



# Collaborative Ingenuity and Careful Operations Brings a Unique Fixed Film Process to BNR

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# Overview

- Case study of operational changes and modest improvements to address:
  - Aging and failing equipment
  - Limitations of the original facility
  - Targeted changes in performance (BOD/TSS/N/P)
- Solution was achieved via:
  - Collaboration with operations staff and process engineering
  - WPCF staff ingenuity to develop unique solutions
  - Diligently monitoring operation and being patient with process changes



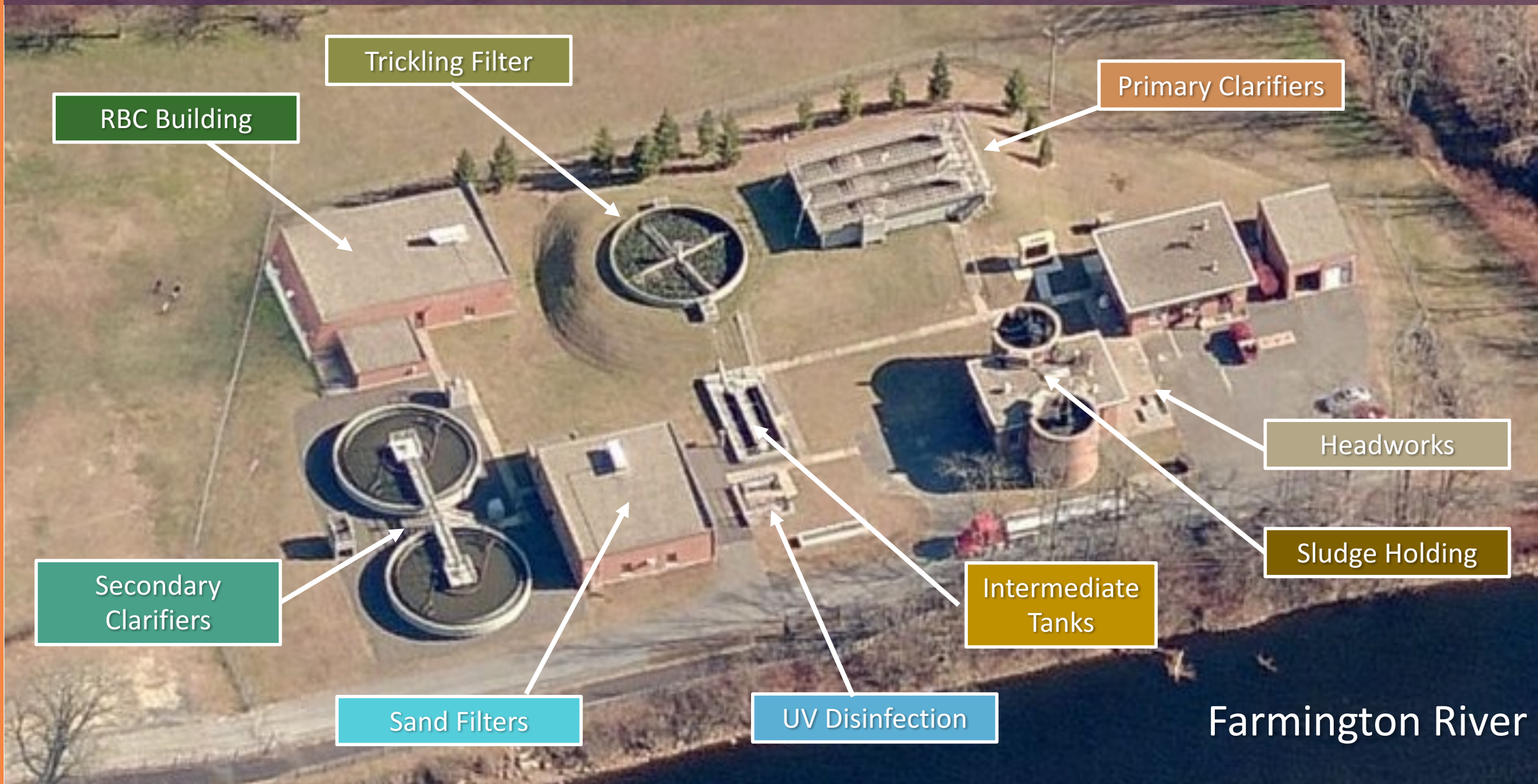
# Canton WPCF History

- Originally Built in 1965 (0.375 MGD)
  - Primary Clarification
  - Secondary Treatment
    - Trickling Filter / Rectangular Clarifiers/  
Chlorine Disinfection
- Major Upgrade in 1991 (0.8 MGD)
  - Enhanced Secondary Treatment
    - RBCs / Circular Secondary Clarifiers/Sand Filters/UV Disinfection
- Plant Re-rating in 2011 (0.95 MGD)
  - 1 Additional Sand Filter





# Canton WPCF – Major Unit Processes



RBC Building

Trickling Filter

Primary Clarifiers

Secondary Clarifiers

Headworks

Sludge Holding

Sand Filters

UV Disinfection

Intermediate Tanks

Farmington River





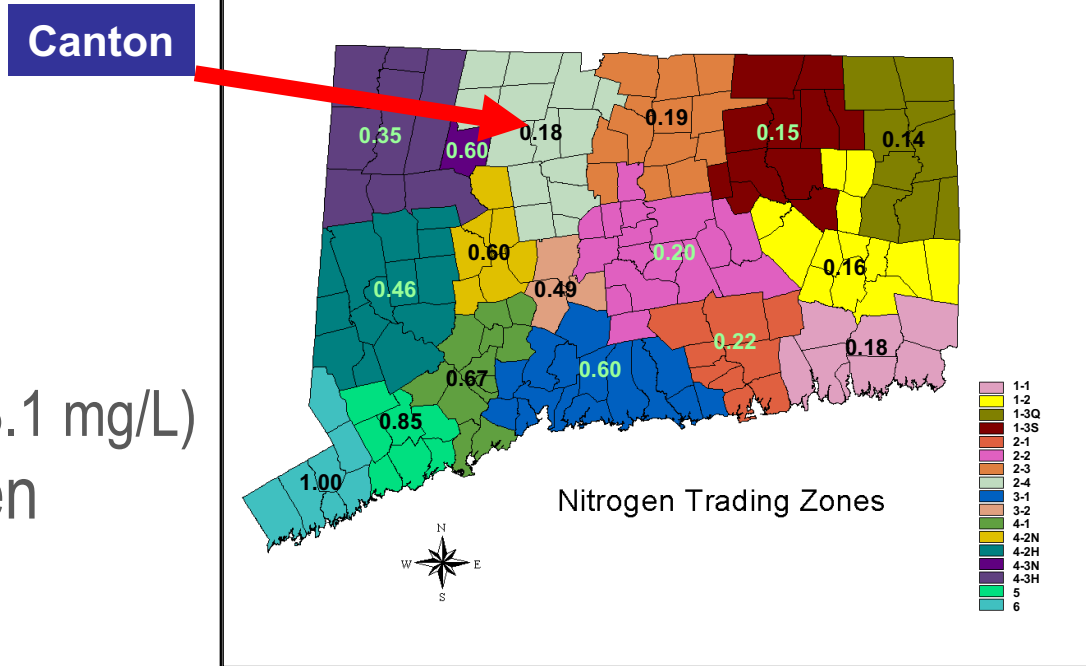
# Canton Permit

## ■ NPDES

- BOD<sub>5</sub> = 17 mg/L
- TSS = 17 mg/L
- e-Coli = 126 col/100 ml
- TP = 24.8 lb/d seasonal cap (3.1 mg/L)

## ■ CT General Permit for Nitrogen Discharges

- Annual Average
- Allows Trading
- 24 lbs/day target (3 mg/L)
- Trading cost set by State and Equalized

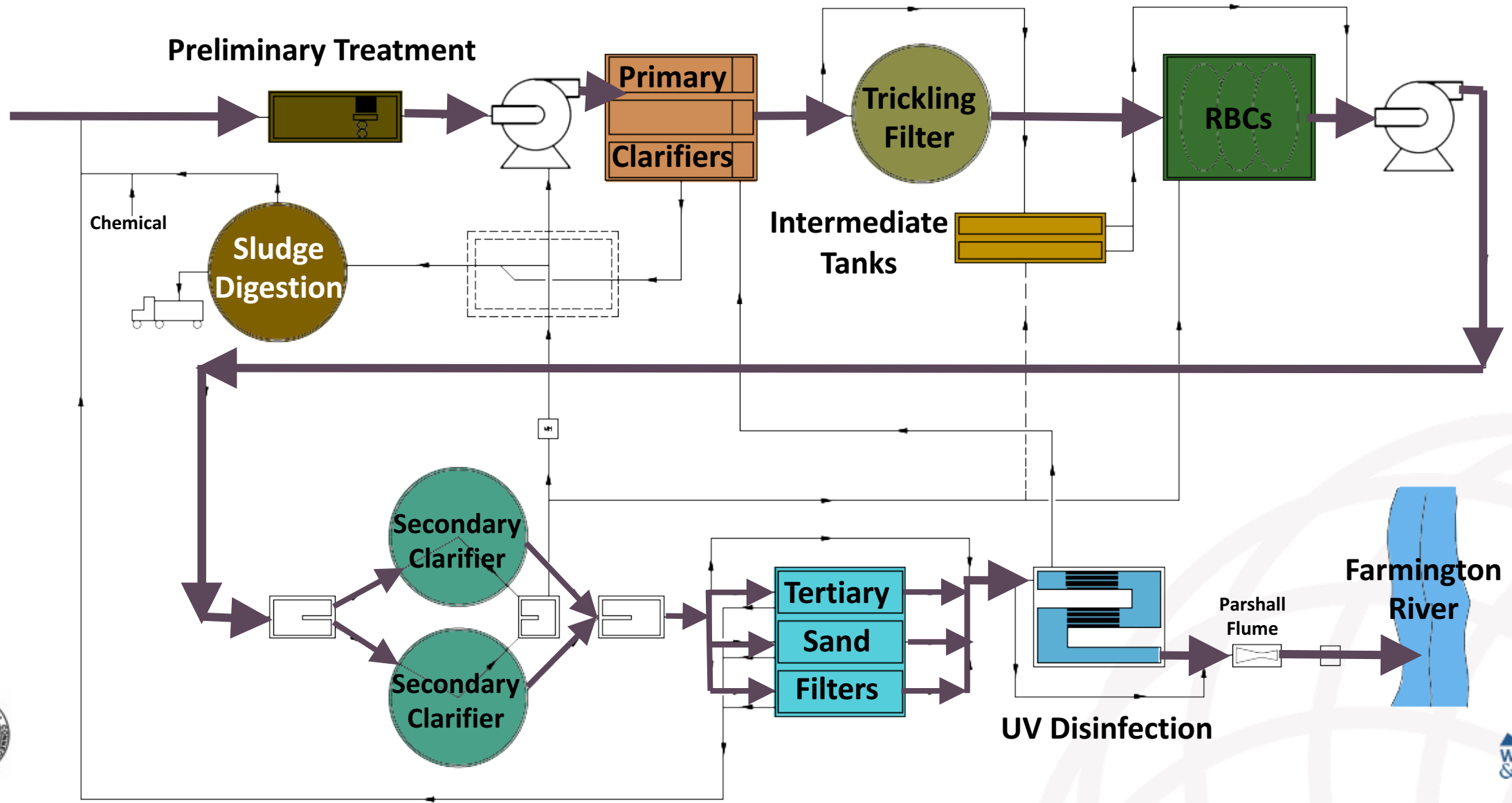


# Equipment Problems and Original Facility Limitations

- Equipment:
  - RBC #1 shaft breakage and
  - Trickling Filter (TF) bearing failure within a couple month period
- WPCF limitations
  - Not designed to nitrify or remove TN
  - Undersized anaerobic digester volume
  - Pumping of RBC effluent (prior to sec. clarifiers)



# WPCF Process Flow Diagram





# Responses to WPCF Challenges

- Added solids recycle (RAS) to RBC's converting it to a hybrid system
- Adding aeration to RBC tanks
- Converted digester to sludge holding tank
- Adding WAS pump
- Convert one old TF (intermediate) clarifier to anoxic tank
- Adding multiple recycle systems



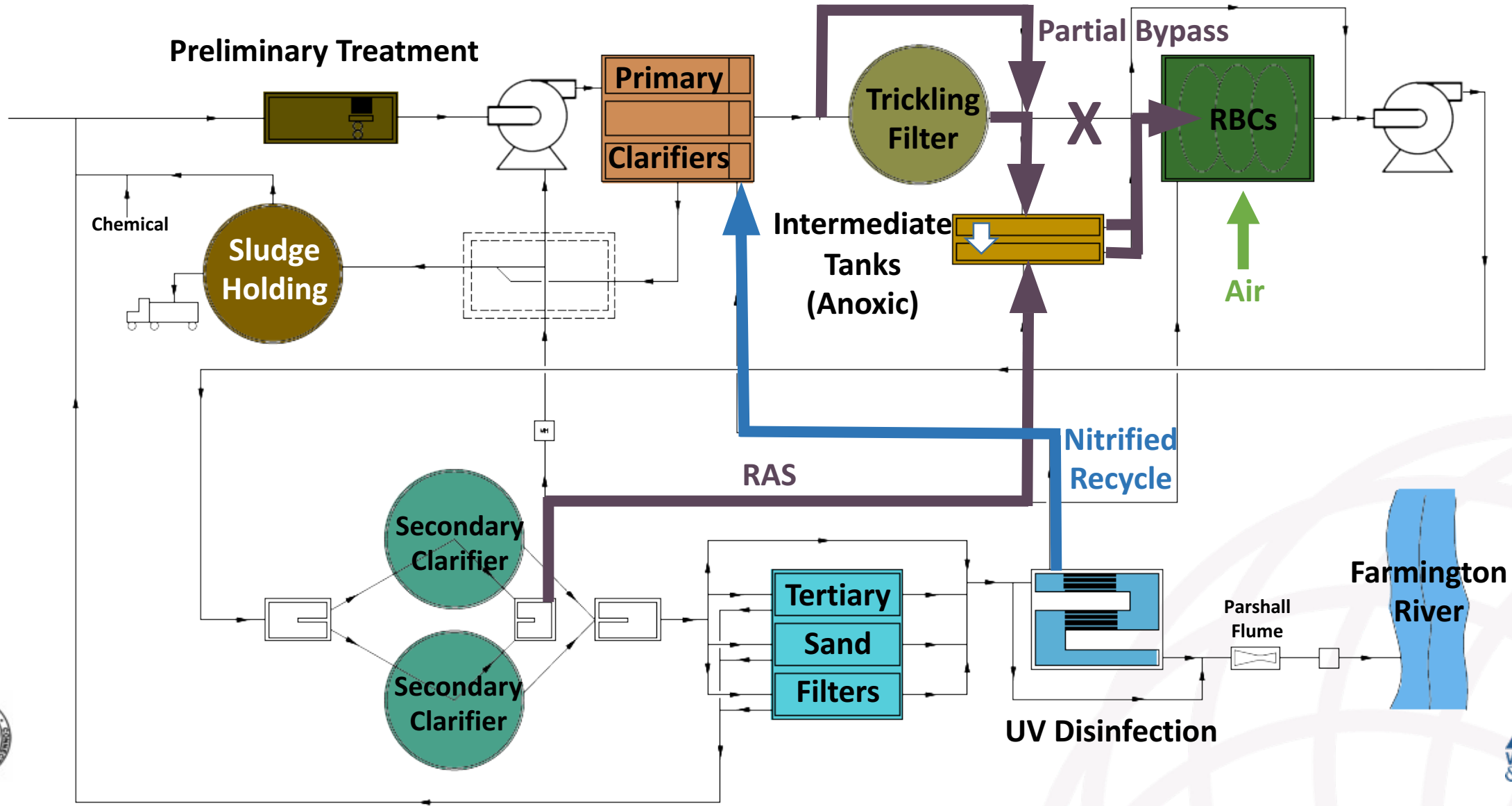




# RBC #3 with empty RBC Bay #4 with aeration

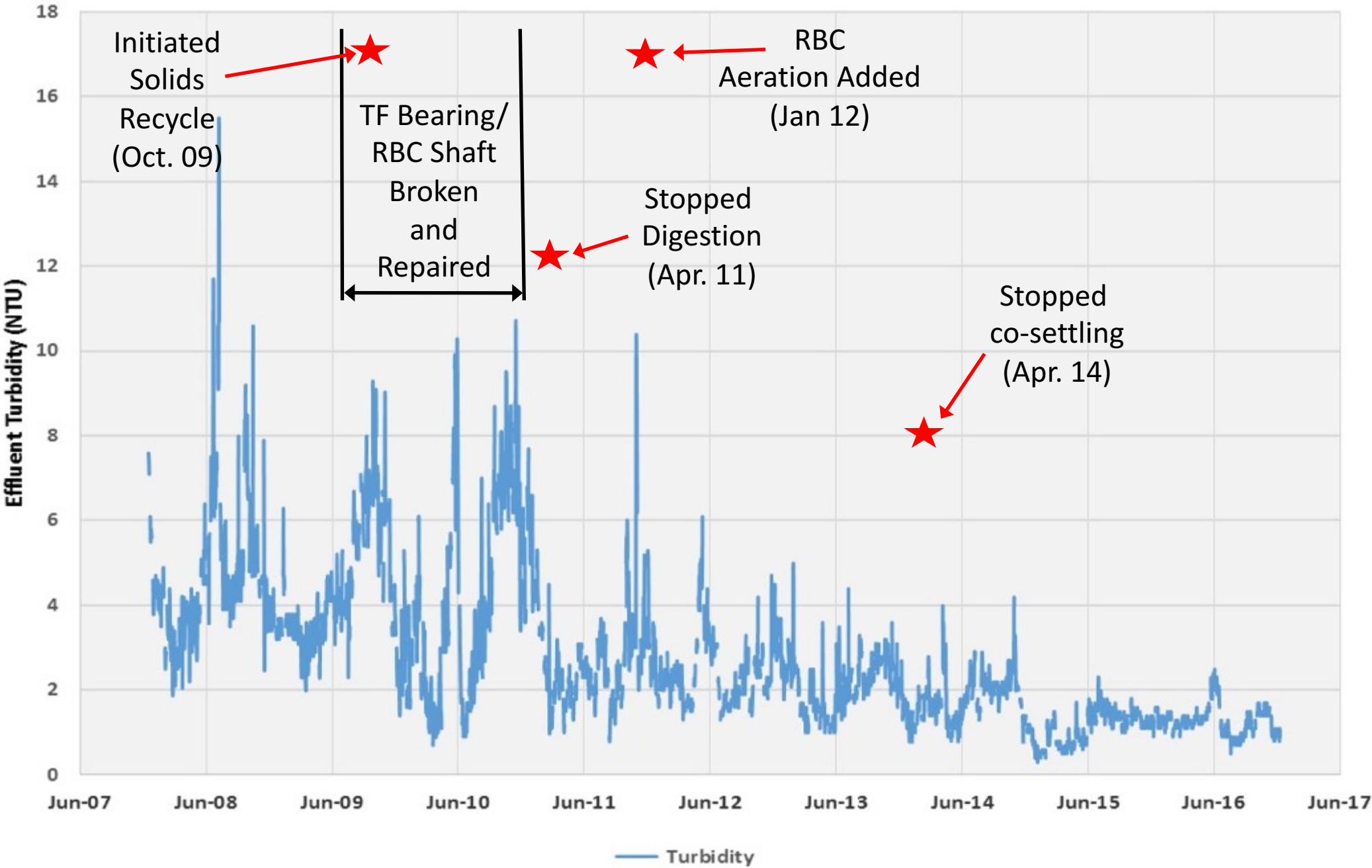


# WPCF Modified Process Flow Diagram

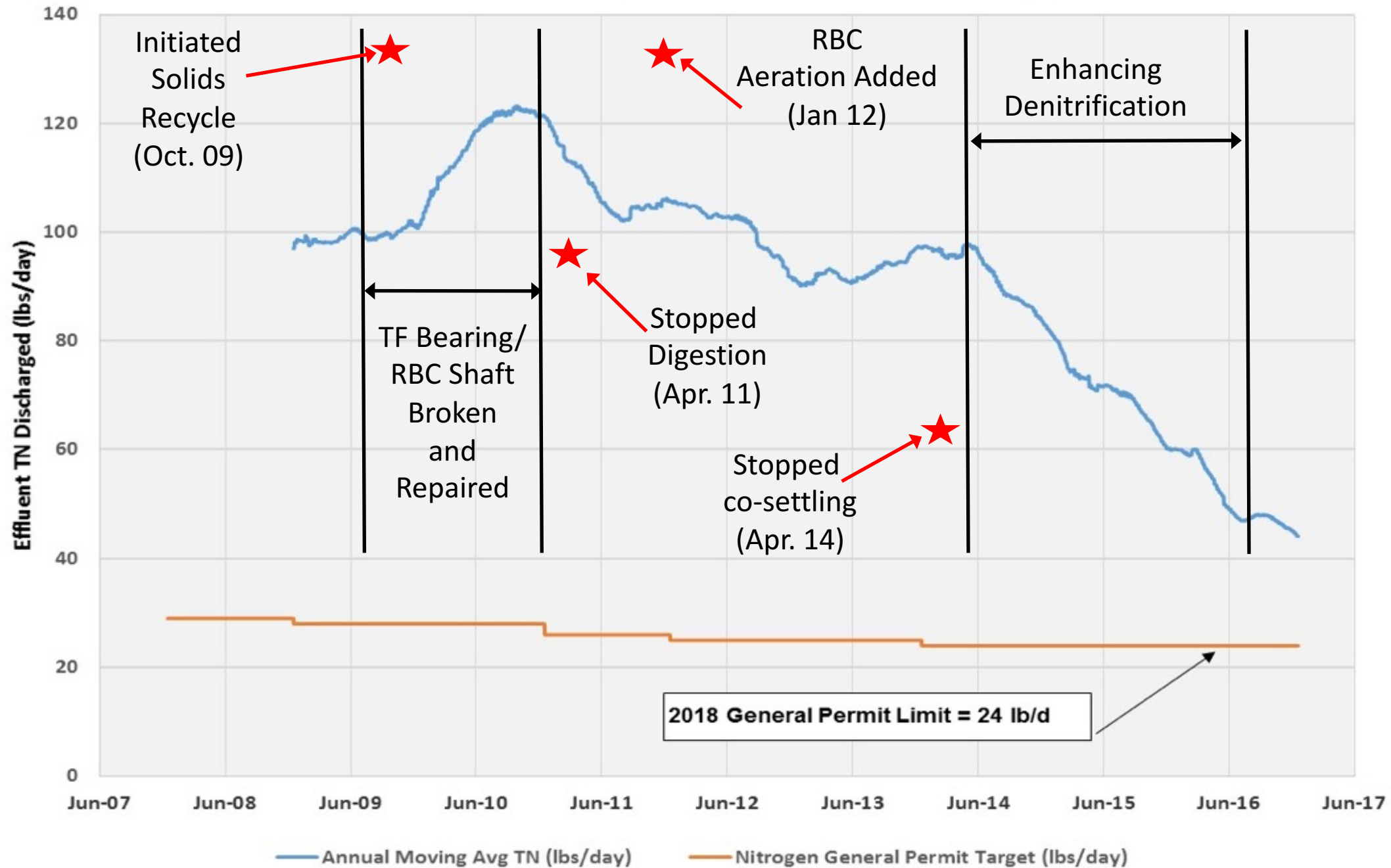




# Effluent Turbidity



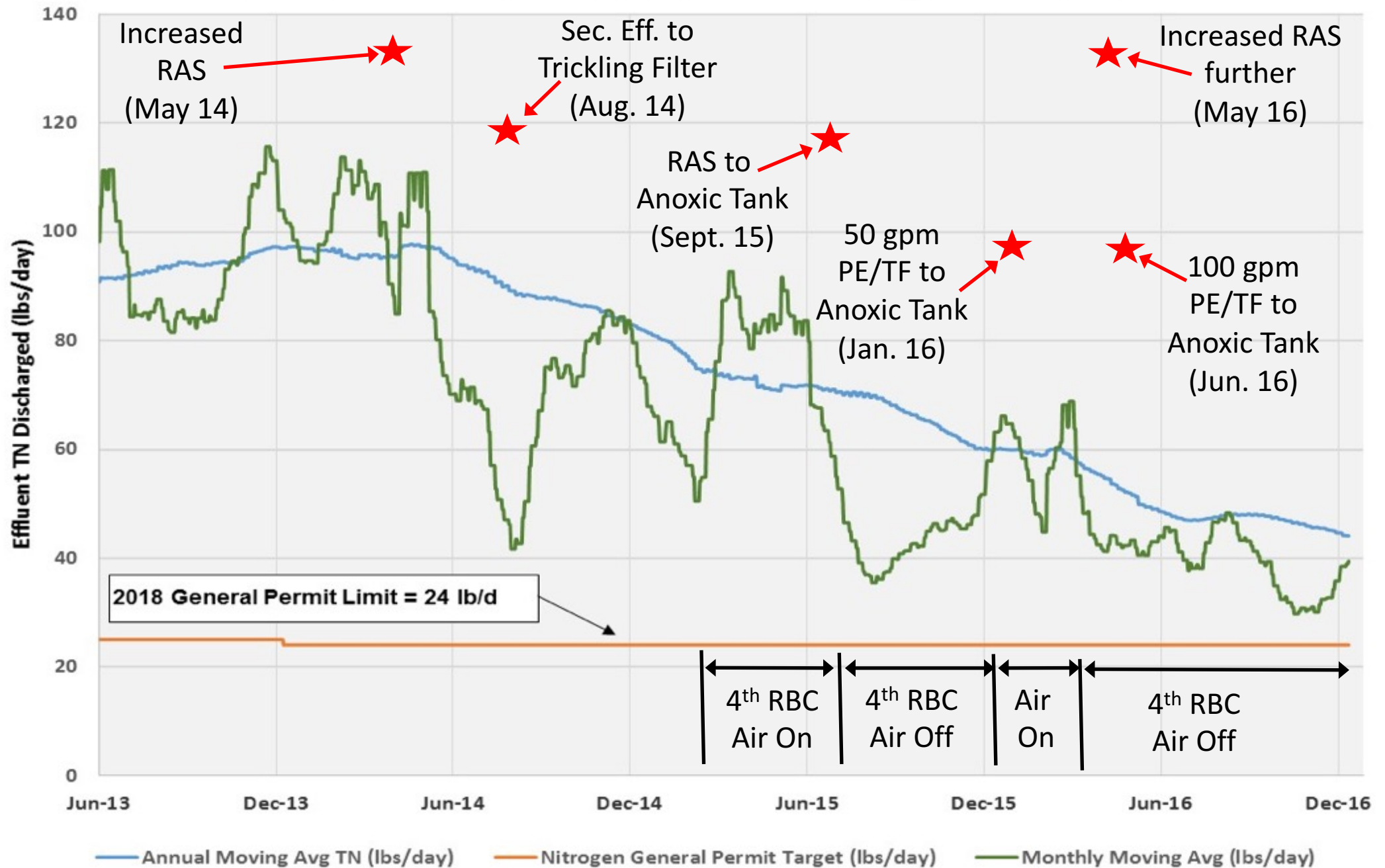
# Effluent Total Nitrogen vs. General Permit Target







# Effluent Total Nitrogen vs. General Permit Target - Denitrification





# Summary and Conclusions

- Significant nitrogen removal can be achieved even in plants not designed for nutrient removal
  - Results achieved approximately 60% TN reduction without significant capital or operating costs
  - Annual cost savings estimated at \$30,000 per year at credit cost of \$6.80/lb
- In Canton, the successful approach included:
  - Effective collaboration between operations staff and process engineering
  - WPCF staff developing and implanting practical solutions to achieve changes in plant configuration and operation
  - Using a careful and patient process control approach





# Questions?

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