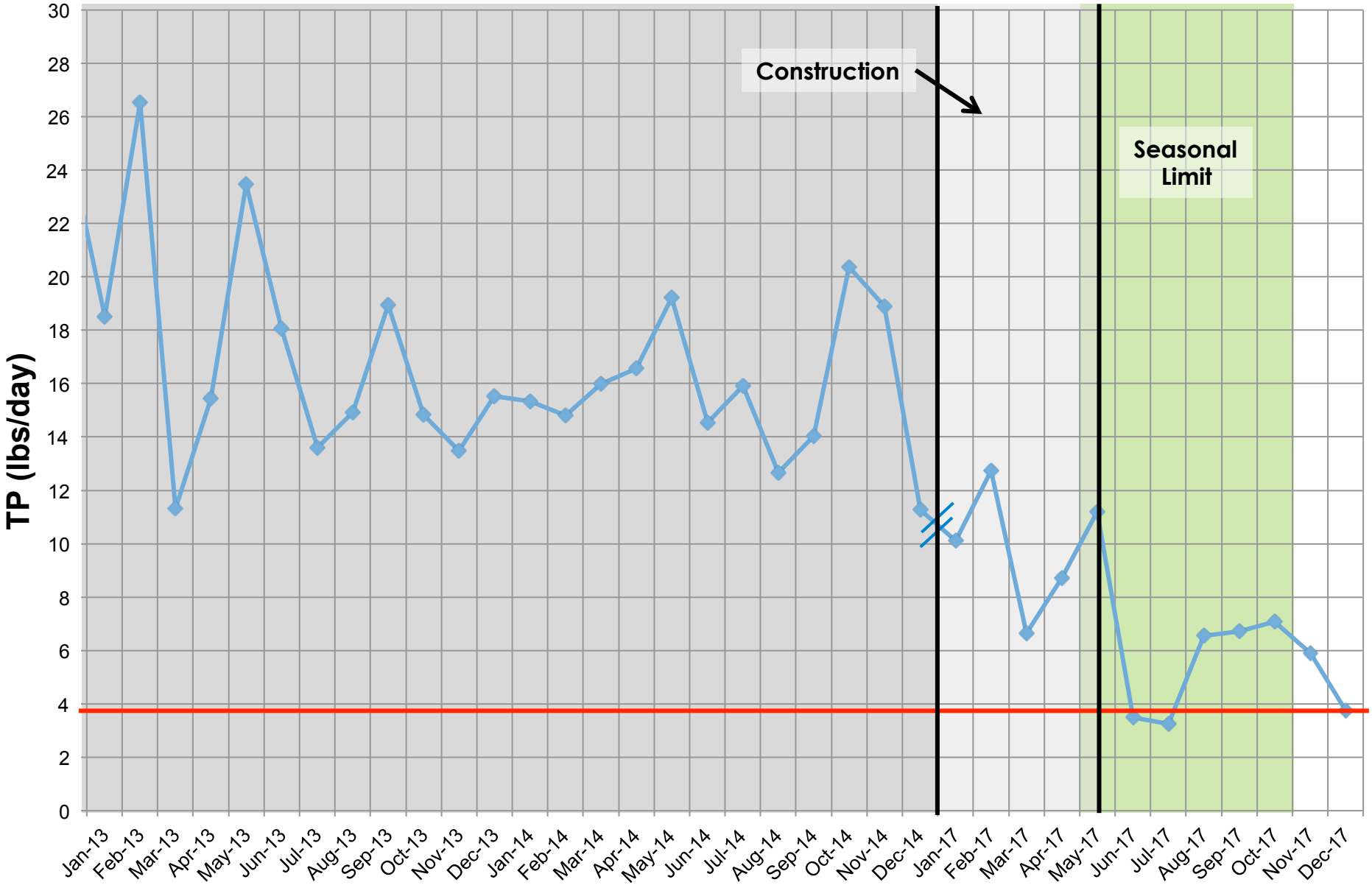


North Plant Mechanical Aeration (Before)

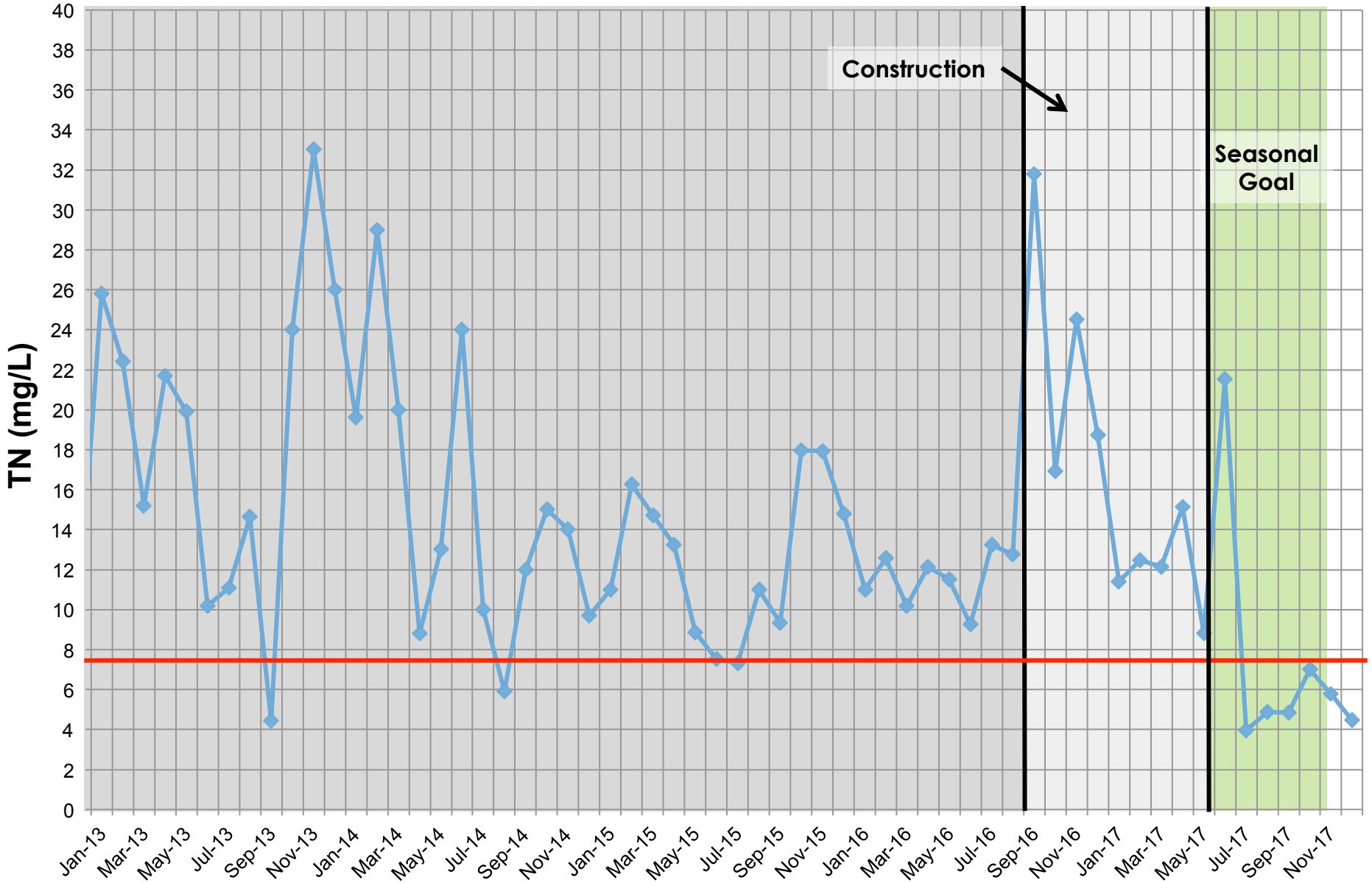
Cyclical Aeration (After)

Cyclical Aeration (After)

North Plant Effluent Phosphorus Load



North Plant Effluent Nitrogen Concentration



Operations

Village Plant

	Summer	Winter
PAC Addition	17 gal/day	12 gal/day
Blower Cycle Times	30 min on 30 min. off	20 min. on 40 min. off

North Plant

	Summer	Winter
PAC Addition	12-25 gal/day*	30 gal/day
Blower Cycle Times	160 min. on 60 min. off	60 min. on 70 min. off

**Will switch to 30 gal/day next summer.*

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Conclusion

Upgrading equipment and treatment processes can be a cost-effective way to achieve nutrient reduction

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Contact Information

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Stephanie Baldino

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