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Removing PFAS: Startup and Performance of the Coupeville GAC Treatment System

Esther Chang, EIT
Matt Maring, PE, PMP

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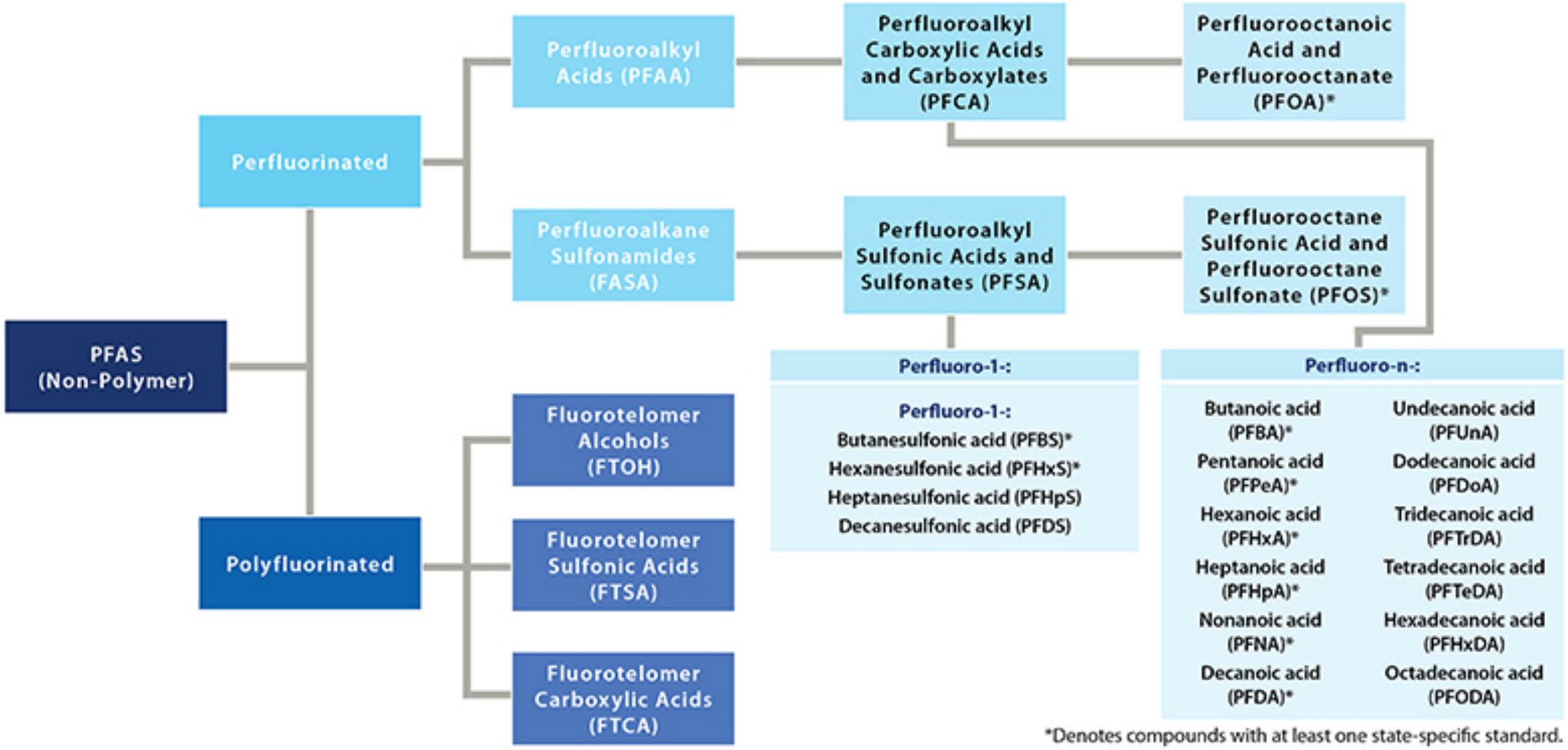
Agenda

- Project Background
- Regulatory Framework
- System Design
- Implementation
- Startup
- Operations and Performance

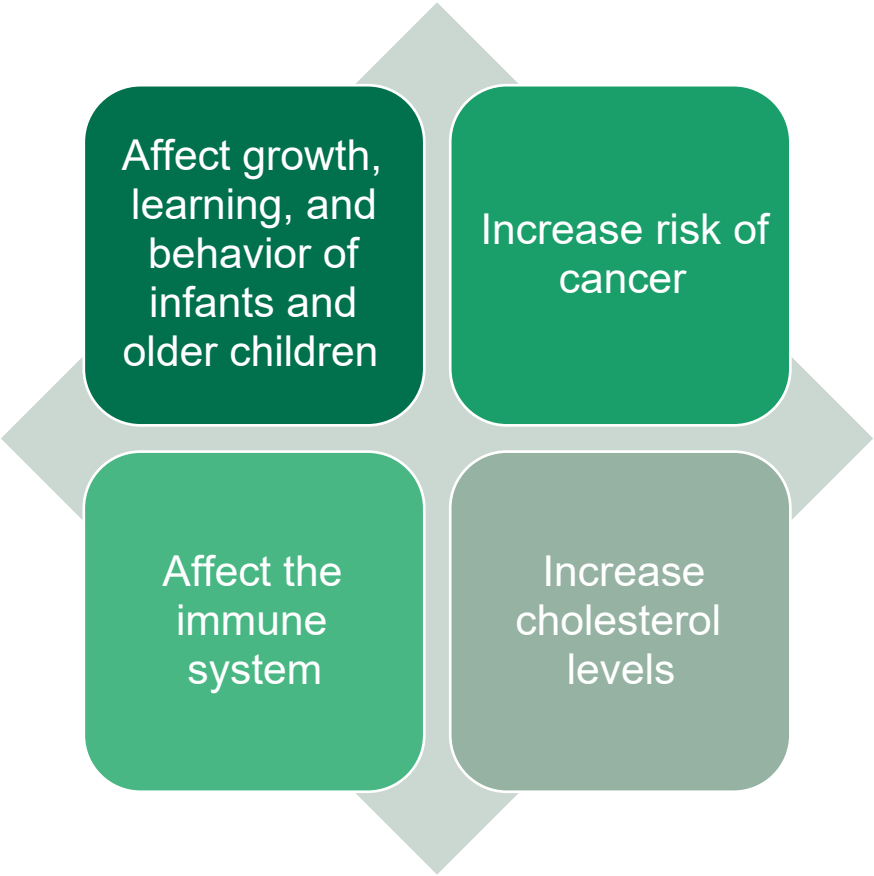
What are PFAS?



Source: https://www.gesonline.com/index.php/insights/2018 -01-12/pfas -primer

PFAS Sources and Concerns

Products resistant to water, heat, and grease				
Firefighting Foams	Cookware	Food Packaging	Electronics	Paint



Source: Agency for Toxic Substances and Disease Registry

Project PFAS Regulatory Status

Federal Regulation	EPA Health Advisory*	Washington State
None**	70 ppt***	None**

* Health advisory levels are not regulatory standards. They are health-based concentrations thresholds which offer a margin of protection for all Americans throughout their lifetimes relative to adverse health effects from exposure to PFOS and PFOA in drinking water.

** State and federal drinking water health advisory and regulatory limits for PFAS compounds are currently underdevelopment, and draft standards continue to evolve.

*** For PFOA and PFOS individual or combined.

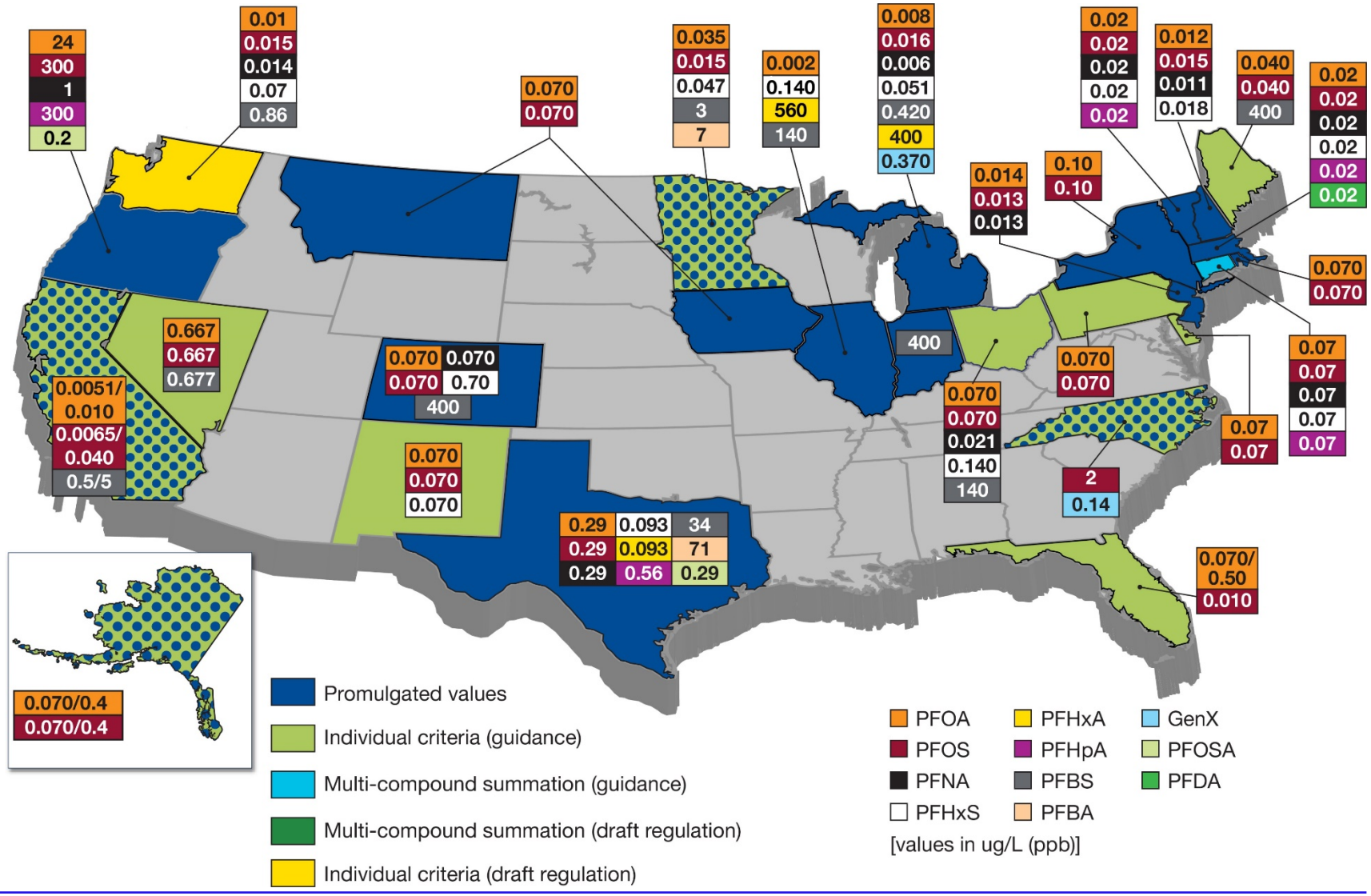
USEPA Method 537.1

Laboratory analysis approaches for a total of 18 PFAS constituents

Analyte[a]	Acronym
Hexafluoropropylene oxide dimer acid	HFPO-DA
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA
Perfluorobutanesulfonic acid	PFBS
Perfluorodecanoic acid	PFDA
Perfluorododecanoic acid	PFDoA
Perfluoroheptanoic acid	PFHpA
Perfluorohexanesulfonic acid	PFHxS
Perfluorohexanoic acid	PFHxA
Perfluorononanoic acid	PFNA
Perfluorooctanesulfonic acid	PFOS
Perfluorooctanoic acid	PFOA
Perfluorotetradecanoic acid	PFTA
Perfluorotridecanoic acid	PFTrDA
Perfluoroundecanoic acid	PFUnA
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS
4,8-dioxa-3H-perfluorononanoic acid	ADONA

Evolving PFAS Regulations

- Focused on MCL for PFOA andPFOS
- Developed reference dose for PFBS
- Continued focus on residuals and air emissions



Project Background

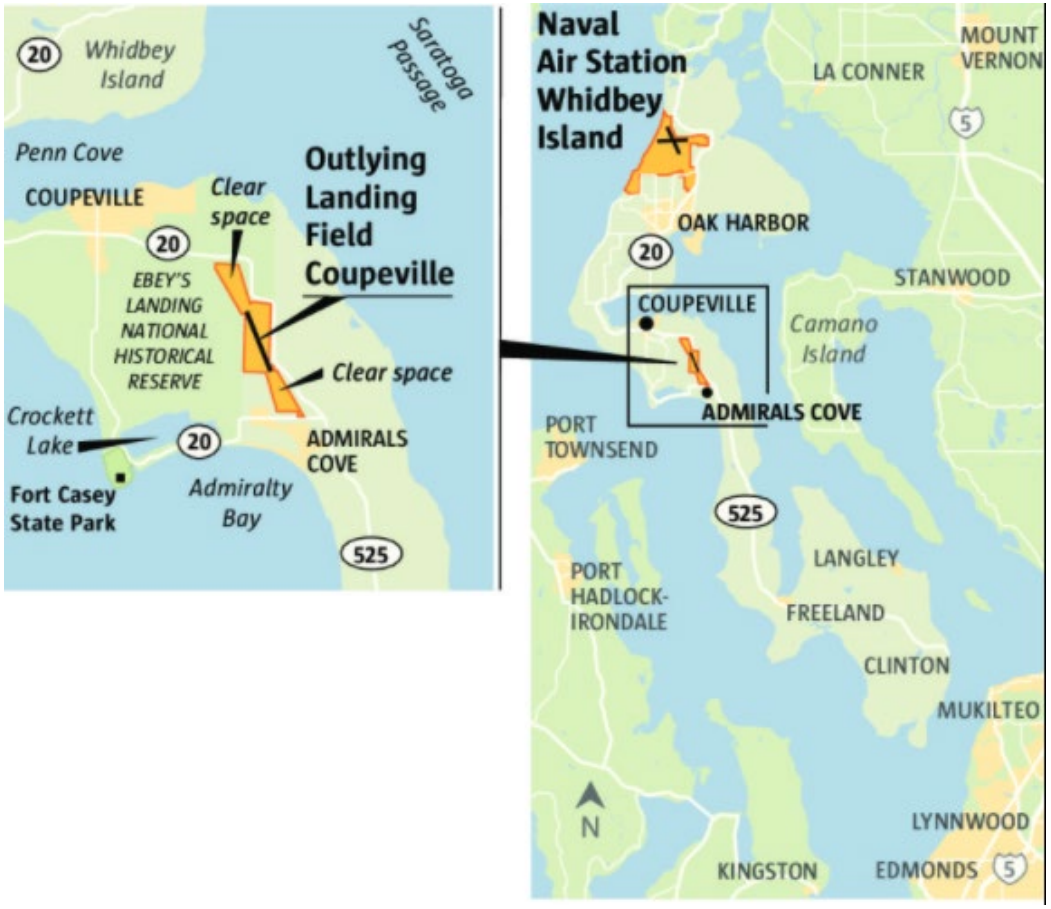
- Aqueous Film Forming Foam containing PFAS
  - Used in fire trainings and emergencies
- Attributed to use by US Navy
  - Navy Outlying Landing Field (OLD) in Coupeville, WA

PFOA levels above LHA detected

- 8 private drinking water wells
- 11 residences

PFOA levels approaching LHA detected

- Town of Coupeville Keystone Supply Well



Solutions

- Short-term
  - Bottled water delivery
  - Point of use (POU) filters
- Long-term
  - Implement GAC treatment at existing Water Treatment Plant
  - Extend Town water system to serve impacted residents

Treatment Alternatives

Granular Activated Carbon (GAC)	• Good PFOA and PFOS removal performance • Established history for PFOA and PFOS removal
Ion Exchange (IX)	• Good PFAS removal performance • Newer/proprietary PFAS treatment technology
Membrane Separation (RO, NF)	• Higher system complexity and cost • Concentrated and continuous liquid waste stream

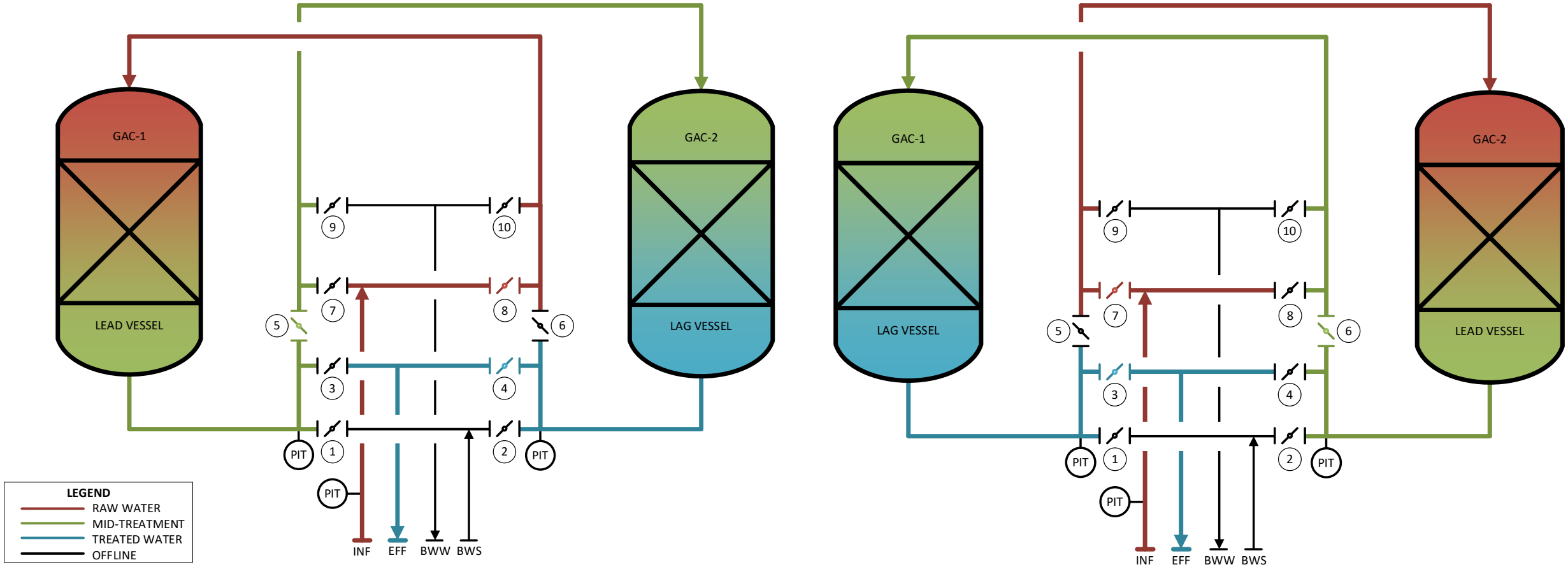
Granular Activated Carbon

- Selected as Preferred (Initial Solution) based on:
  - Proven history of performance
  - Favorable lifecycle cost
  - Operational simplicity
  - Manageable waste streams
  - Future Flexibility (dual use filter vessels can also be used with Ion Exchange medias)

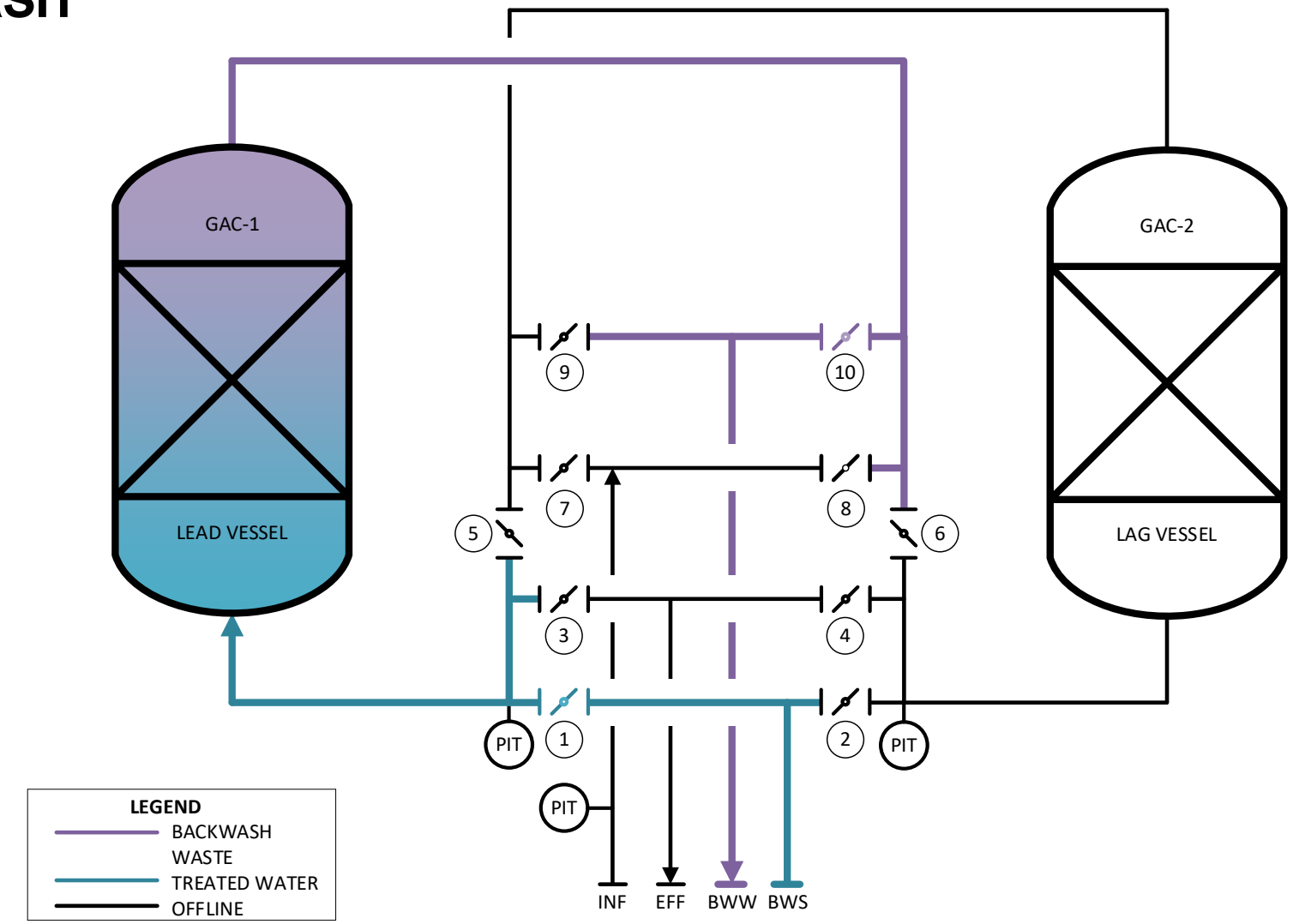
GACSystem Design Parameters

- 500 gpm initial GACcapacity
  - Two 250 gpm Lead-Lag Dual Vessel Treatment Trains
  - Room for future third GAC Train
  - 10,000 lbs GAC per Vessel
  - 20+ minutes Empty Bed Contact Time (EBCT)
  - 5 gpm/sf Surface Loading Rate
  - GAC media selection and expected performance piloted via Rapid Small Scale Column Testing (RSSCT)

Lead-Lag Adsorber Treatment Trains

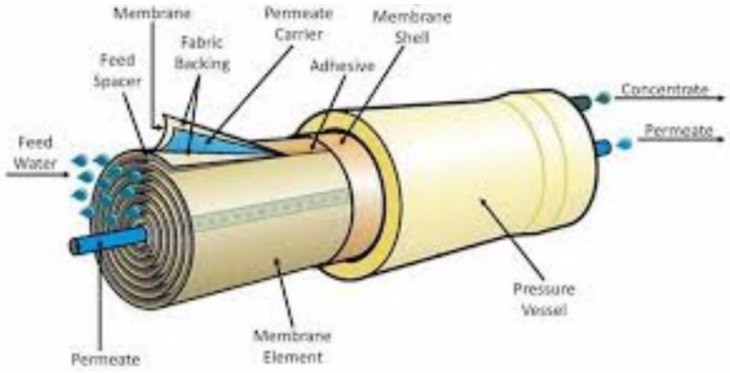


Media Backwash



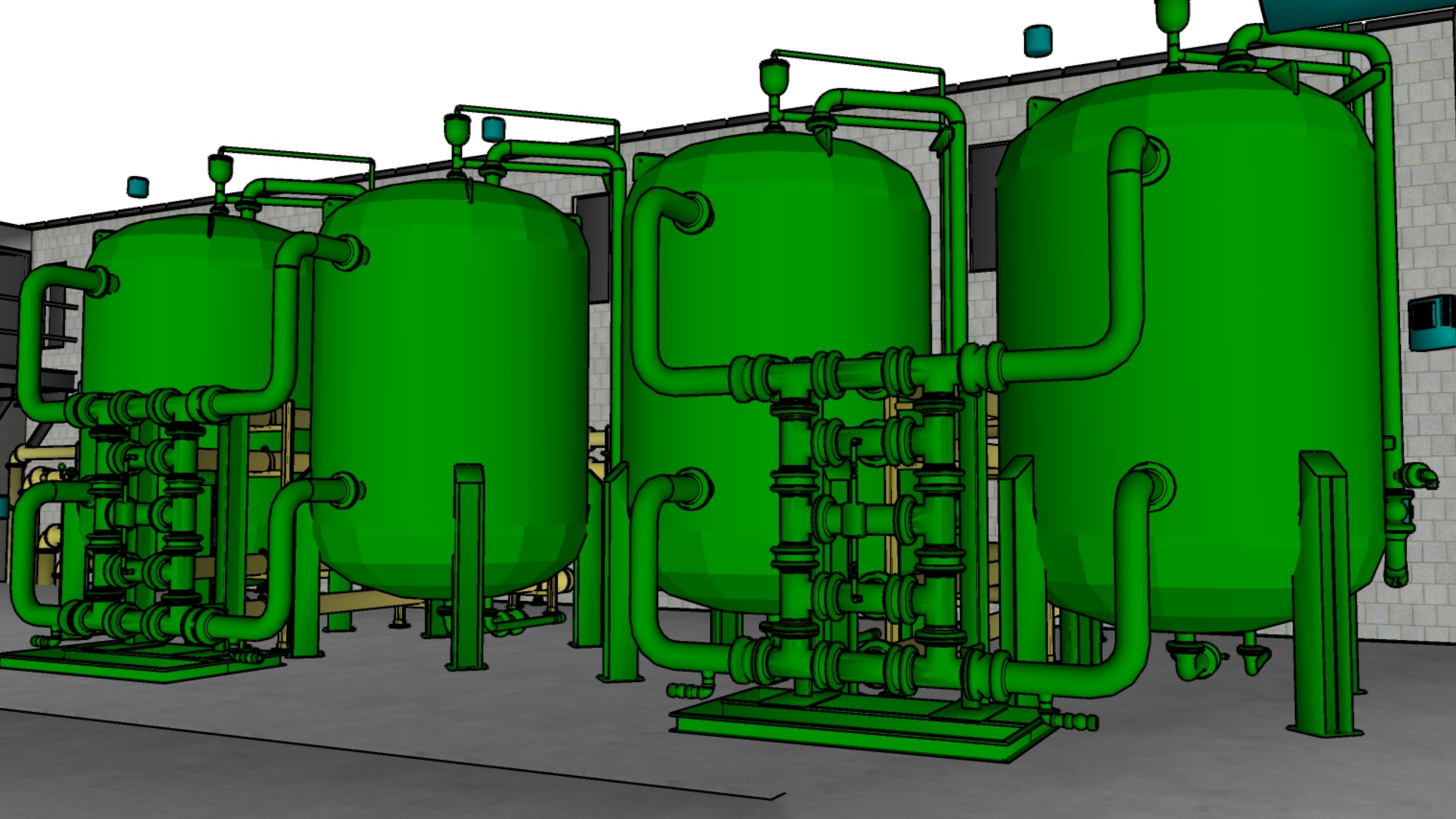
CEUVirtual Attendance Poll Question 1 of 2

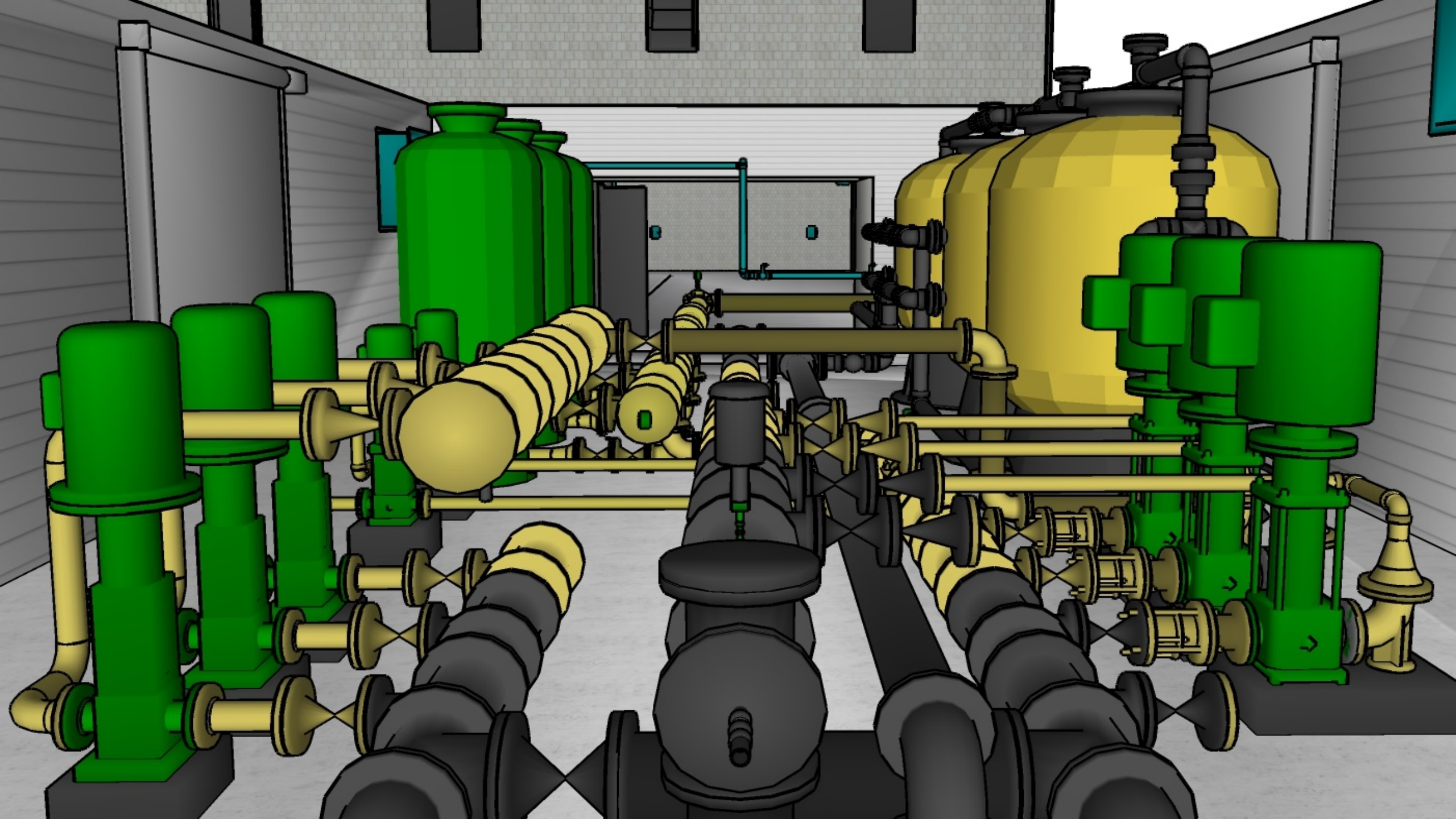
- What does PFAS treatment approaches were considered for Coupeville?
  A. Granular Activated Carbon
  B. Ion Exchange
  C. Membrane RO/NF Separation
  D. Proprietary Sorbent Medias
  E. All of the above
  F. A, B, and C, but not D

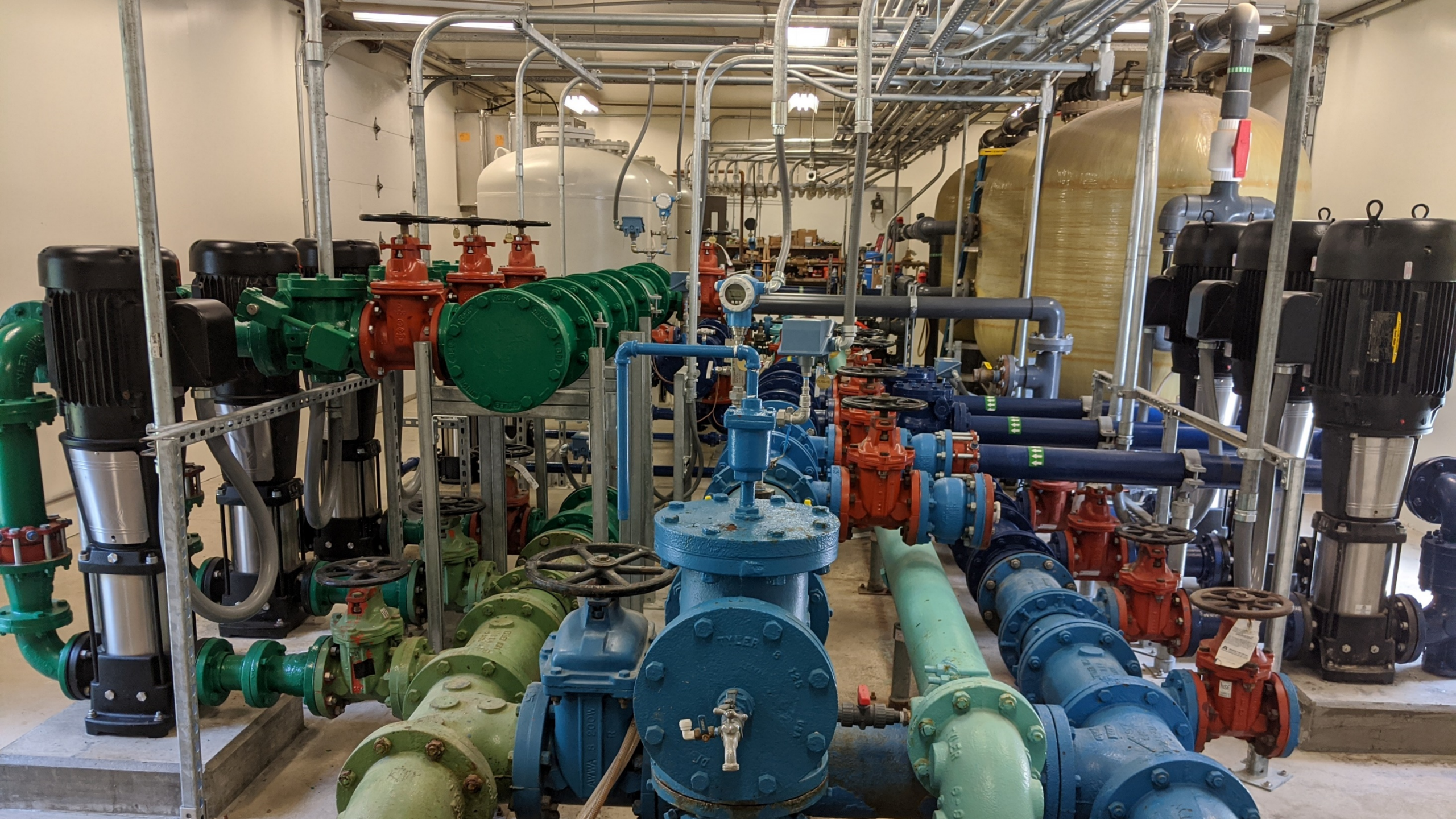


Other Project Elements

- GACEquipment and Media Procurement
- Integration with existing upstream Fe/Mn treatment process
- All new treatment process and supply pumps
  - Treatment System Raw Water Supply (VFD)
  - Finished Water and Fire Flow Supply (VFD)
  - New Distribution System Supply (VFD)
- New Instrumentation, Controls, and Telemetry System
- New Diesel Backup Power Generator
- New Treatment Building with room for expanded Fe/Mn treatment units
- Expanded/New Distribution System Piping
  - 1.5 miles of new water main and residential service lines extensions
  - 10-inch diameter (8-inch ID) High Density Polyethylene (HDPE - AWWA C906)



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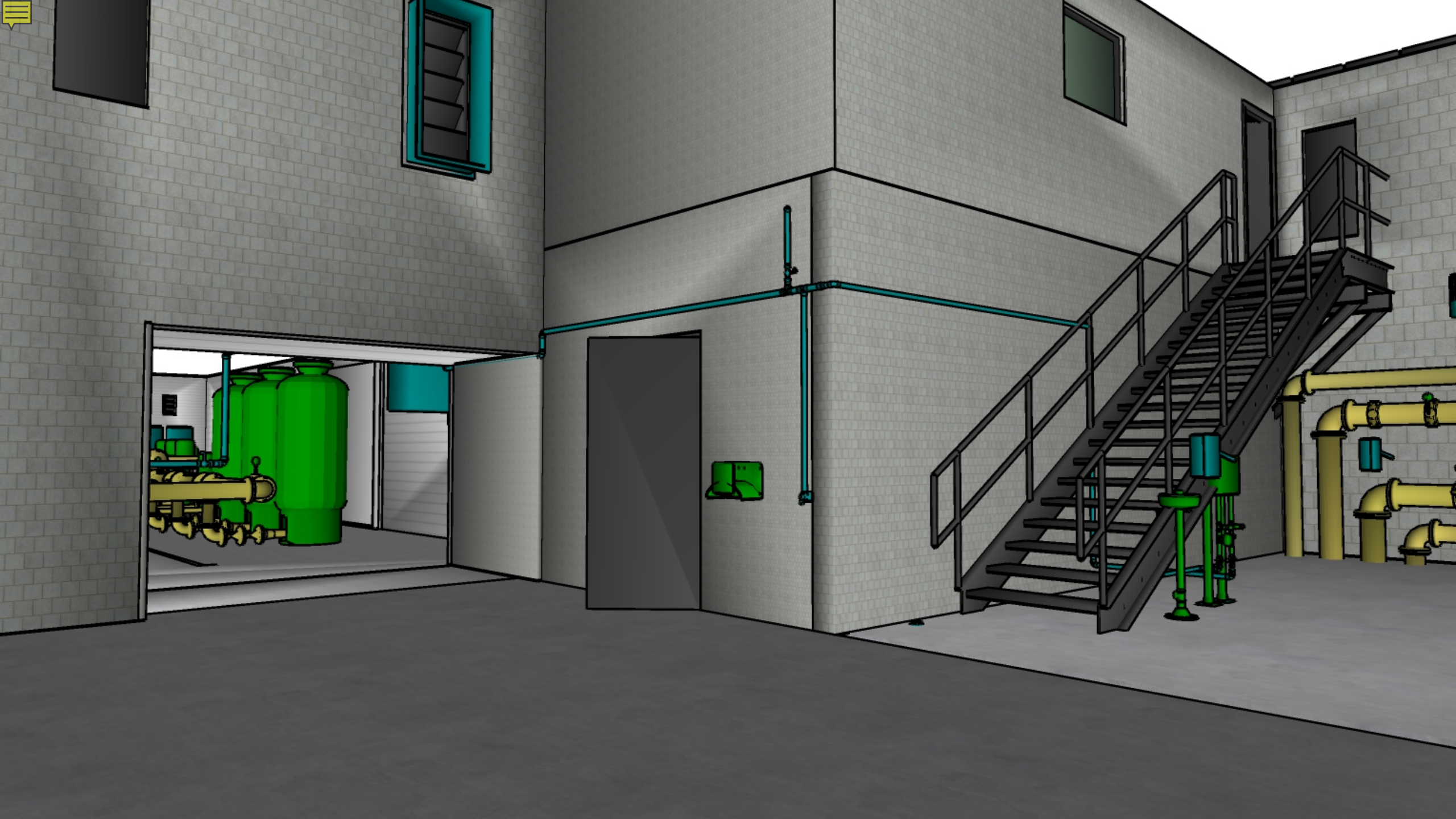
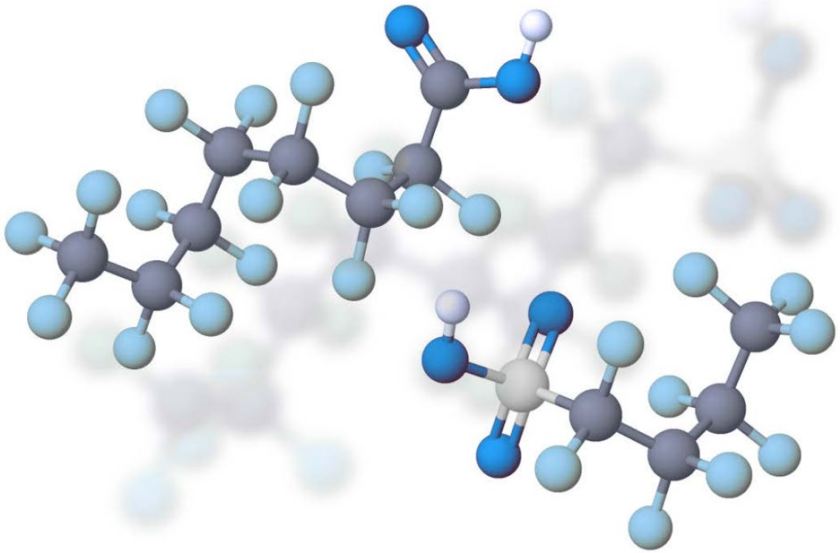


CEUVirtual Attendance Poll Question 2 of 2

- What does “PFAS” stand for?
  A. Pan fried, absent sticking (e.g., nonstick pans)
  B. Popcorn, fluffy and savory
  C. Per and Polyfluoroalkyl Substances
  D. Poly Fluorinated Acidic Sulfonates



Lessons Learned

- Balancing various interests for this complex system
- Aggressive schedule
- Media fill challenges

Treatment and System Performance after 20 -months of Operation

- Raw Water Influent
  - PFOA approaching 70 ppt,
  - Various other PFAS present at varied concentrations
- Lead-Lag Vessel Midpoint
  - Limited breakthrough of PFOA
  - Various other PFAS present at reduced concentrations
- Treated Water
  - PFOA consistently Non-Detect to Date
  - Other PFAS generally Non-Detect to Date
- Minimal Headloss Accumulation to Date
- Probing and Visual Inspection of GAC indicates stable media bed
- US Navy, Town of Coupeville, and WTP Operators pleased with project/performance

Related Project Benefits

- Disinfection By-Product Levels (TTHM and HAA5) reduced significantly
- New treatment plant office/lab space and telemetry system simplifies operations
- Customers appreciative of improved water taste and odor characteristics

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Acknowledgements

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- Kendra Leibman
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Town of Coupeville

- Mayor Molly Hughes
- Joe Grogan
- Kelly Riepma

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- Denis Mehinagic

Questions?

Thank you

Jacobs

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