



Idaho Water Resources Board

# Snake Water, Algae, Spiders and more! Pilot Plant Operations on the Snake River



PNWS AWWA Conference  
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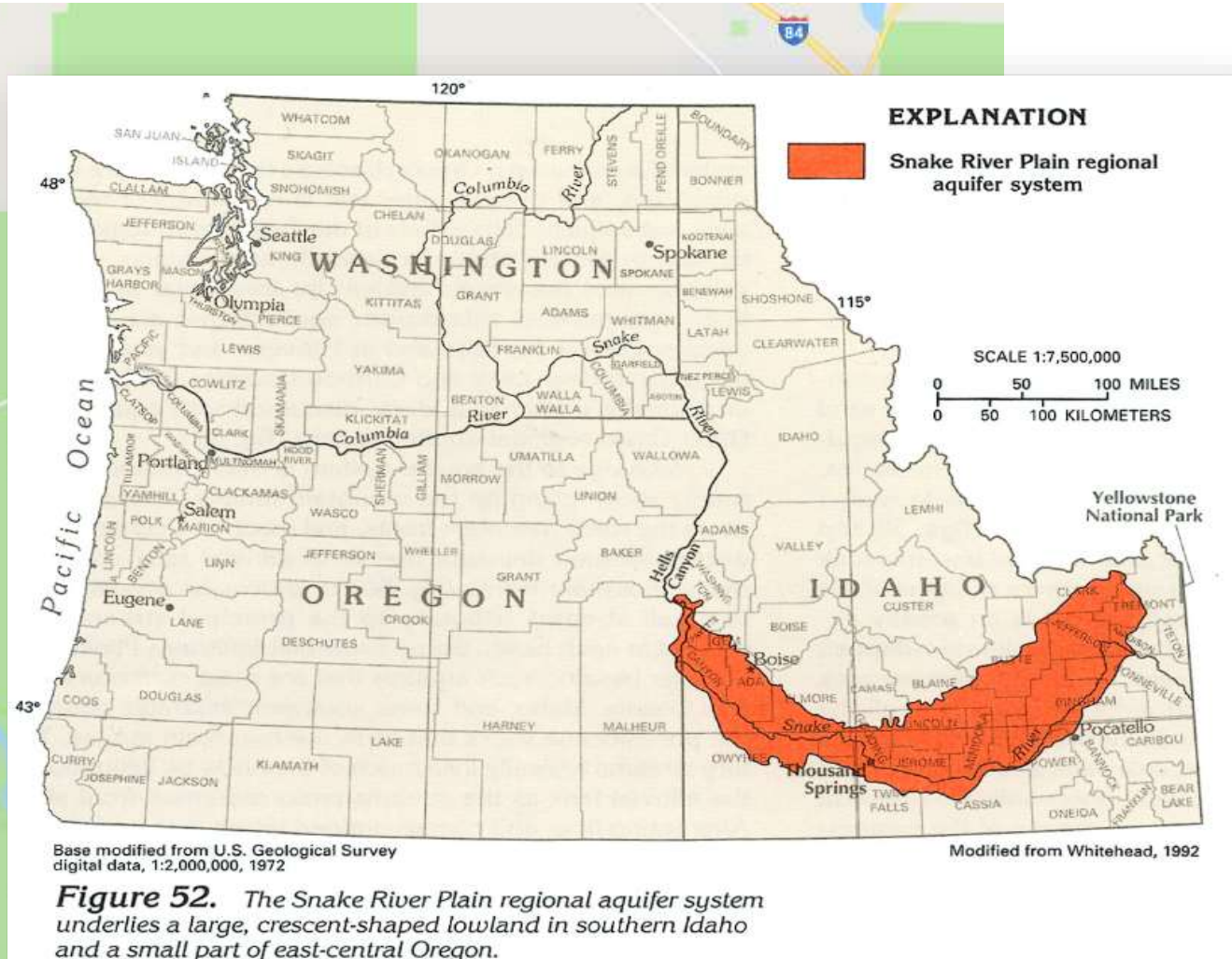
# Outline

- Project Overview
- New Drinking Water Source
- Pilot Plant Location
- Initial Sampling
- Pilot Plant Operation
- Water Quality Fluctuations and Response
- Next Steps



*Pilot Plant Filters*

# Project Background



# New Drinking Water Source



# Pilot Plant Location

- Access to reservoir water
- Proximity to intake structure
- Accessible utilities (i.e. Power)



# Pilot Plant Location

- Constraints:
  - Limited cell phone service
  - Limited access to potable water
  - Health & Safety Provisions



# Initial Data Review

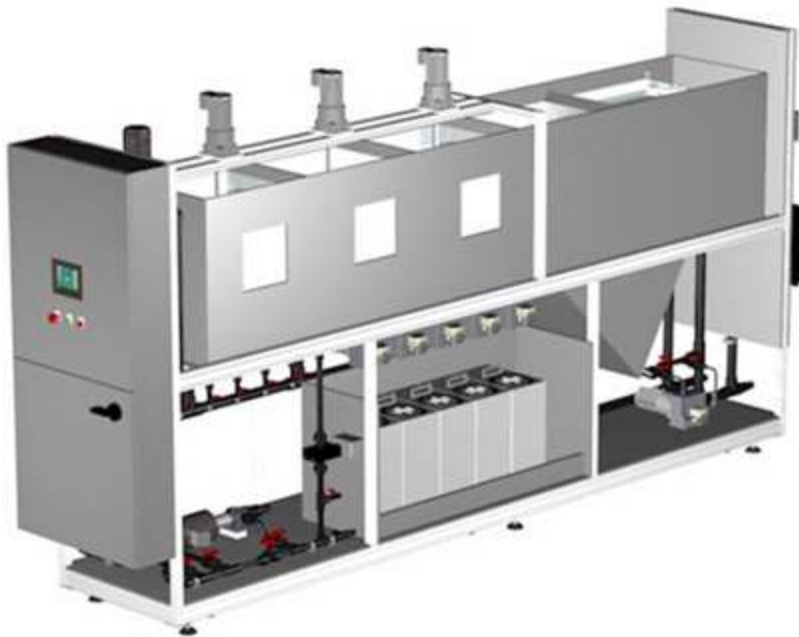
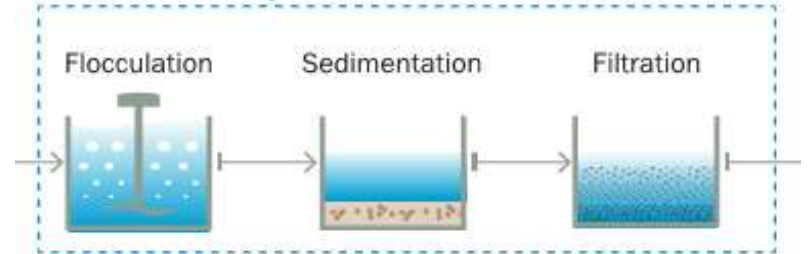
- Limited Historical Data
- Water Supply Planning Study by SPF Water Engineering
  - Low Turbidity, low-modest TOC
  - Average nutrients
  - Conventional filtration recommended by SPF

Raw Water Sampling (SPF 2016)				
Parameter	Unit	January	August	MCL
Turbidity	NTU	3.1	3.4	--
Total Organic Carbon	mg/L	1.0	1.6	--
Nitrate (as N)	mg/L	2.1	0.9	10
Nitrite (as N)	mg/L	0.02	0.03	1

# Pilot Plant System

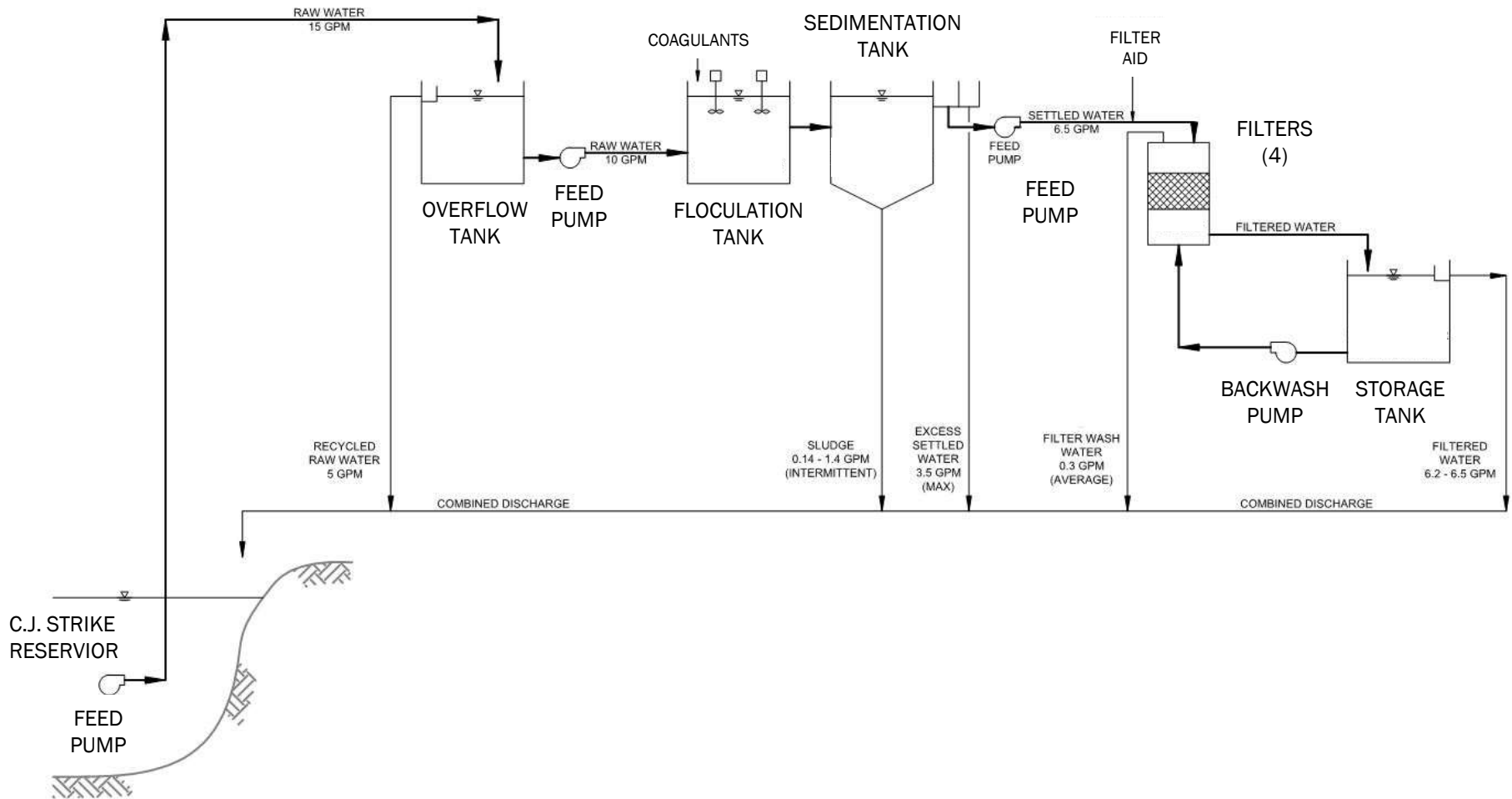
- Pilot Conventional Treatment
- Packaged system provided by vendor

2017 Pilot Study



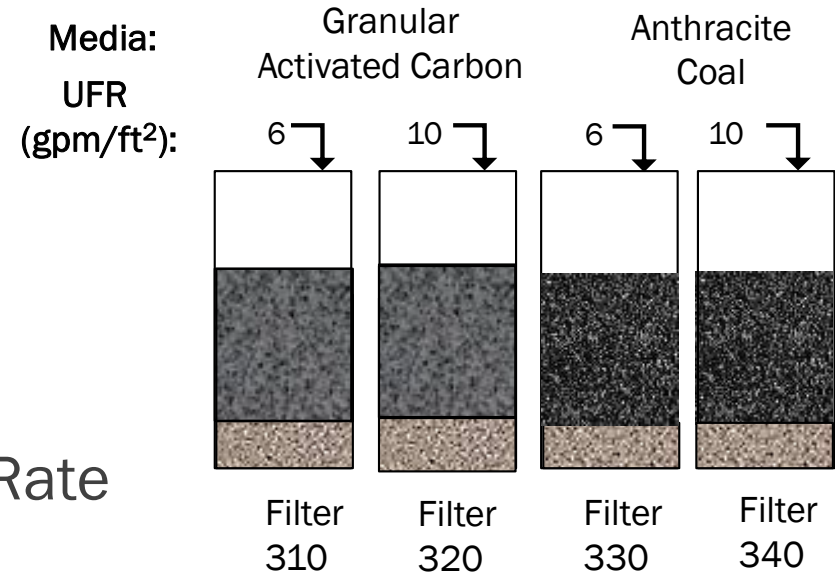


# Pilot Plant Process Flow Diagram



# Pilot Plant Objectives

- Develop Design Basis for;
  - Mixing Velocity Gradient
  - Flocculation Detention time
  - Sedimentation Surface Overflow Rate
  - Test Chemicals and Doses
  - Unit Filtration Rates (6 – 10 gpm/ft<sup>2</sup>)
  - Filter Media
- Additional Goals
  - Identify Seasonal Operational Challenges
  - Compare direct filtration to conventional filtration



# Assembly and Start-Up



# Start-Up Preparation (June 2 – 8)

- Required constant supervision
- Media backwashed for fines removal
- Sidewall forces affected backwashing
  - Added air scour and backwash flow
- 48 Hour Media Acclimation



*Filter backwashing in progress*

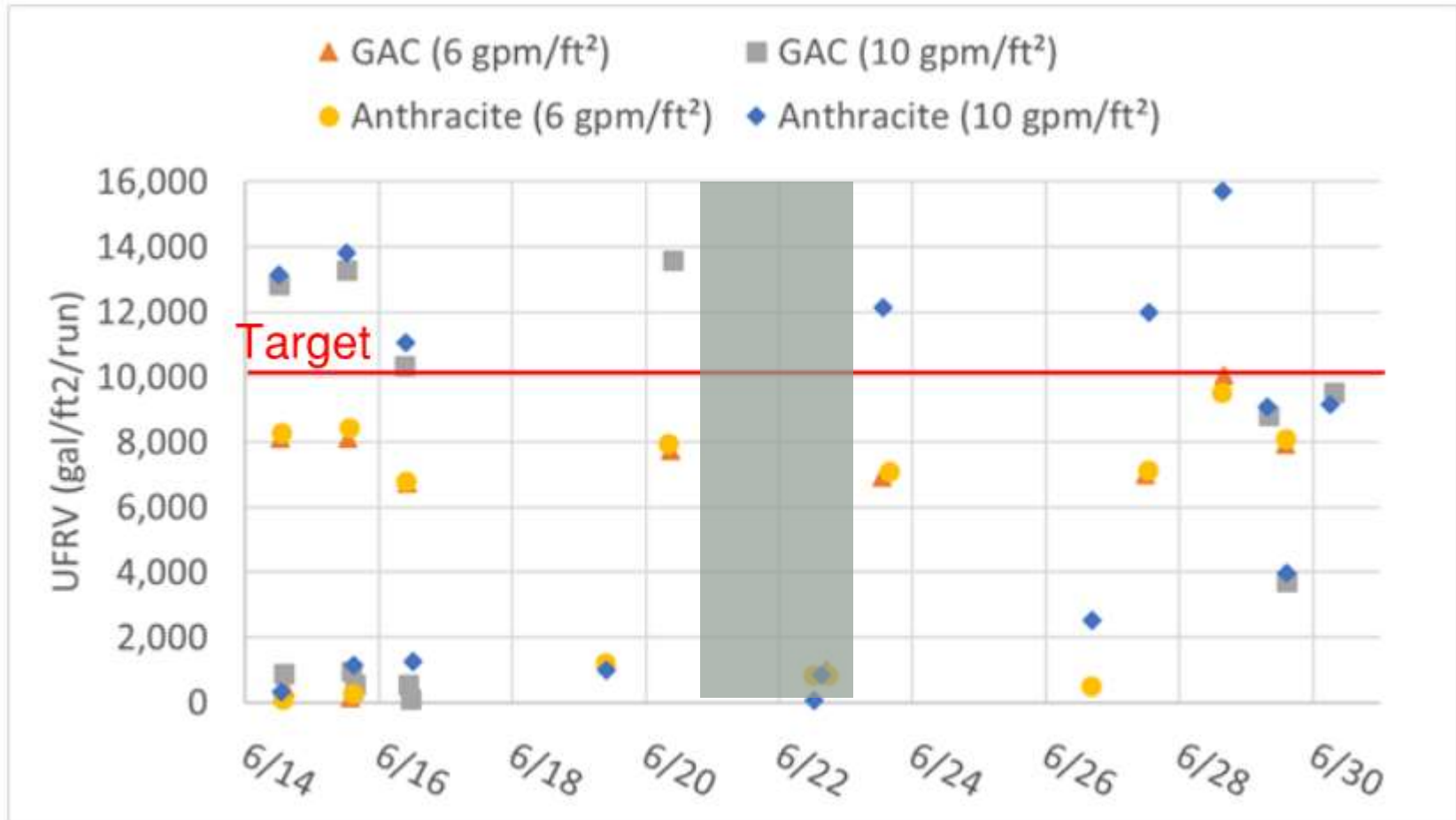
# Start Operation (June 13 – 16)

<b>Initial Plant Operations</b>	
<b>Flocculation Sedimentation Module</b>	
Flow Rate, gpm	6.5
Flocculation HRT, Min	16.9
Flocculant	Poly Aluminum (PACl)
Dose as Aluminum, mg/L	2.0
Coagulant Aid	Used
Dose, mg/L	1.0
Normalized SOR (gpd/ft <sup>2</sup> )	165
Nominal SOR (gpd/ft <sup>2</sup> )	1,244
Filter Aid	None
Dose, mg/L	-
<b>Filtration Module</b>	
Filter Unit Flow Rates, gpm/sf	
GAC	6.0
GAC	10.0
Anthracite Coal	6.0
Anthracite Coal	10.0

# Column Failure (June 20 - 22)

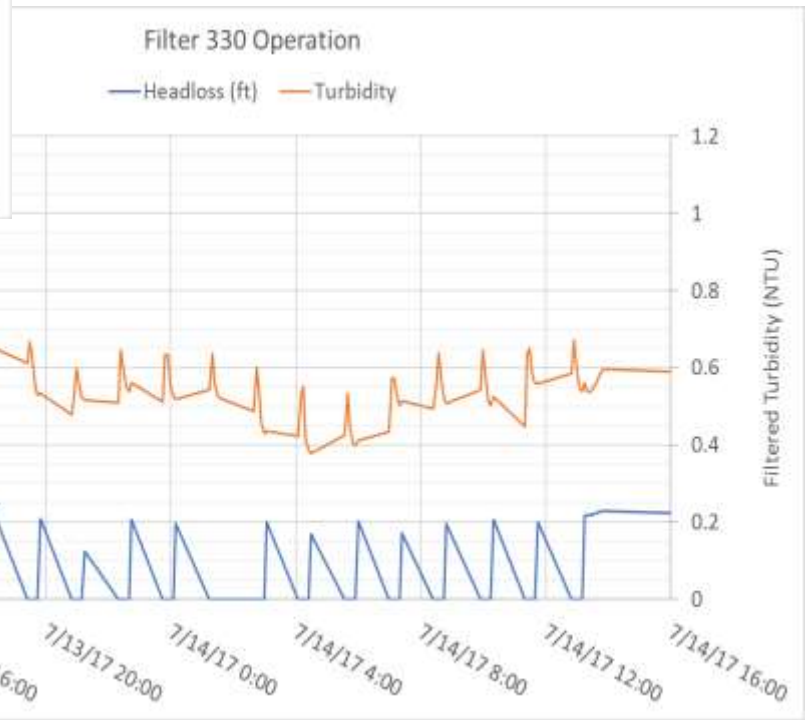


# Operations Review (June 14 – July 1)



# Onset of Algae Issues (July 5 - 14)

Backwash Water Production

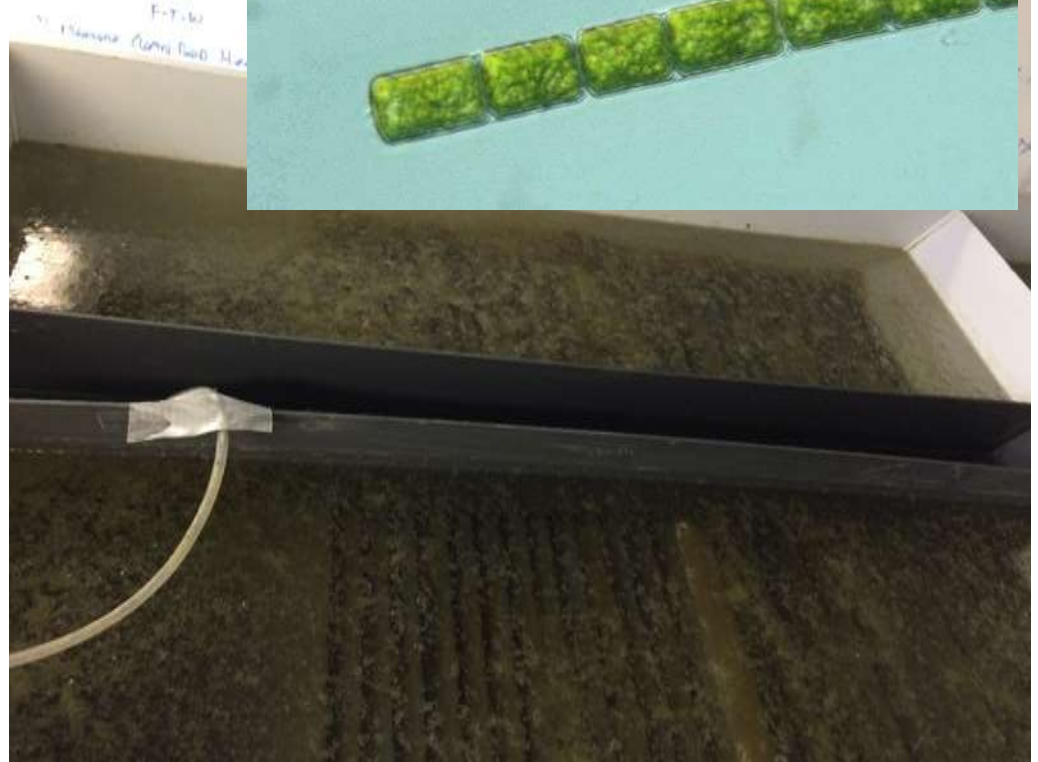


Filter Continuously Backwashing



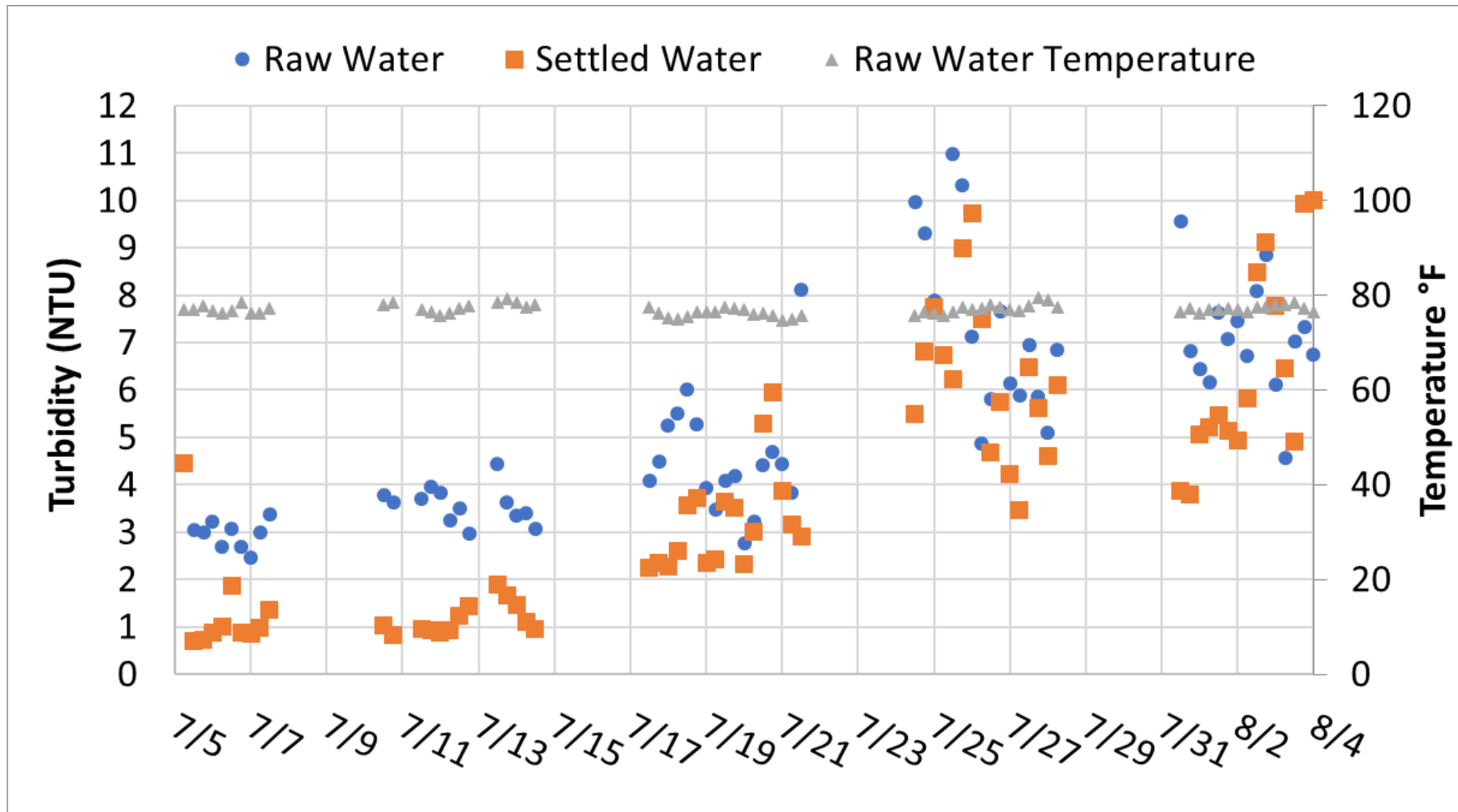
# Onset of Algae Issues (July 5 – 14)

- Algae Samples Tested on July 19
- Melosira
  - Count 1,144 /mL
- Total Algae
  - Count 2,496/mL
- Observed thick surface blanket in sedimentation basin.



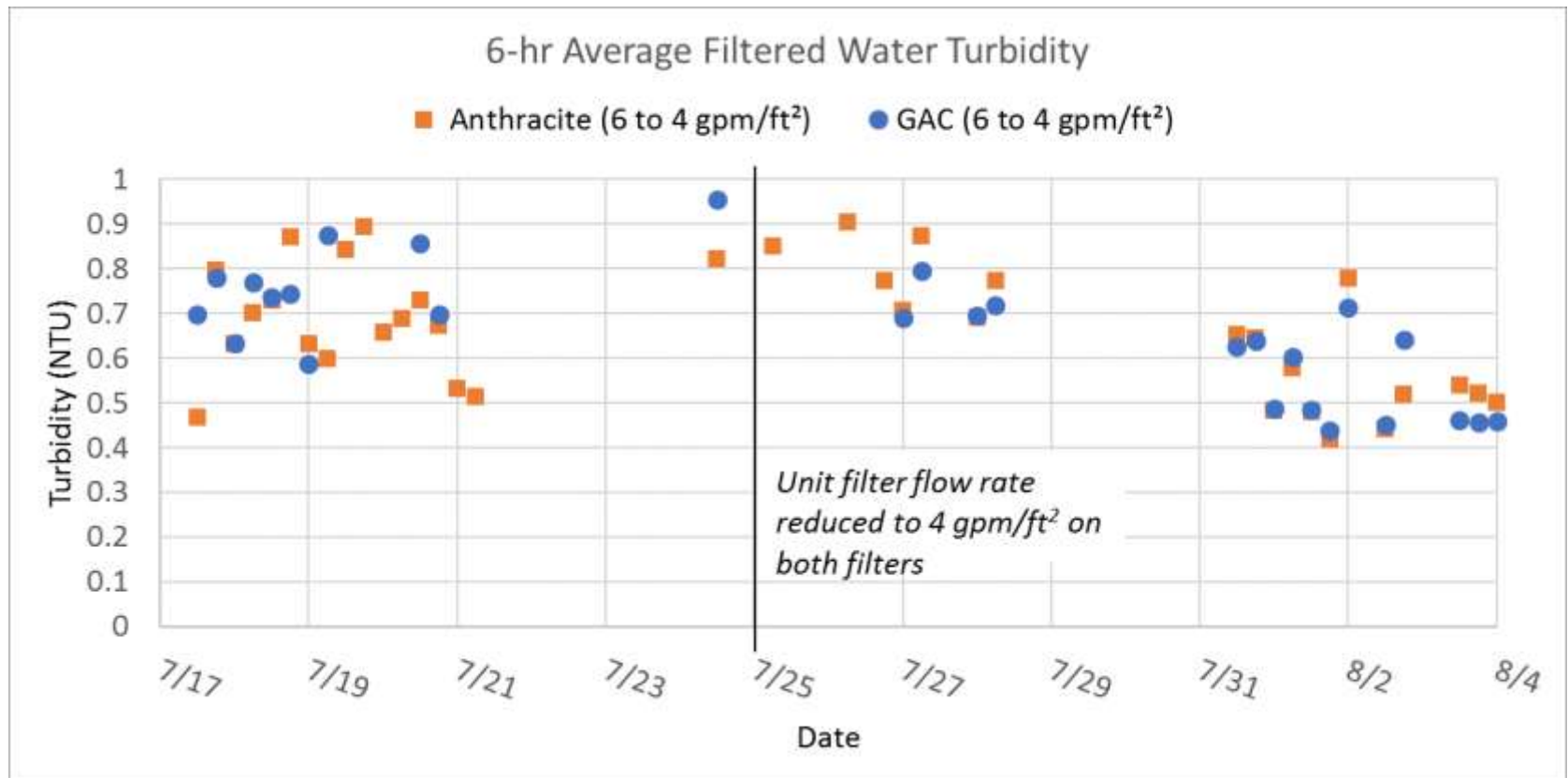


# Flocculation/Sedimentation Response (July 5 - Aug 4)



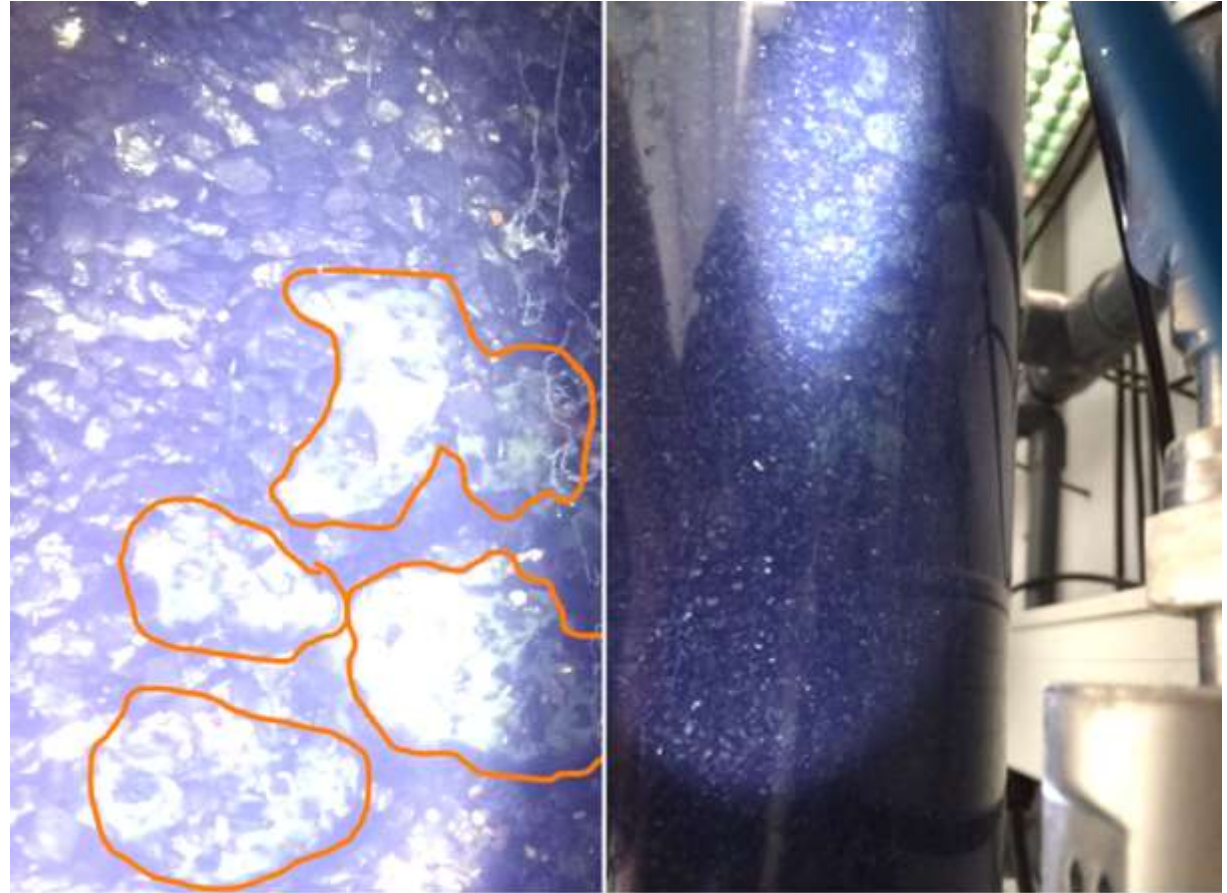
# Filter Response (July 17 – Aug 4)

- Reduced Unit Flow Rates
  - 4 gpm per ft<sup>2</sup> and 6 gpm per ft<sup>2</sup>
- Cleaned filter screens



# Continued Algae Problems (Aug 8 – 14)

- Algae growth in columns
  - Physical Clean August 8<sup>th</sup>
- Additional jar testing coagulants
- Mud balls formed
  - Chemical Clean
  - August 14<sup>th</sup>



# Chlorine Shock Treatment (Aug 14)

- 25 mg/L Free Chlorine
- 24 Hour Contact Time
- Intense backwash and screen cleaning



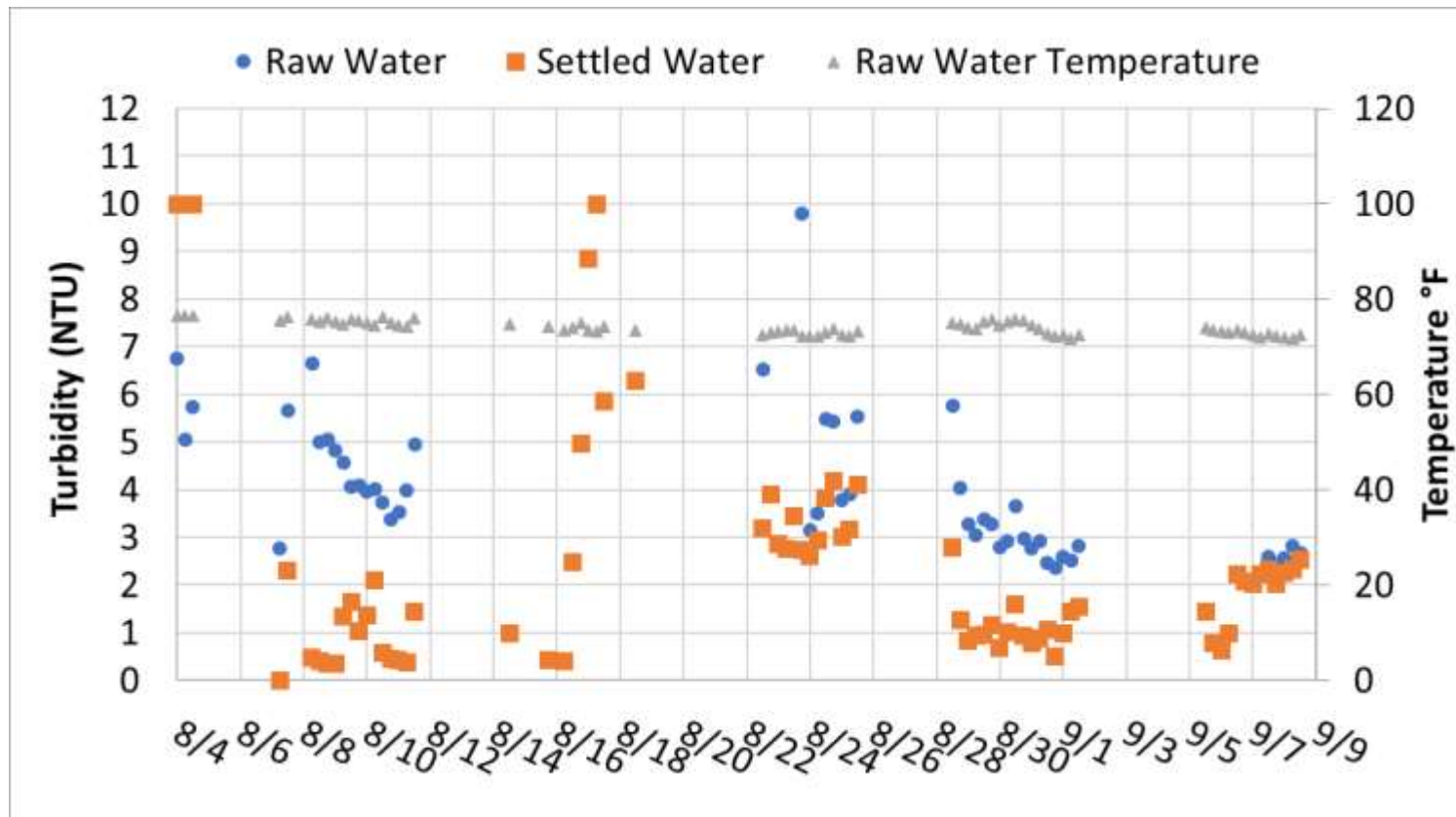
Pre Treatment



Post Treatment

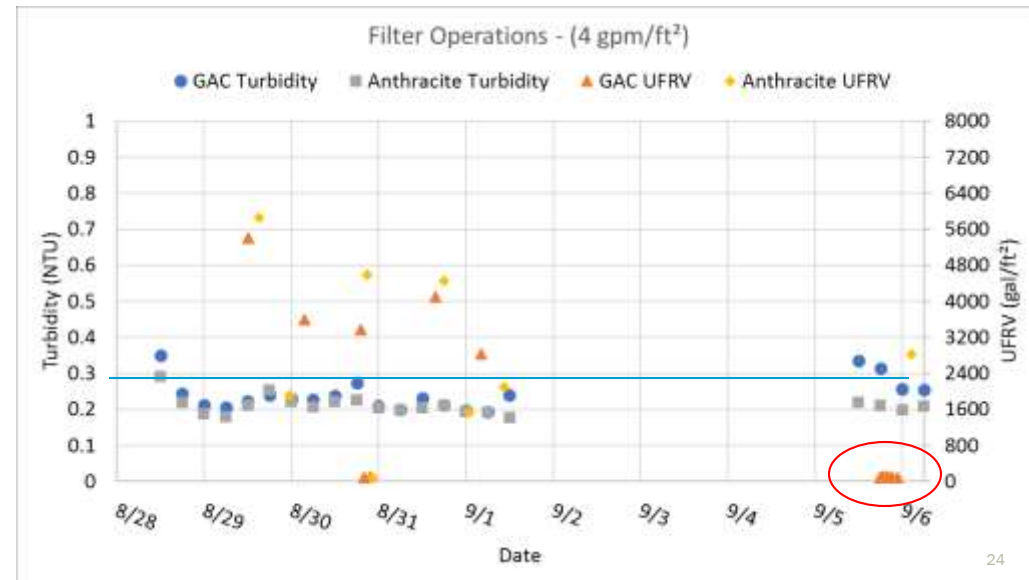
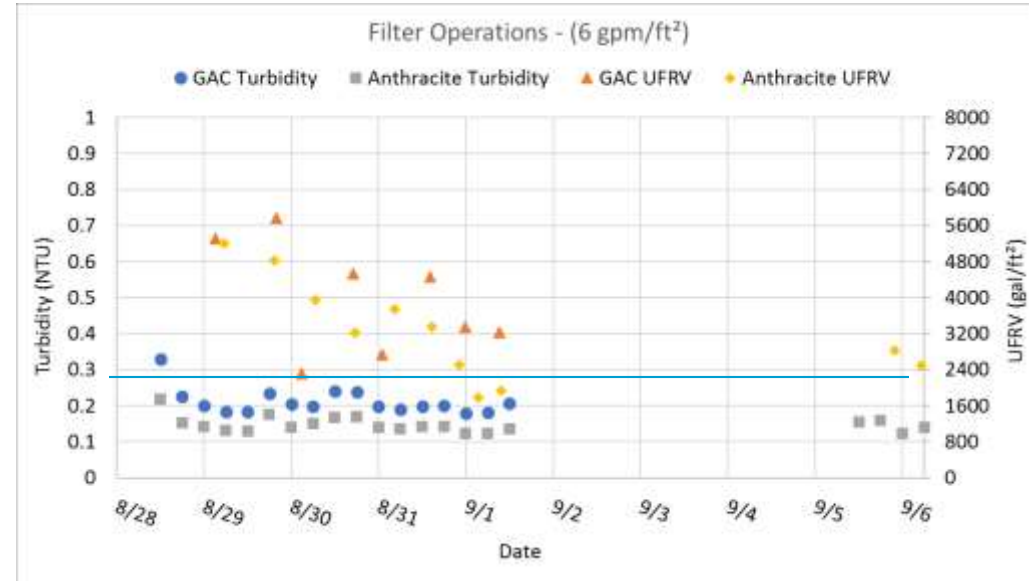
# Start of Recovery (Aug 17 – Sept 9)

- Raw Water Turbidity Drops
- Settled Water Turbidity Stabilizes



# Start of Recovery (Aug 17 – Sept 9)

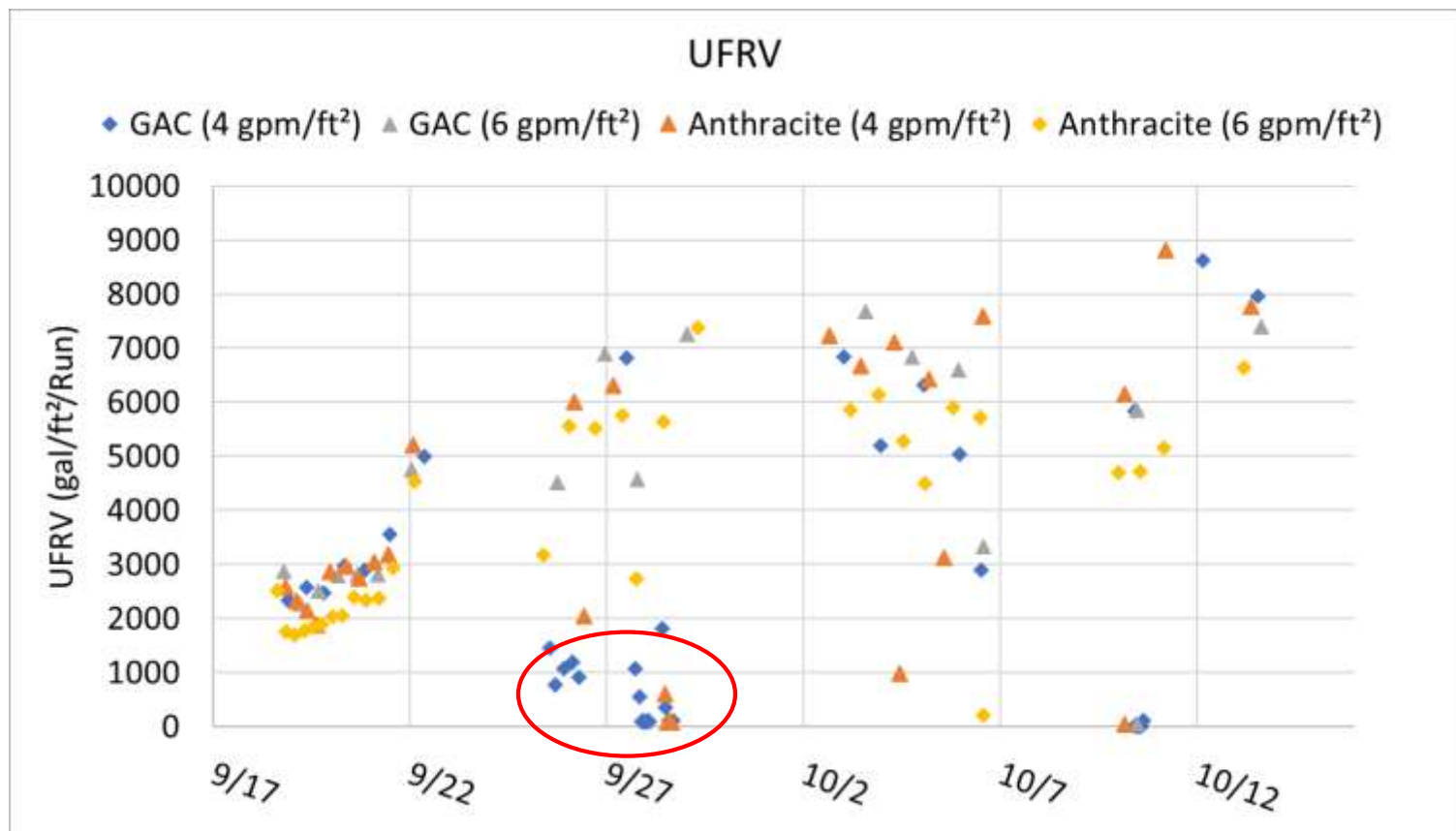
- Post cleaning filtrate turbidity improves
- Backwash triggered by high headloss
- Improvements began week of August 28<sup>th</sup>
- Mechanical malfunctions early September





# Performance Improvements (Sep 20 - Oct 17)

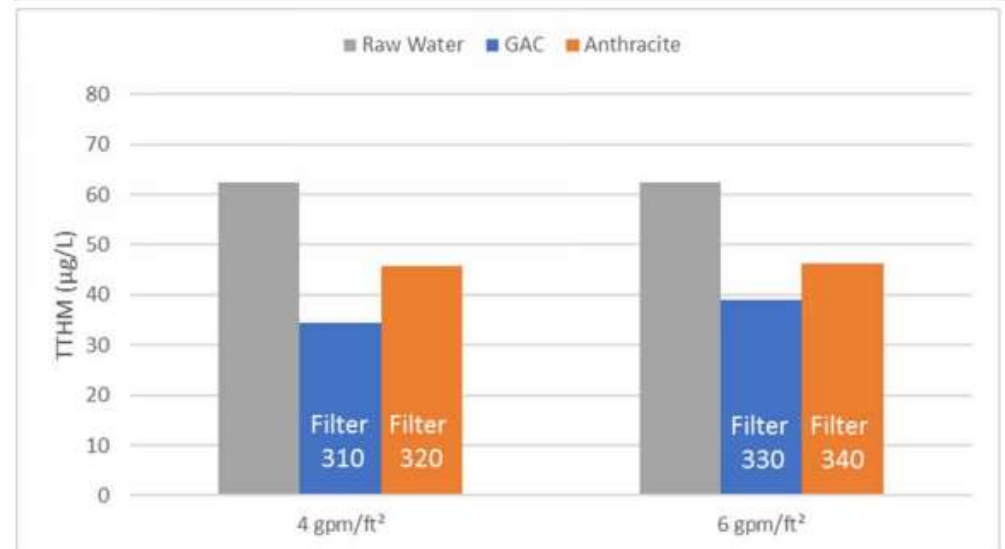
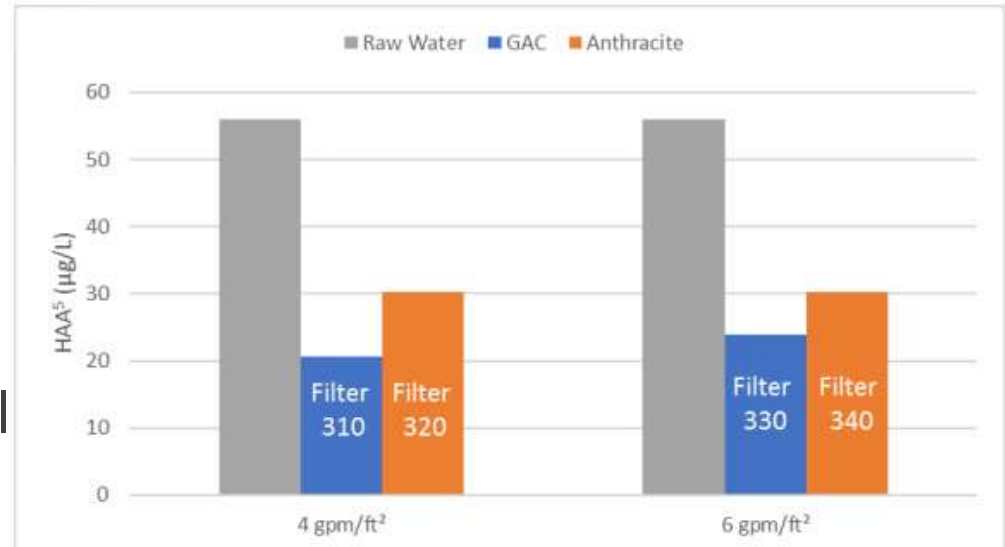
- Multiple Media and Screen Cleanings
- UFRV Improves



Sep 27<sup>th</sup> physically cleaned screens and media surface

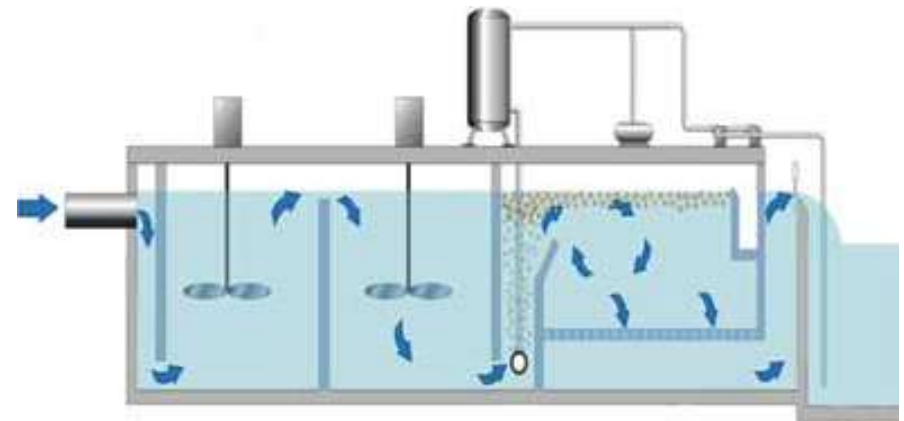
# Final Testing and Shutdown (Oct 17 – Oct 31)

- Final Week Sampled
  - Total Organic Carbon
  - Dissolved Organic Carbon
  - Total Trihalomethanes (TTHM) Formation Potential
  - Haloacetic acid (HAA5) Formation Potential



# Results

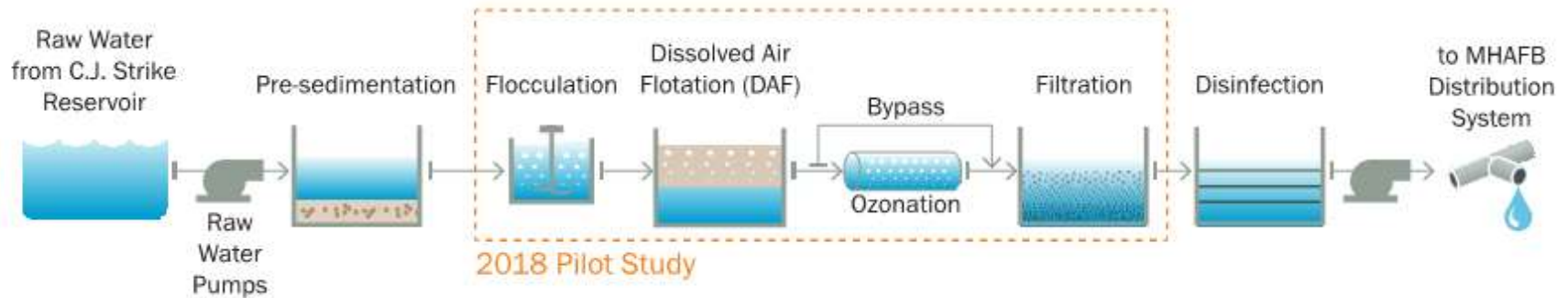
- Shut plant off early
- Conventional filtration plausible when algae not present
- Potential Algae Solutions
  - Covered Pre-Sed Basins
  - DAF
  - Ozone (*Potential Bromate*)
  - *Filtration*
- Proposed 2018 Pilot Plant Work



*Dissolved Air Flotation  
Process*

# Next Phase

- Summer 2018: Next Phase of Pilot Testing
- 2019: DBO Selection
- 2019 - 2021: Implementation



# Unexpected Visitors





Questions?

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**Brown AND  
Caldwell**