WHY CARE ABOUT PRETREATMENT?

getting the most out of your GAC contactors

ACTIFLO® CARB PILOT STUDY SUMMARY

VEOLIA

Technical & Performance Optimization

Pilot Testing Period: June 6 - July 1, 2022
Bellingham, MA

VEOLIA

Hartford Ave WTP- Bellingham, MA

Population ~ 18,000.

SouthWest of Boston.

4 wells serve as source water.

Occasional DBPs.

Began routine testing for PFAS in 2020.

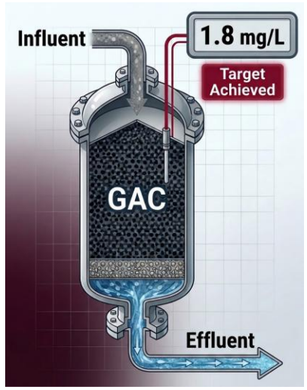
Decided to pilot Actiflo vs DAF for GAC pretreatment.

Project Objectives

Goal 1: EXTEND GAC

media life by reducing influent TOC to <2.0 mg/L

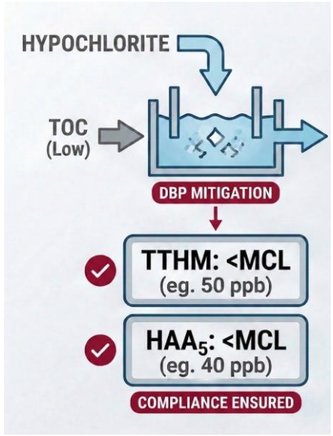
Reduce Total Organic Carbon (TOC) to **< 2.0 mg/L** prior to Granular Activated Carbon (GAC) media to prevent premature exhaustion.



Goal 2: CONTROL DPBs

by reducing TOC

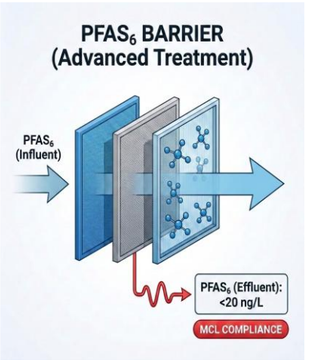
Prevent the reaction between Hypochlorite and TOC to mitigate DBPs, keeping TTHM and HAA_5 levels below MCLs (Minimum Containment Level).



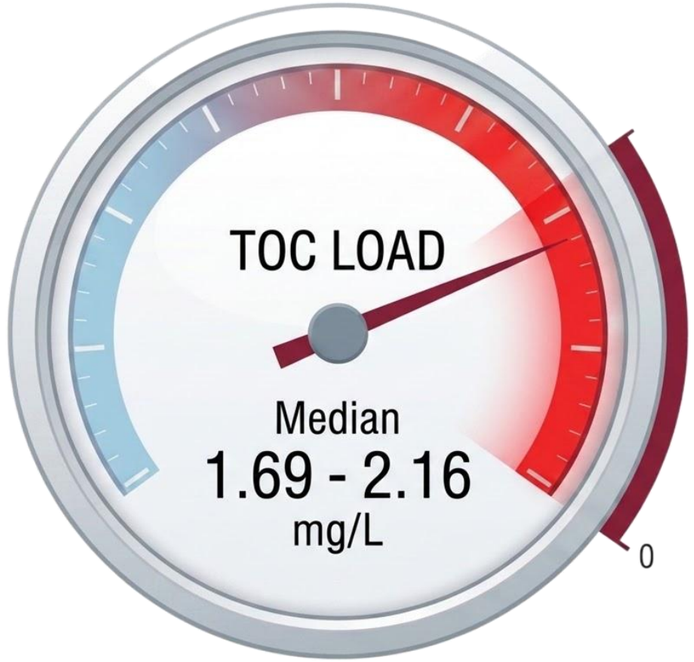
Goal 3: REDUCE

$PFAS_6$ below Mass DEP regulation

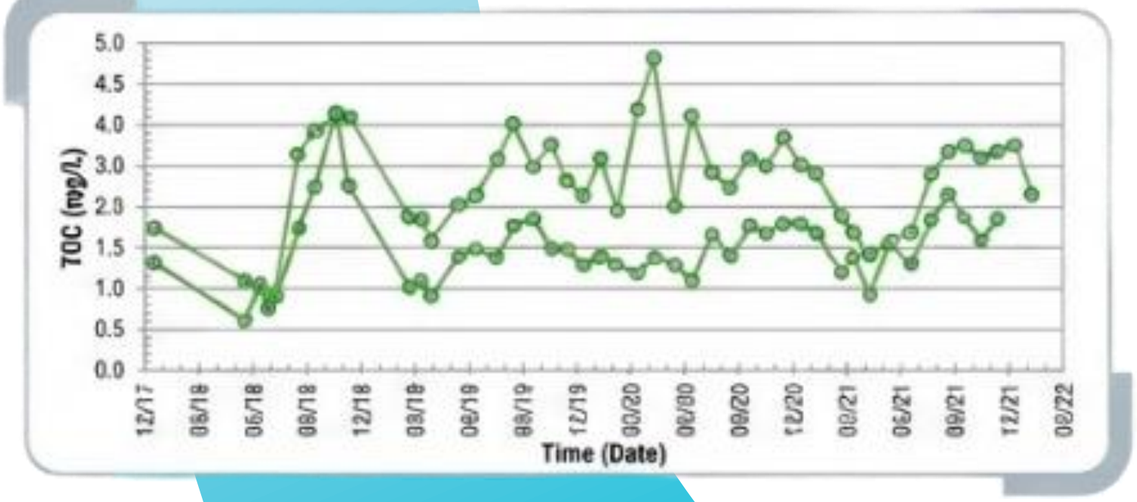
Reduction of six regulated per- and polyfluoroalkyl substances below the Mass DEP MCL of **20 ng/L**.



Influent Water Quality Dashboard

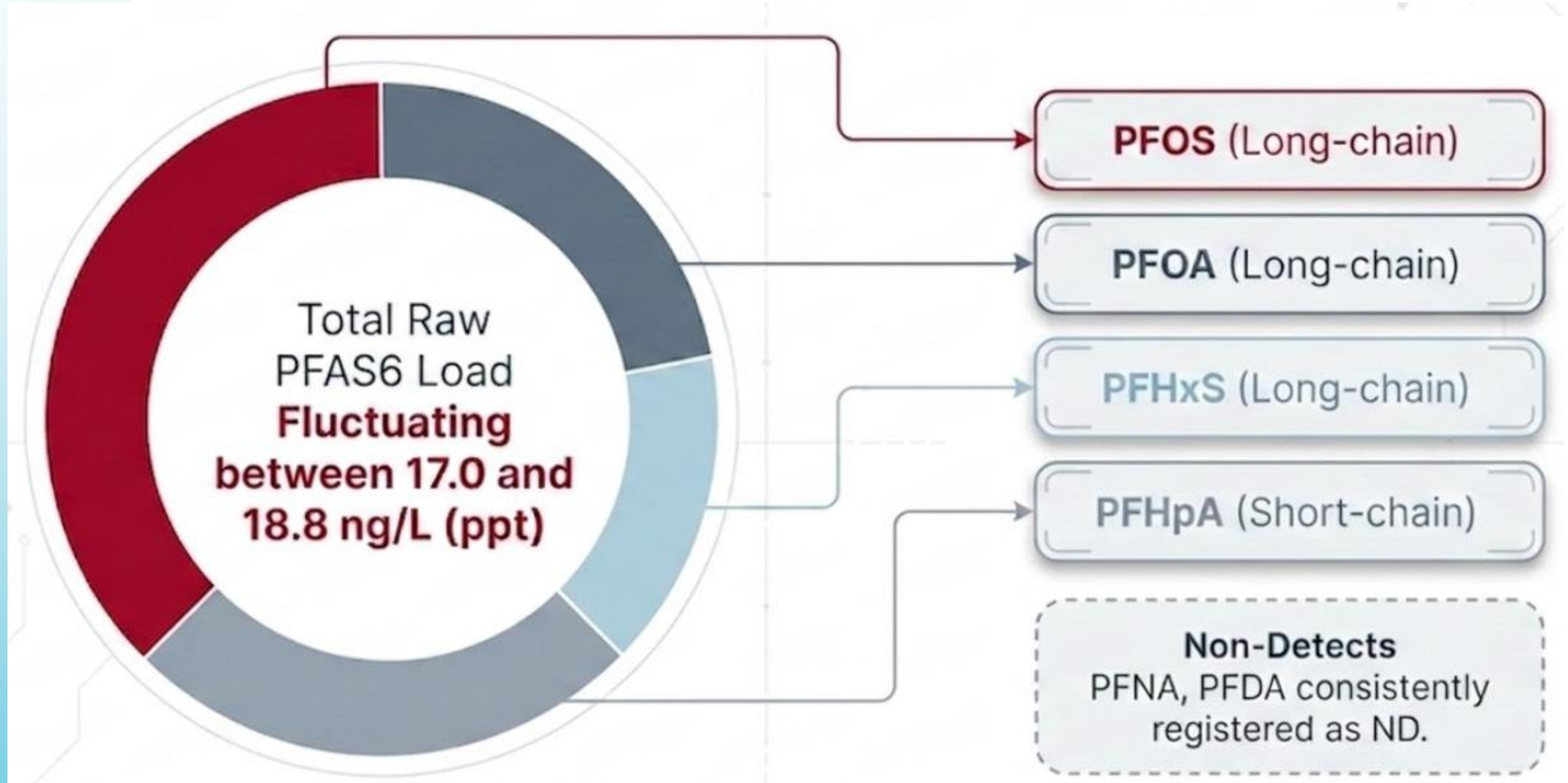


spikes up to 5.0 mg/L threaten downstream GAC



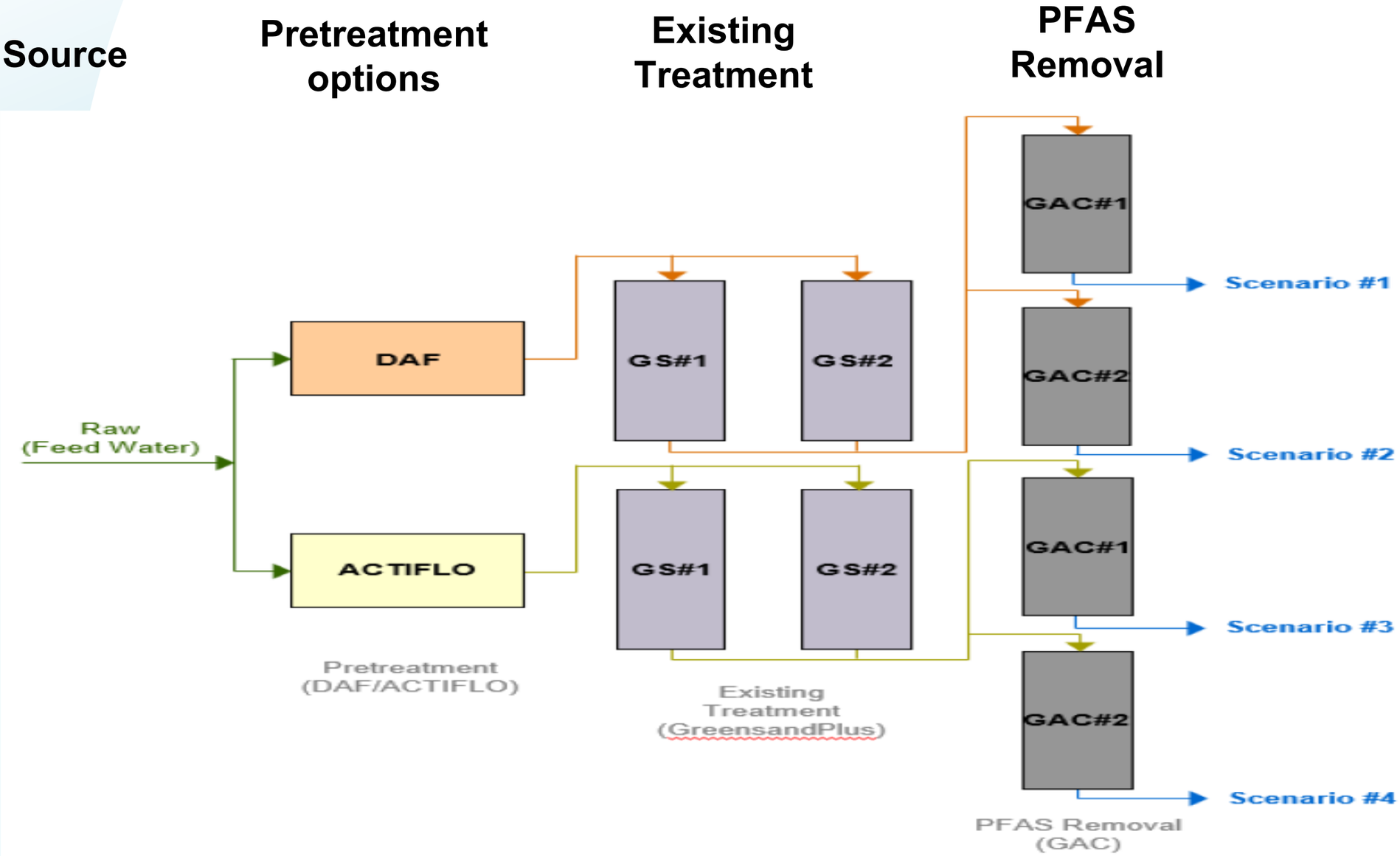
Highly variable influent parameters necessitate a high-rate, highly adaptive pretreatment clarification process.

Influent Water Quality Dashboard

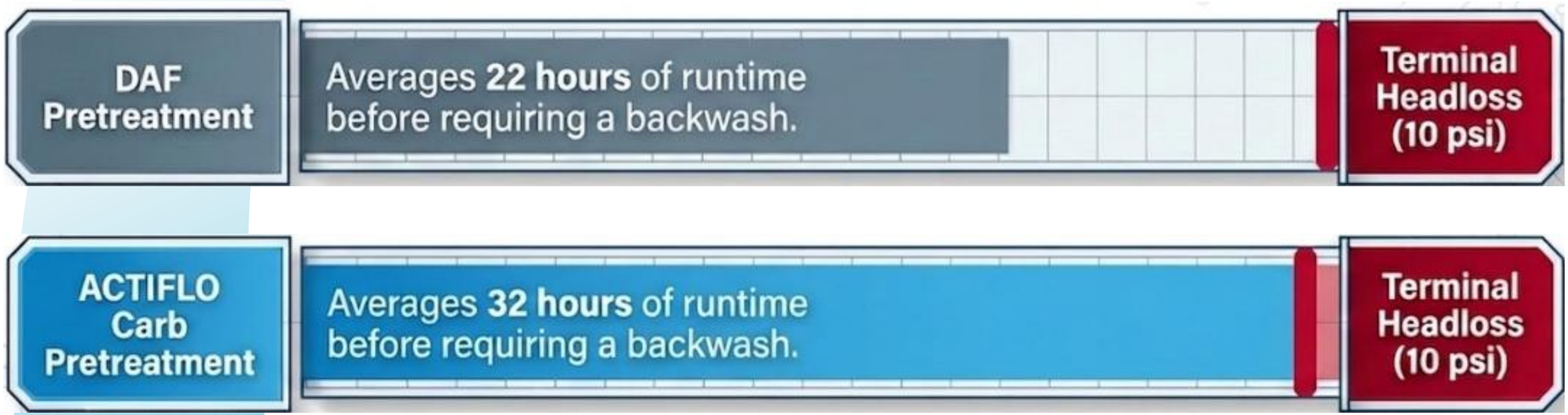


The raw water hovers close to, and historically spikes above, the Mass. DEP MCL of 20 ng/L.

Pilot Study Process Flow Diagram



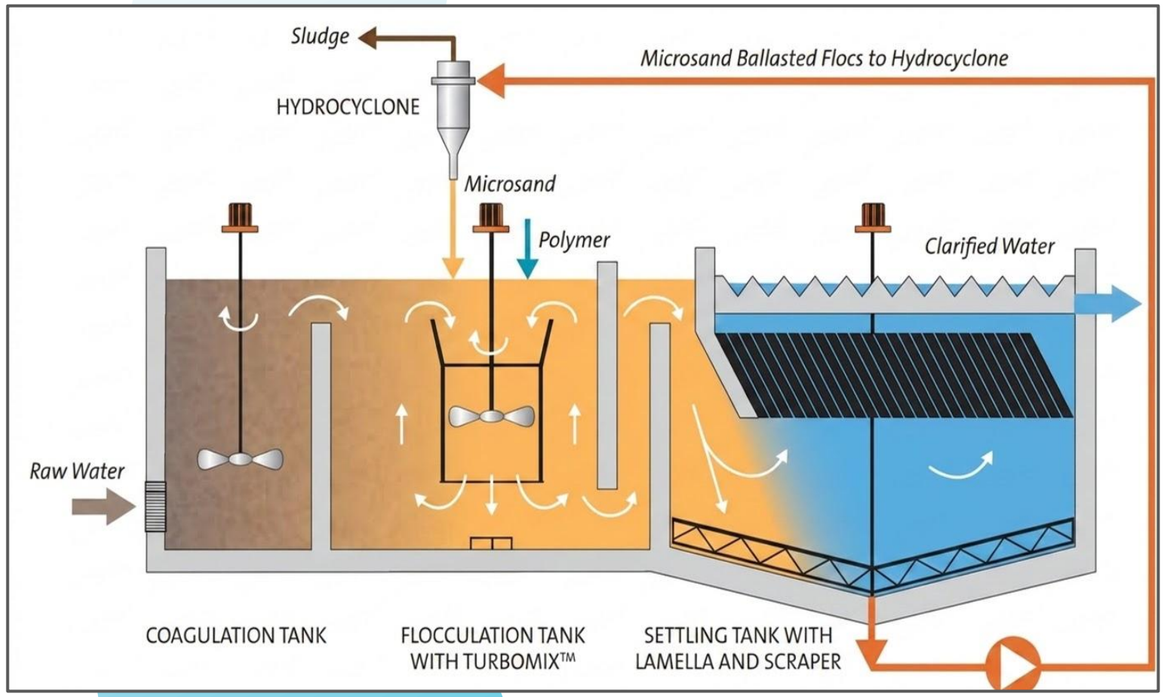
Pre-treatment System Operational Comparison



ACTIFLO® CARB yields a 45% increase in operational uptime for downstream filters due to Iron and TOC reduction.

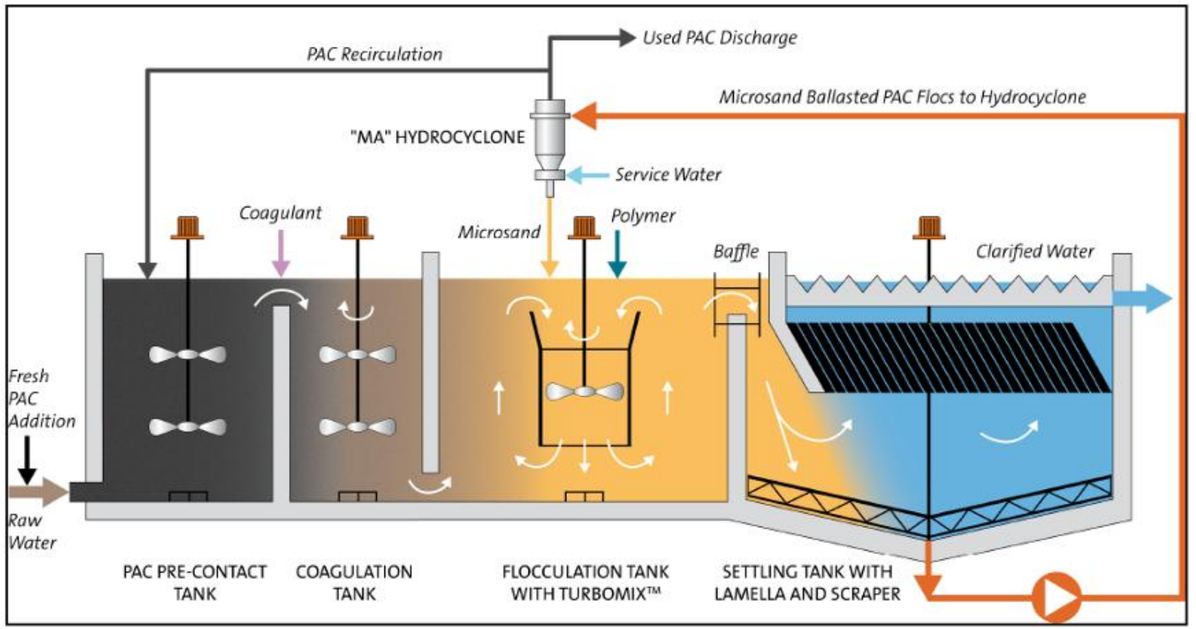
ACTIFLO® System Technical Comparison

ACTIFLO®



High-rate, microsand ballasted clarification system. Utilizes coagulant and polymer to bind pollutants, with the microsand accelerating settling.

ACTIFLO® CARB



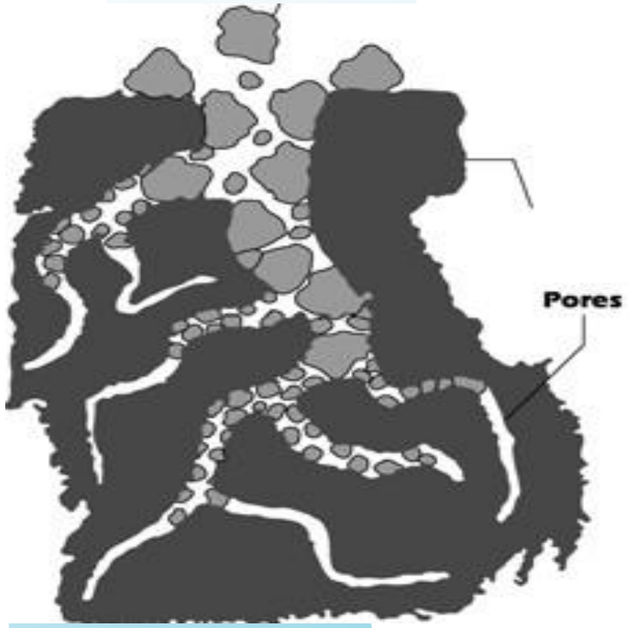
PAC Pre-contact Tank

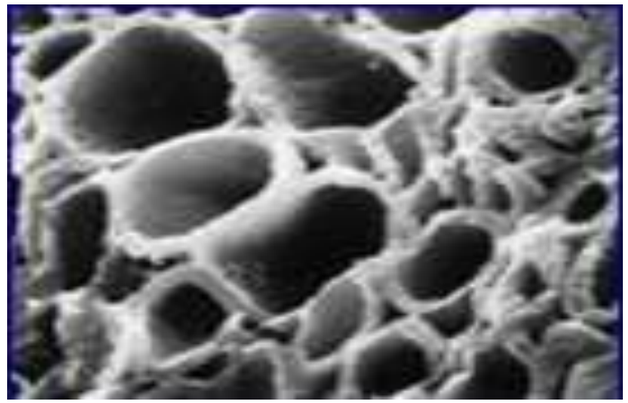
Added at the beginning of the process for advanced organic compound adsorption.

PAC Recirculation

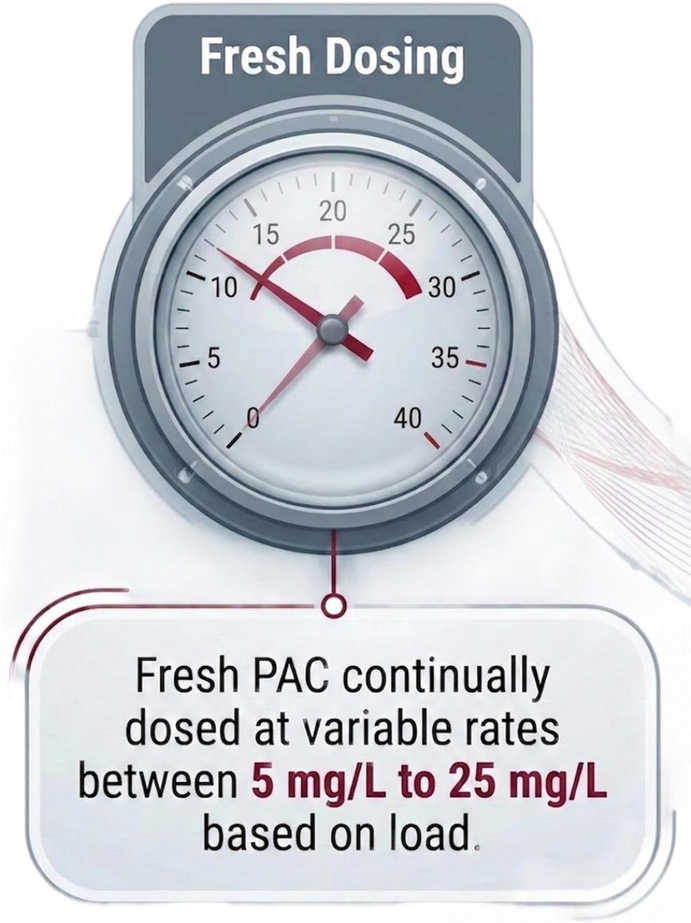
Continually returns PAC flocs from hydrocyclone to maximize carbon site utilization.

ACTIFLO® CARB Contact Tank Operation





PAC seen with microscope with mesopores (< 25 nm) and micropores (< 1 nm)



The system maintains a constant PAC tank concentration of 800 - 1,000 mg/L, ensuring maximum pollutant adsorption.

Chemical Dosage Optimization

Coagulant Options

Aluminum Sulfate (Alum): 48.5% active	**PolyAluminum Chloride (PACl) 100% active**

Polymer Options

Hydrex 3521: Anionic polymer for primary floc binding.	**Hydrex 3621: Cationic polymer.**

Find the exact dosage combination that **maximizes TOC/Iron/PFAS removal** while **minimizing chemical spend** and **sludge production**.

ACTIFLO® System Operational Comparison

ACTIFLO® Mode Baseline

ACTIFLO® CARB Mode Baseline

Alum Operation	PACl Operation
15 mg/L Alum + 0.70 mg/L polymer	25 mg/L PACl + 0.80 mg/L polymer

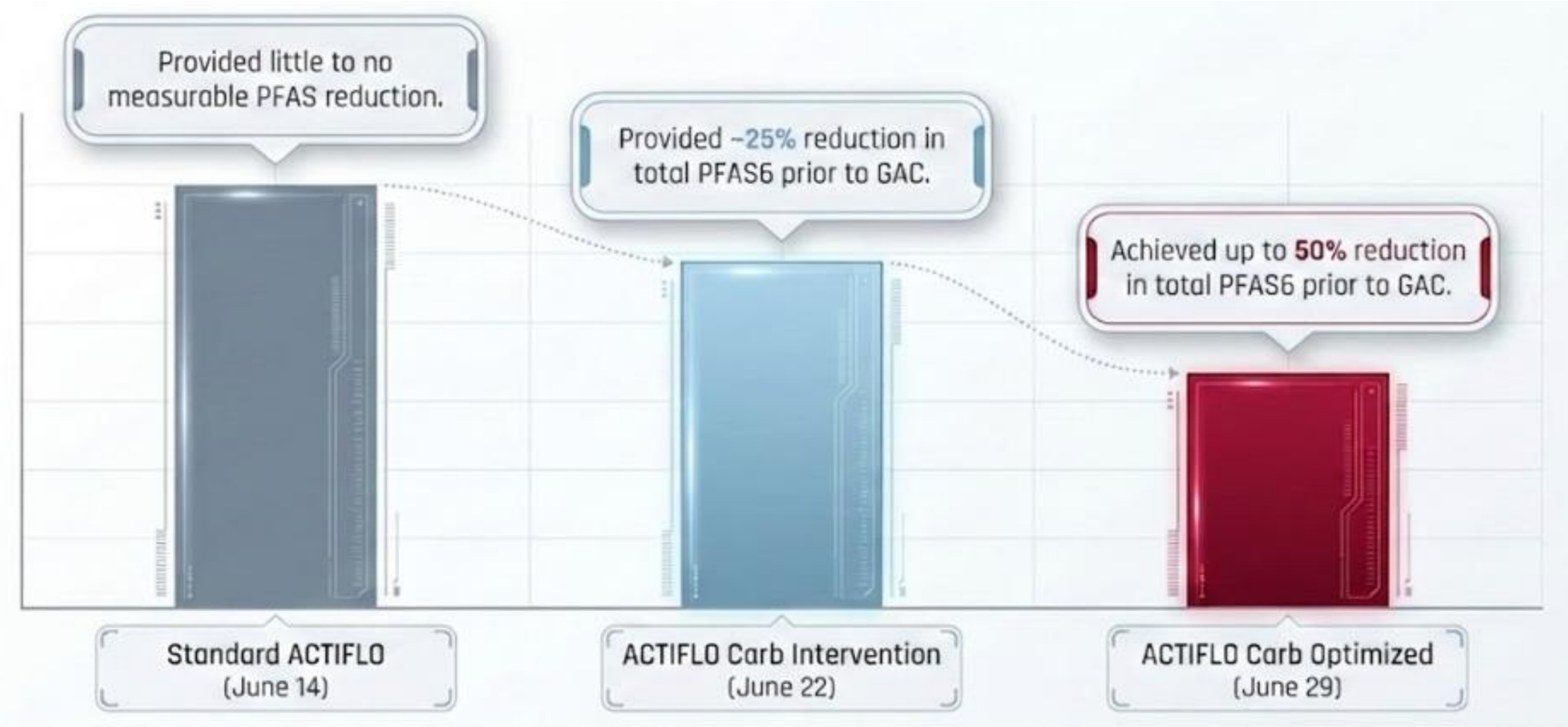
Note: Increased polymer demand (0.60 - 1.0 mg/L) due to PAC addition.

ACTIFLO® System Operational Comparison

ACTIFLO® Mode	ACTIFLO® CARB Mode
Total Iron Reduction: ~28% TOC Reduction: ~35%	Total Iron Reduction : ~54% TOC Reduction: 49 - 58%

While standard ACTIFLO® provides excellent baseline clarification, the addition of PAC with ACTIFLO® CARB is consistently able to increase TOC and Iron removal.

ACTIFLO® System Operational Comparison



By reducing up to half of the PFAS load in the pre-treatment phase, ACTIFLO® CARB can extend the bed life and economic efficiency of downstream GAC contactors.

Head to head Pre-Treatment System operational Comparison

	TOC Removal	IRON Reduction
DAF	44.9-46.6%	25-30%
Actiflo®CARB	up to 58%	57-59%

Pre-treatment System Goals

- GOAL 1 Reduce TOC <2.0 mg/L, reducing GAC fouling and extending GreenSand filter run times by 45%.
- GOAL 2 Reduced DBPs below MCL by reducing organic precursors.
- GOAL 3 Demonstrated reduction in PFAS6 by 50% thereby reducing the downstream load on the GAC reactors.

Thank you to Wright-Pierce for letting us participate, and thank you to Blueleaf for managing the Hartford Ave. Pilot Study.

Questions?

Wayne M. Emery
Veolia
wayne.emery@veolia.com

Bryan Fincher
Veolia
bryan.fincher@veolia.com