



# Proactive Treatment Solutions for PFAS Groundwater Contamination

Coupeville/Navy Fort Casey WTP Improvements

By Esther Chang and Andrew Ryder

5/3/19

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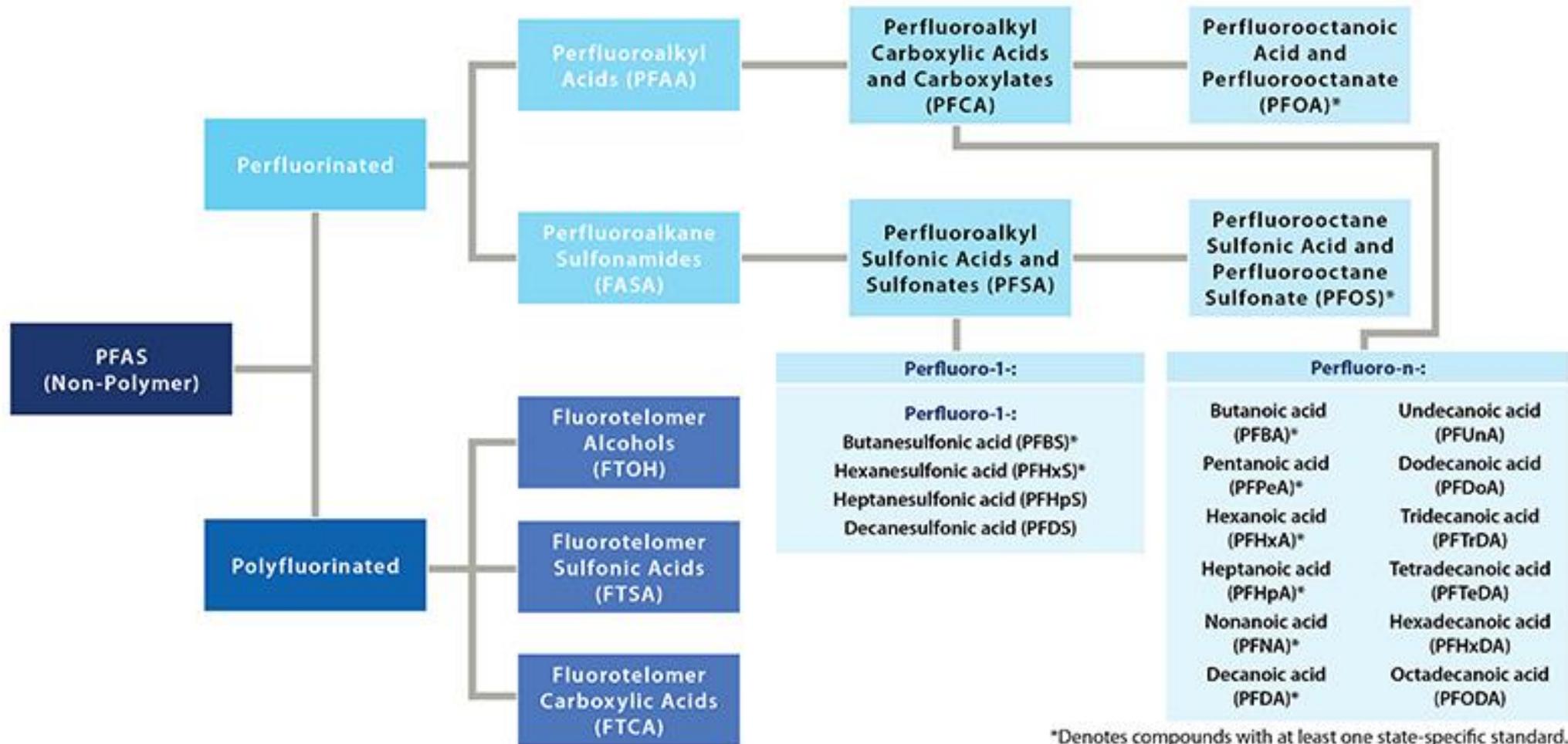
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# Agenda

- Project Background
  - PFAS
  - Navy
  - Coupeville, WA
- System Design
- Implementation

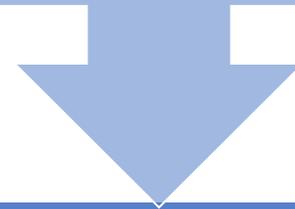
# What are PFAS?



\*Denotes compounds with at least one state-specific standard.

# PFAS Sources

PFAS has been around since the 1950s



Products resistant to water, heat, and grease

Firefighting  
Foam

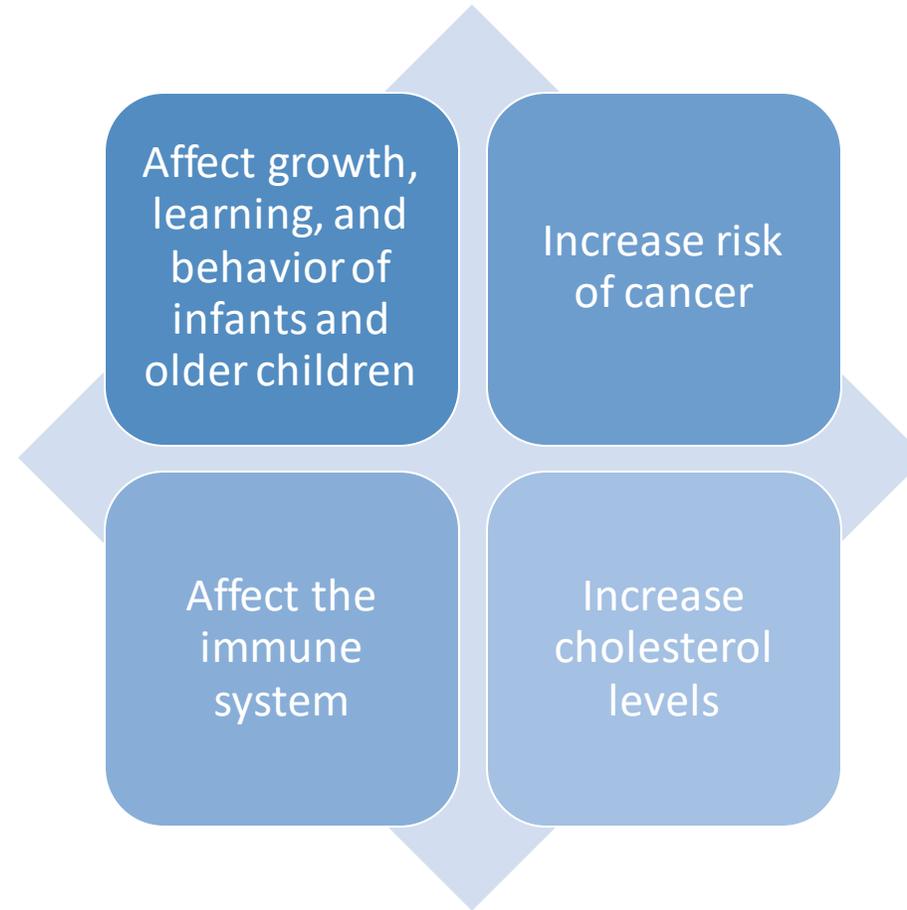
Cookware

Food  
Packaging

Electronics

Paint

# Health Concerns



Content source: [Agency for Toxic Substances and Disease Registry](#)

# Regulations

Federal Regulation	EPA Health Advisory*	Washington State
• None**	• 70 PPT***	• None**

\*According to the EPA: Health advisory levels are not regulatory standards. They are health-based concentrations which should offer a margin of protection for all Americans throughout their life from adverse health effects resulting from exposure to PFOS and PFOA in drinking water.

\*\*State and federal drinking water health advisory and regulatory limits for PFAS compounds continue to evolve

\*\*\* For individually or combined PFOA and PFOS

# USEPA Method 537.1

Testing for 18 PFAS constituents

November 2018

<b><u>Analyte</u><sup>a</sup></b>	<b><u>Acronym</u></b>
Hexafluoropropylene oxide dimer acid	HFPO-DA
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSA <sup>f</sup>
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSA <sup>l</sup>
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	PFTTrDA
Perfluoroundecanoic acid	PFUnA
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OU
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ON
4,8-dioxa-3H-perfluorononanoic acid	ADONA

A photograph of firefighters in full gear applying foam to a structure. The foam is being sprayed from a hose, creating a thick, white layer. The scene is outdoors, with trees and a clear sky in the background. The image is dimmed to serve as a background for the text.

# Aqueous Film-Forming Foam (AFFF)

- Contains PFAS chemicals
- Fire training
- Emergencies



Coupeville,  
WA



Navy  
Outlying  
Landing  
Field

# Results

## PFOA levels above LHA detected

- 8 private drinking water wells
- 11 residences

## PFOA levels near LHA detected

- Town of Coupeville's Keystone Well



# Solutions

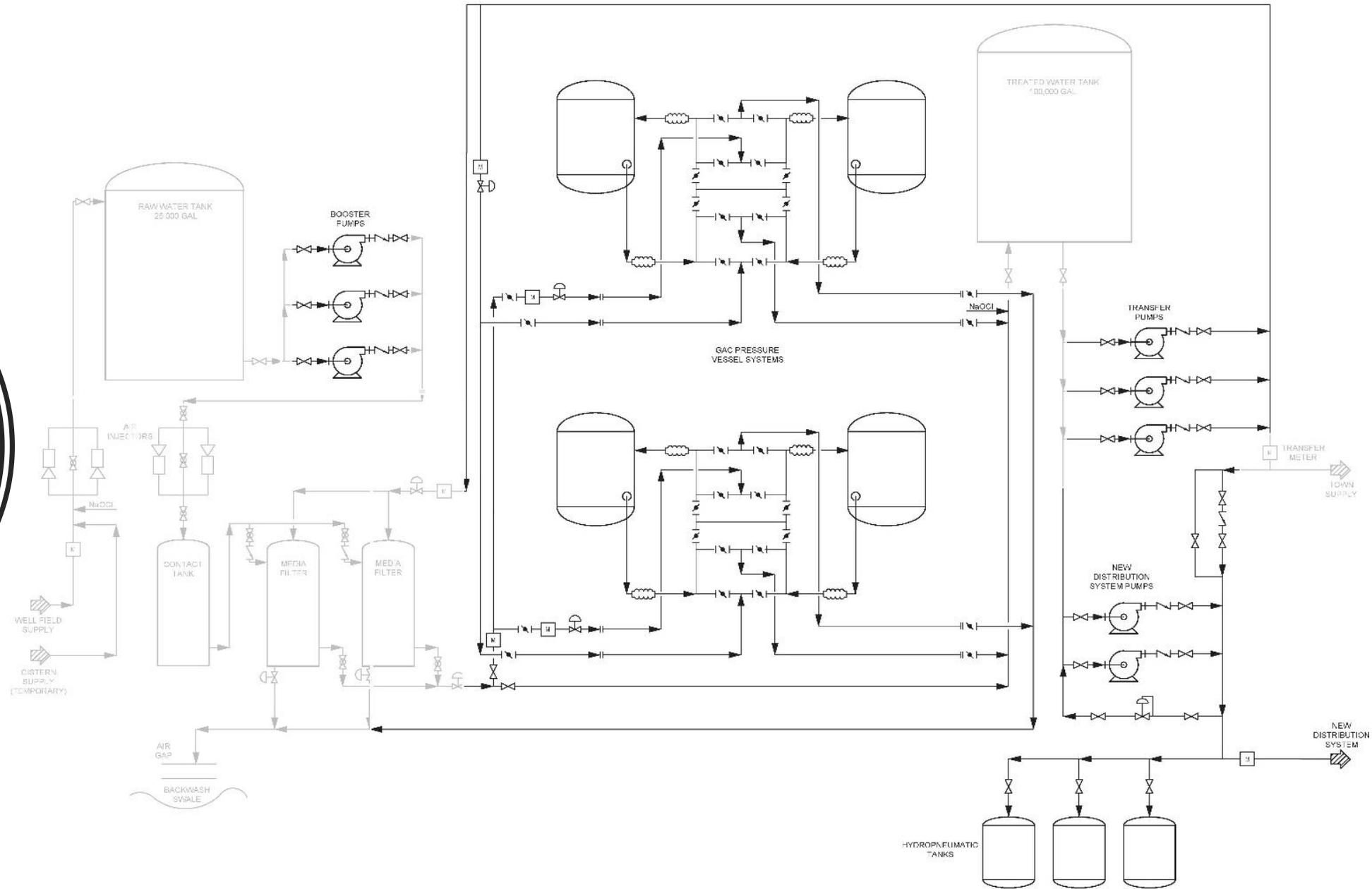
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- Short-term
  - Bottled water
  - Undersink GAC filters
- Long-term
  - Extend water distribution system to impacted residents
  - Add GAC treatment to Fort Casey WTP

# New Distribution System

- Water Main
  - 8" ID
  - 7,500 LF
  - AWWA C906 HDPE restrained joint piping
- Water Service
  - Up to 12 connections
  - Double Check Valve Assembly
  - Reduced Backflow Pressure Assembly
- Fire Flow Delivery
  - Upgrade pumps
  - Add hydropneumatics tanks
  - 5 Fire hydrants at 900 ft spacing

# Treatment Process Schematic



# Treatment Alternatives

## Granular Activated Carbon

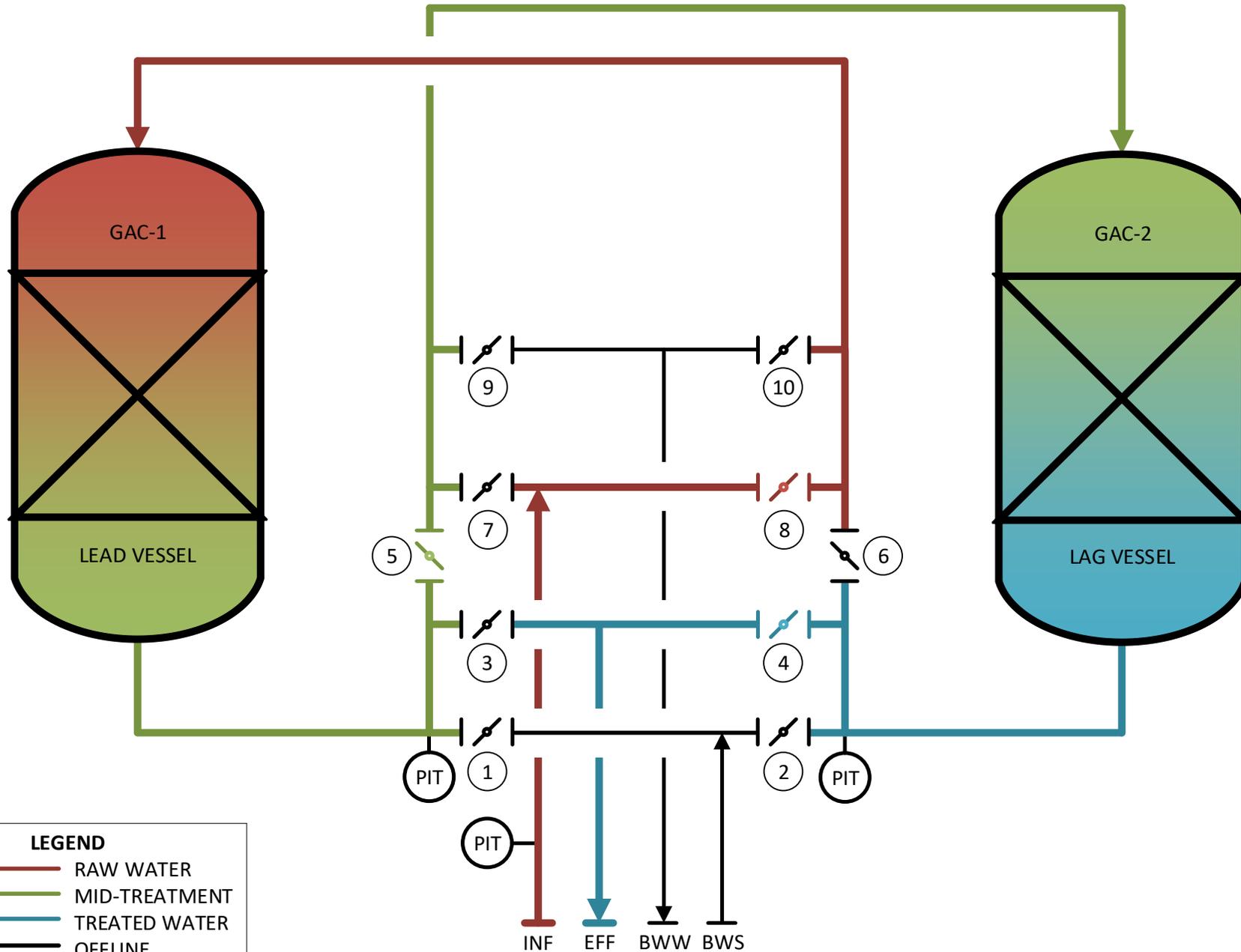
- High PFOA and PFOS removal
- Wide history of use for PFOA, PFOS removal

## Anion Exchange

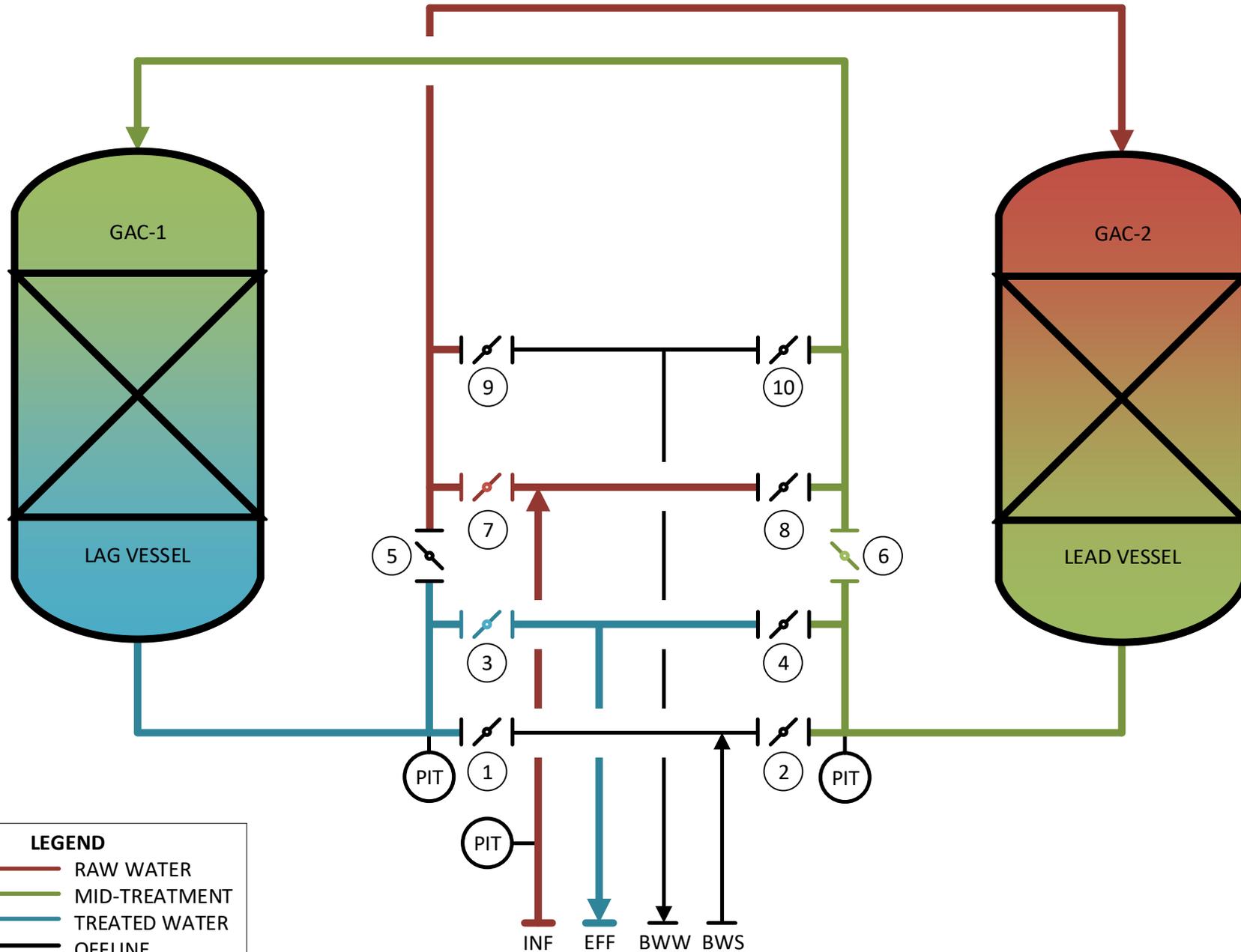
- High short and long chain PFAS removal
- Relatively new technology in this market

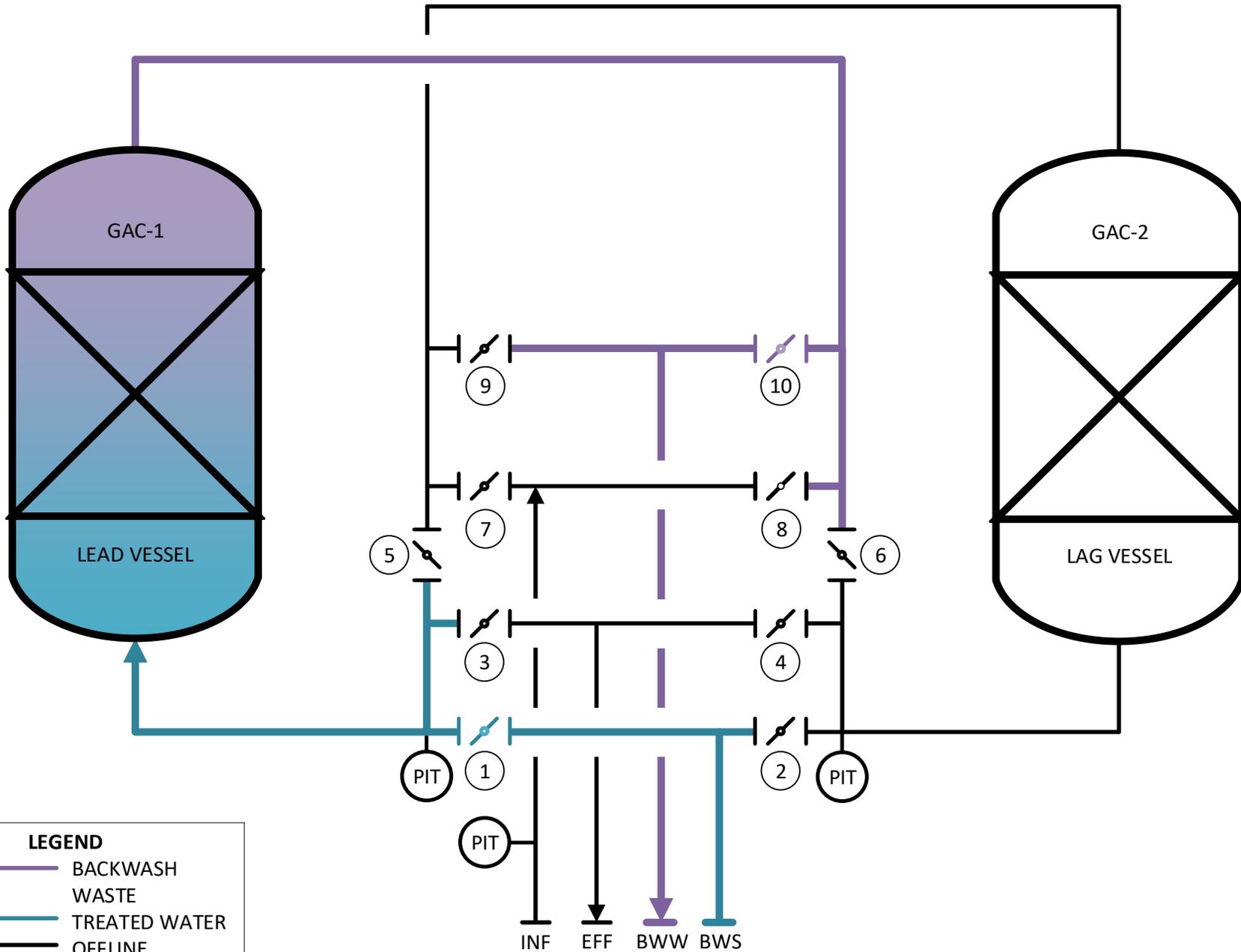
## Membrane Separation (RO, NF)

- High system complexity, cost
- Concentrated liquid waste stream



LEGEND	
<span style="color: red;">—</span>	RAW WATER
<span style="color: green;">—</span>	MID-TREATMENT
<span style="color: blue;">—</span>	TREATED WATER
<span style="color: black;">—</span>	OFFLINE





LEGEND	
	BACKWASH
	WASTE
	TREATED WATER
	OFFLINE

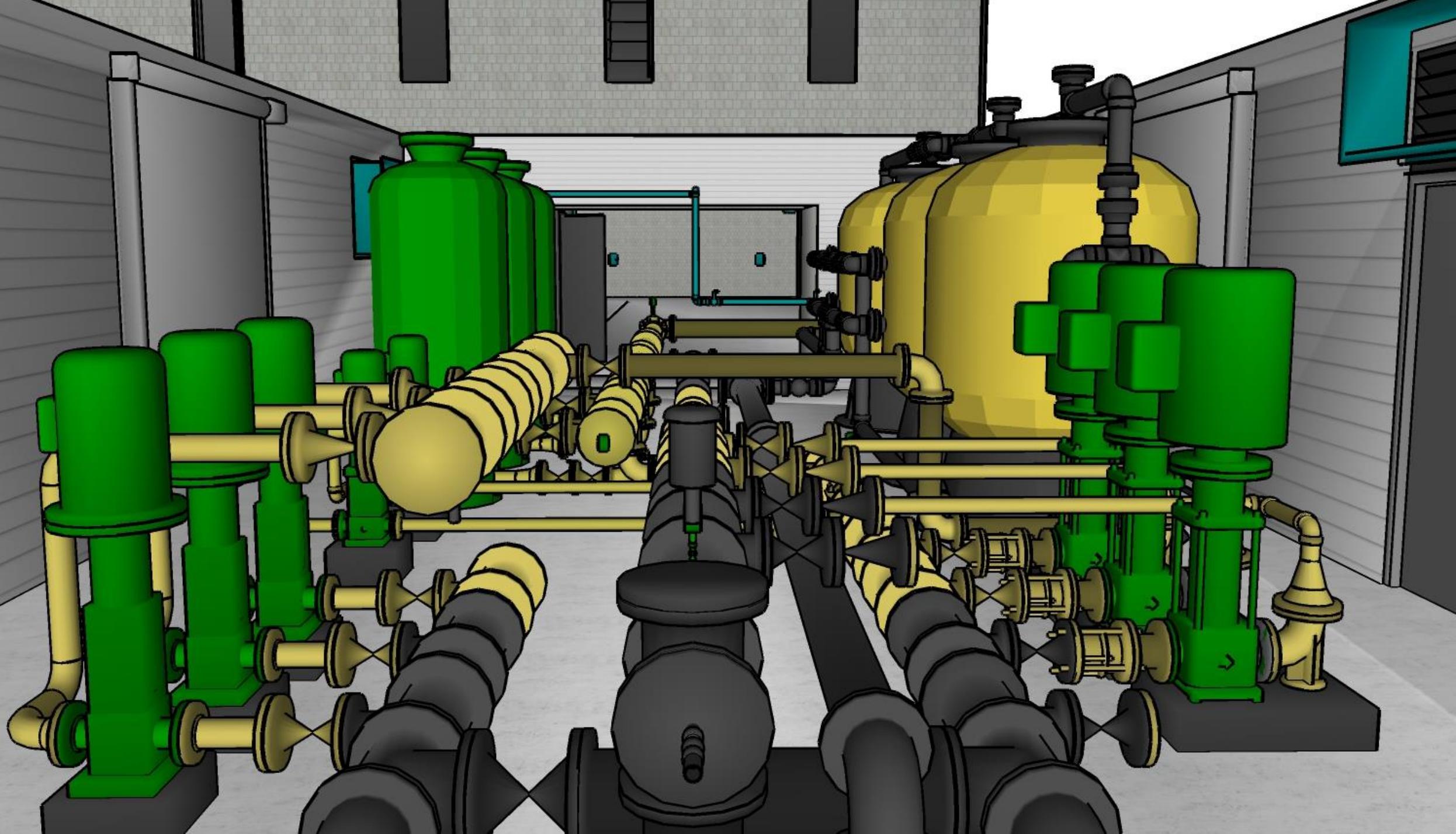


Fort Casey  
Water  
Treatment  
Plant

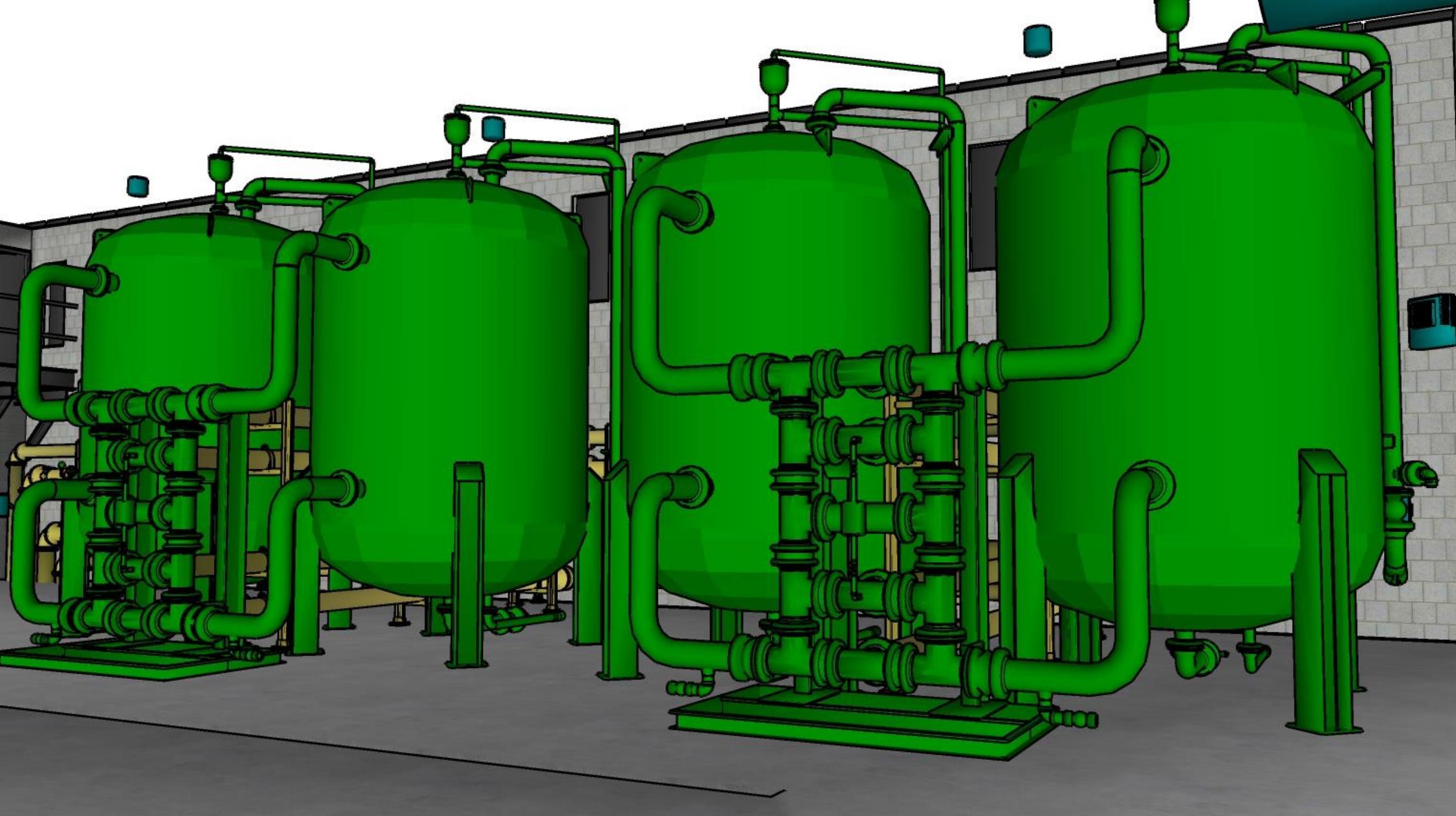


Fort Casey  
Water  
Treatment  
Plant











## Lessons Learned

Balancing various interests  
for this complex system

Aggressive schedule

TCRA: Permit or no permit

# Acknowledgements

## US Navy

- Kendra Leibman
- Chris Generous

## Town of Coupeville

- Mayor Molly Hughes
- Joe Grogan
- Kelly Riepma

## Department of Health

- Bob James
- Denis Mehinagic

# Questions?