Water Resources Council (WRC)

October 11, 2023

North Central Texas Council of Governments
Environment & Development

www.nctcog.org/WaterResources

Procedures for Online Meeting

- Today's presentation will be posted on the WRC website at:

https://www.nctcog.org/envir/committees/water-resources-council

- Roll call today in lieu of sign-in sheet.
- Please keep your microphone on mute when not speaking.
- Please use the "raise hand" feature to ask a question or provide a comment. When called on, state your name and entity you are representing.
- Approval of action items will still be done by a voice vote. Please only vote if you are a member of the WRC.

Water Resources Council

1. Welcome and Introductions

- WRC attendance by roll call
- Including new WRC members
  - **Tim Abbott**, Pumping Facilities Superintendent, City of Plano
  - **Bill Gase**, Assistant Director - Water Treatment, City of Arlington
  - **Paul Hackleman**, Director of Public Works, City of Watauga
  - **Michael Kivlan**, Area Manager, Texas Water Utilities
  - **Valerie Miller**, Industry Expert, Olsson
  - **Eduardo Valerio**, Assistant Director, City of Dallas
- Welcome guests
- Thank you all for attending!

Action Item

2. Meeting Summary

The July 12, 2023 meeting summary will be presented for approval.

Presentation

3. Essential Strategies for Water Purveyors: Addressing PFAS in Water and Wastewater

Swaroop Puchalapalli, Associate Vice President and Dallas Water Practice Manager, STV, will share updates on pending future PFAS regulations and the best methods for treatment.

Addressing PFAS in Water and Wastewater:

Essential Strategies for Water Purveyors

Presented by:
Swaroop C Puchalapalli, PE (TX, NY & CT)

stv

North Central Texas Council of Governments

Outline

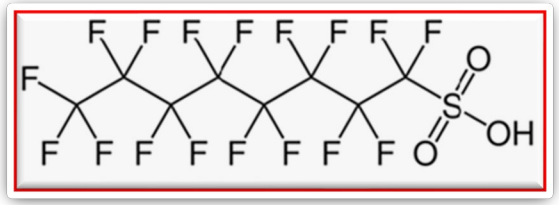
- PFAS Overview
- Regulatory Overview
- Treatment
- Emerging Treatment Technologies
- Funding
- Case Studies

PFAS Overview

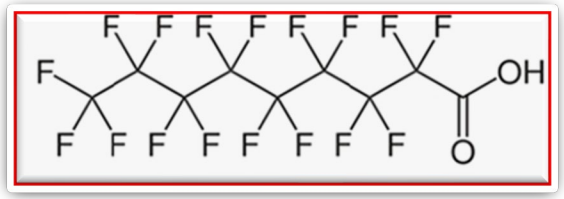
What are PFAS?

- Per- and Polyfluoroalkyl Substances
- Carbon – Fluorine bonds
- PFOS and PFOA
- 3M, Dupont (Chemours)

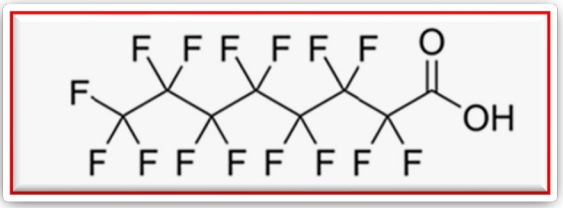
Perfluorooctanoic Sulfonic Acid (PFOS)



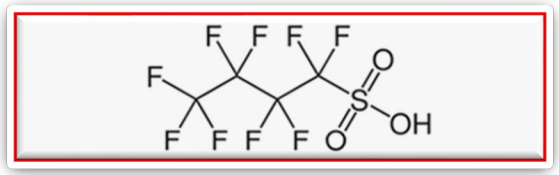
Perfluorononancanoic Acid (PFNA)



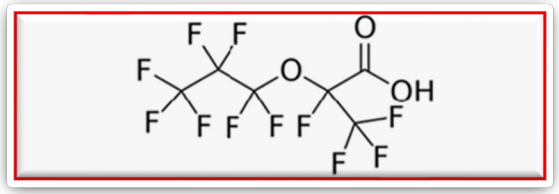
Perfluorooctanoic Acid (PFOA)



Perfluorobutane Sulfonic Acid (PFBS)

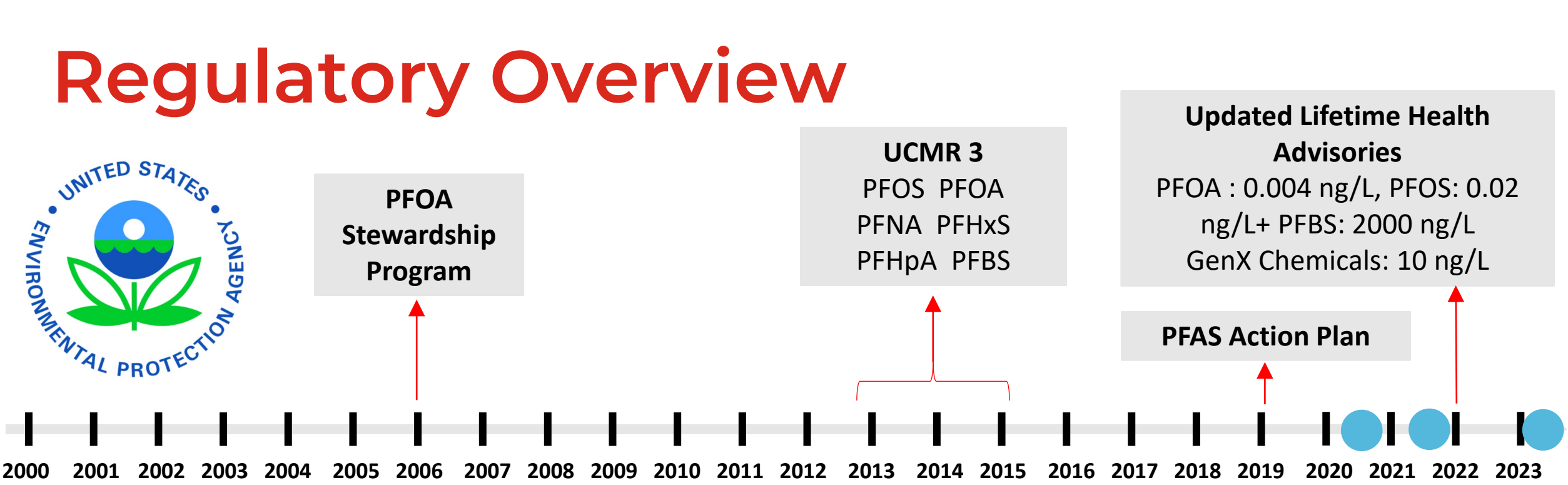


Hexafluoropropylene Oxide Dimmer Acid (GenX)



PFAS in Products

Regulatory Overview

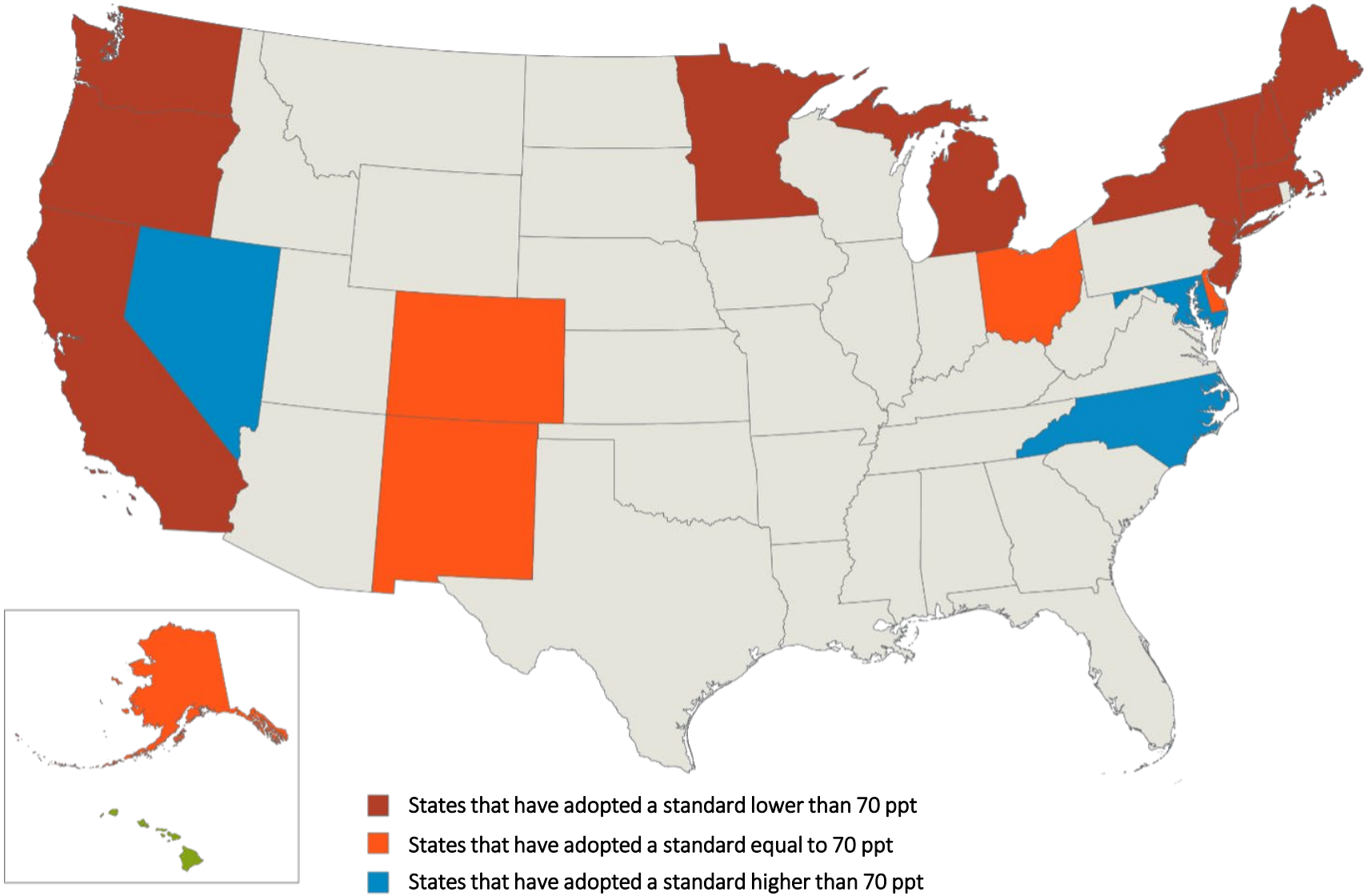


Strategy for PFAS in NPDES Permits

Oct 2021 PFAS Strategic Road Map

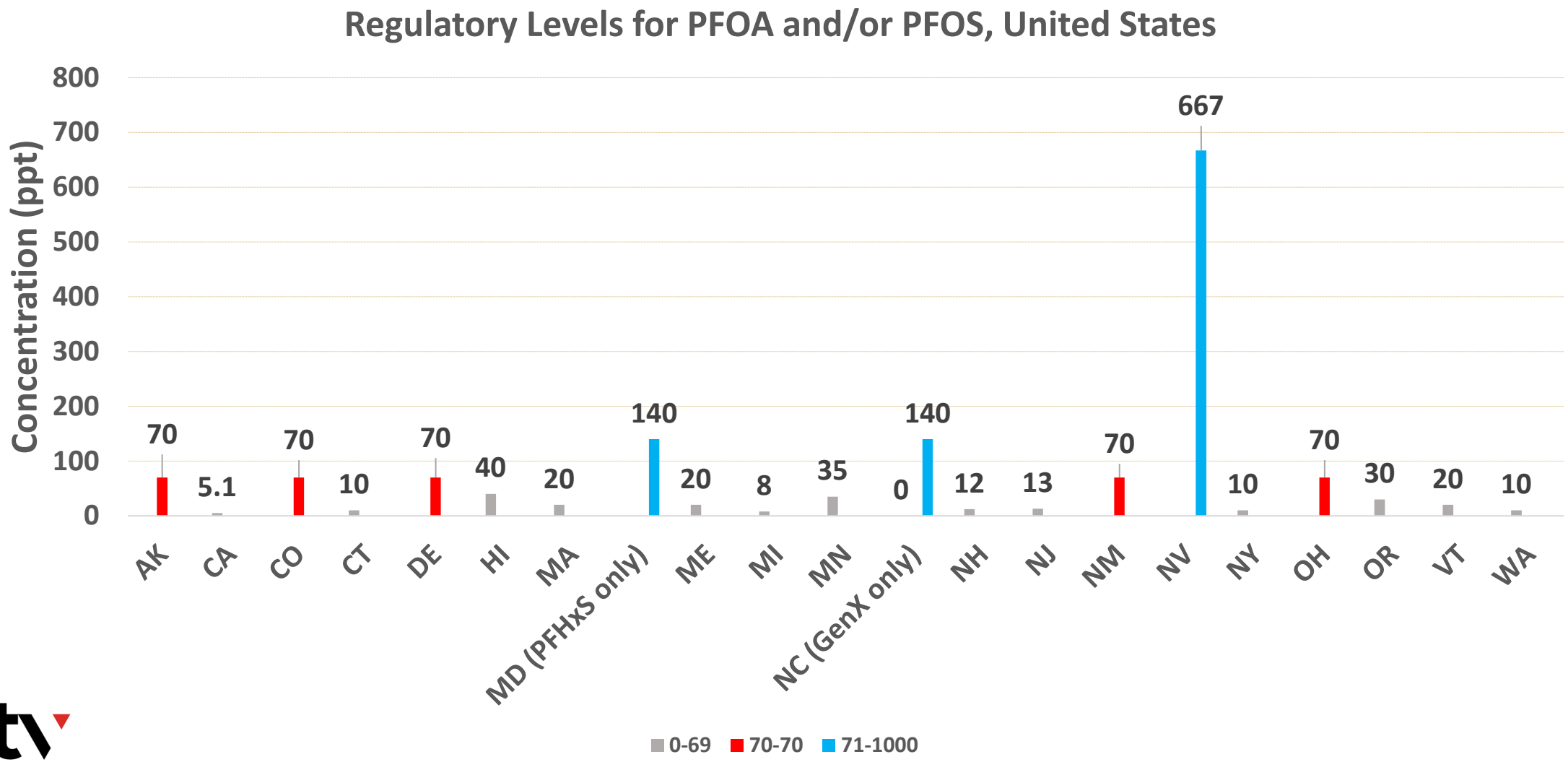
PFOA and PFOS as Hazardous Substances Under CERCLA and Plan 15

PFAS Drinking Water Regulations



- States that have adopted a standard lower than 70 ppt
- States that have adopted a standard equal to 70 ppt
- States that have adopted a standard higher than 70 ppt
- 18 Individual PFAS Standards
- States that have not regulated PFAS in drinking water

PFAS Drinking Water Regulations



Proposed Maximum Contaminant Level (MCL)

- National Primary Drinking Water Regulation (NPDWR)

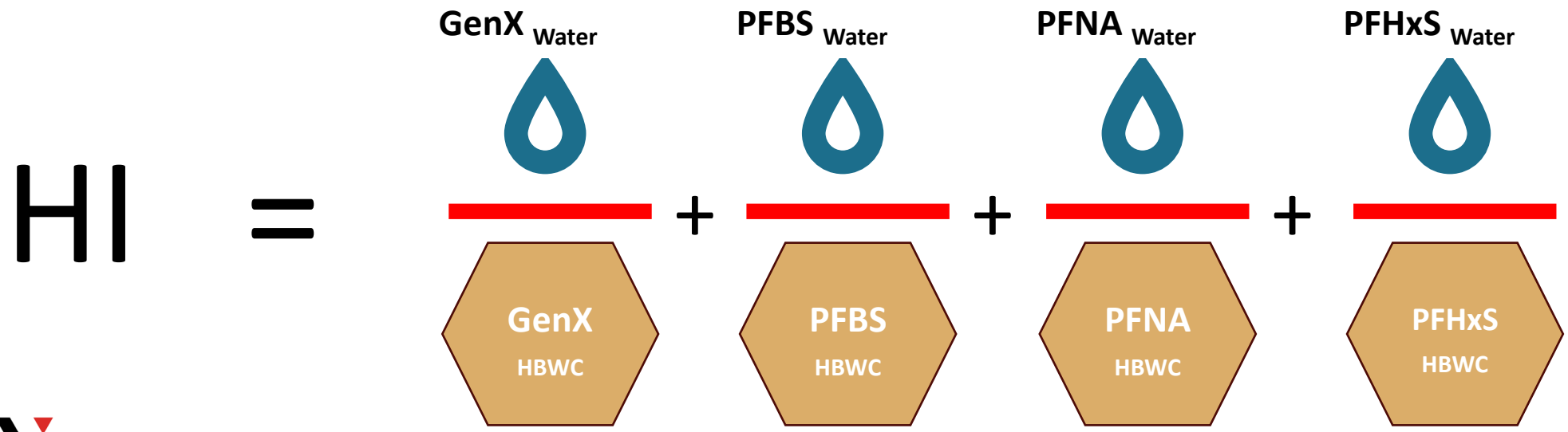
PFAS Compound	Proposed MCLG (Goal)	Proposed MCL (Enforceable Levels)	Rule Trigger Level
PFOA	Zero	4.0 ppt*	1.3 ppt*
PFOS	Zero	4.0 ppt*	1.3 ppt*
PFNA	1.0 (unitless) Hazard Index**	1.0 (unitless) Hazard Index**	0.33
PFHxS			
PFBS			
HFPO-DA (GenX Chemicals)			

ppt = parts per trillion (also expressed as ng/L)

***Hazard Index is a tool used to evaluate potential health risks from exposure to chemical mixtures*

Hazard Index

- The Hazard Index (HI) is used to understand health risks
- Measured level compared to Health Based Water Concentration (HBWC)



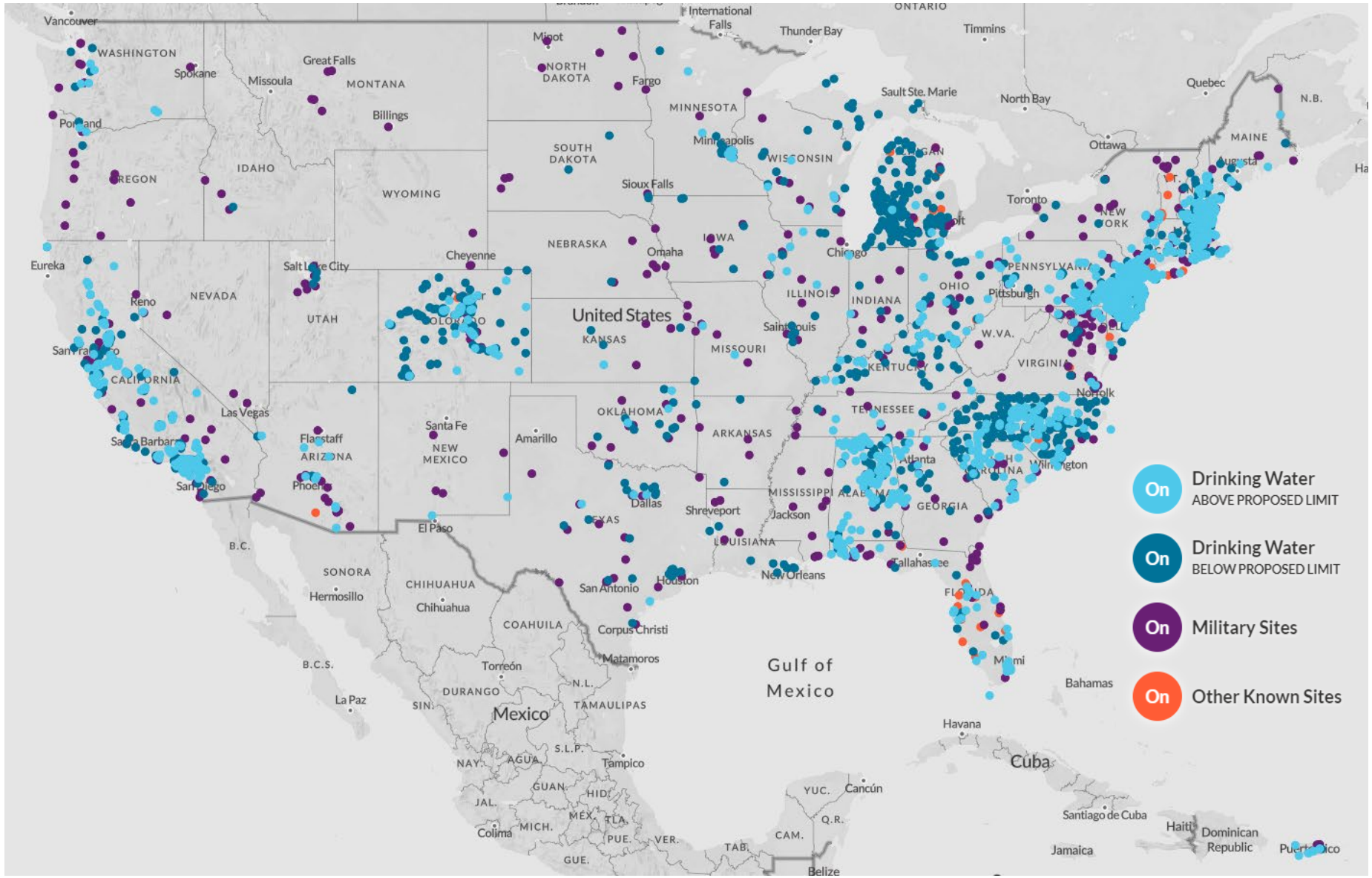
Monitoring and Reporting Requirements

- Groundwater >10,000 customers and All Surface Water Systems
  - Initial monitoring
    - Quarterly
    - Each point of entry
    - 12-month period
  - Initial below trigger level
    - Two samples
    - Each point of entry
    - All regulated PFAS
    - Minimum 90 days apart
    - One calendar year

Monitoring and Reporting Requirements

- Groundwater ≤10,000 customers
  - Initial monitoring
    - Two samples
    - Each point of entry
    - All regulated PFAS
    - Minimum 90 days apart
    - 12-month period
  - ≤3,300 customers below initial trigger level
    - One samples
    - Each point of entry
    - All regulated PFAS
    - Minimum 90 days apart
    - One calendar year
  - >3,300 customers below initial trigger level
    - Two samples
    - Each point of entry
    - All regulated PFAS
    - Minimum 90 days apart
    - 12-month period

PFAS Drinking Water Map



Source: ewg.org

Link: https://www.ewg.org/interactive-maps/pfas_contamination/map/

Determining a Violation

- After one complete year of quarterly sampling
- Running annual average exceeds MCL
- Calculating Running Annual Average
  - IF sample concentration below MCL
  - THEN its default value = Zero for that quarter
- Previous UCMR 5 Monitoring Data
- Previous State-Led Monitoring Data
- If systems have multiple years of data, the most recent data must be used

Impacts on Water Utilities

- UCMR 5 Sampling
- Monitoring and Testing
- Funding
- Bench Scale and Pilot

Lawsuits Against PFAS Manufacturers

- Seventeen (17) States, over 100 local governments, and multiple water providers sued PFAS manufacturers for contaminating water and natural resources
- On June 2, 2023, DuPont, Chemours, and Corteva announced a settlement with $1.185 billion
- On June 5, 2023, 3M announced a settlement with $10.3 and $12.5 billion
- Settlements essentially apply to all water systems in USA. Notice of settlements were sent to water systems in early September.
- Both settlements allow water systems to submit objections:
  - DuPont deadline: 11/04/2023
  - 3M deadline: 11/11/2023
- Water systems can submit notices to opt-out of the settlements:
  - DuPont deadline: 12/04/2023
  - 3M deadline: 12/11/2023

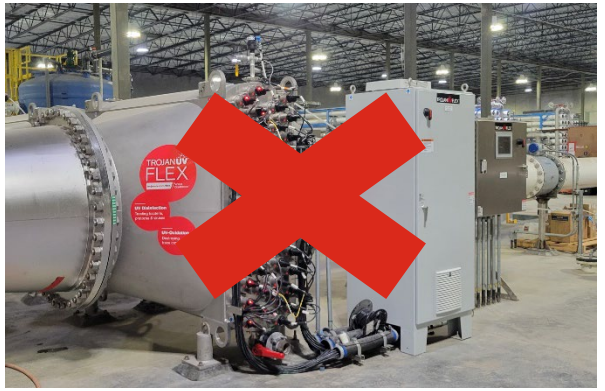
Treatment

PFAS Treatment Overview:
Focus on Drinking Water

Best Available Technologies

“Conventional” Pretreatment

Air stripping / aeration



UV Advanced Oxidation Process (AOP)

Membrane Filtration

Physical separation with concentrated waste stream

Activated Carbon (GAC & PAC)

Adsorption

Ion exchange

Ion exchange and adsorption

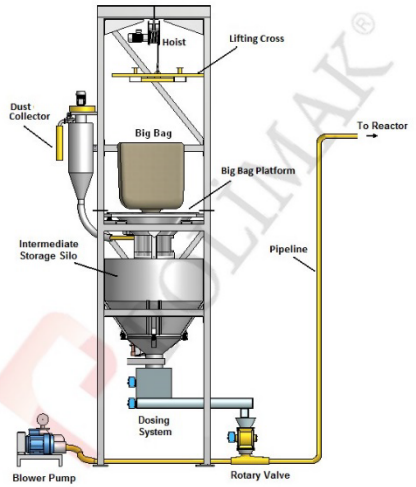
Treatment Technologies

- **Nanofiltration/ Reverse Osmosis**
  - Pretreatment
  - Post treatment to control corrosivity
  - PFAS waste stream
  - Complex operation
  - High capital cost
  - High operating cost
  - Treats co-contaminants

Treatment Method	Potential Removal[1]	Costs	Considerations	
			Pros	Cons
Membrane Filtration	PFOA: 47-99% PFOS: 93-99% PFBA: 99.9% PFBS: 99.8% PFHxA: 99.2% PFHxS: 99% PFHpA: 99% PFHpS: 99% PFNA: 99%	$$$	• Excellent, broad spectrum removal of PFAS • Reasonable for groundwater systems	• Reject water must be treated before discharging • High capital expense with high energy demands • Susceptible to fouling and may require pre-treatment • Reverse osmosis is preferable to nanofiltration due to better removal efficiency but higher operating costs

Treatment Technologies

- **Powdered Activated Carbon (PAC)**
  - Surface water
  - PAC pretreatment
  - Moderate removal
  - PFAS residuals



- **Activated Carbon**
  - Many full-scale installations
  - Adsorption
  - Good removal capacity
  - Removes organics/ co-contaminants
  - GAC can be reactivated or incinerated

Treatment Method	Potential Removal[1]	Costs	Considerations	
			Pros	Cons
Activated Carbon	PFOA: 40-99% PFOS: 18-98% PFBA: 99% PFBS: 98% PFHxA: 95% PFHxS: 90% PFHpA: 90% PFHpS: 82% PFNA: 93%	$$	• Widely used for PFAS removal, high removal rates possible • Powder activated carbon is useful for responding to spills	• Lower removal rates for perfluoroalkyl acids and short-chain PFAS • Possibility of competitive adsorption with other compounds present, such as TOC • Low rate of adsorption in GAC may result in long mass transfer zones and adjustment of associated operating requirements • Requires thermal regeneration of GAC; regenerated GAC may not be as effective as virgin GAC • Creates waste residuals to dispose of exhausted carbon and potential opportunity for pollution

- *Types of GAC:*
  - Bituminous coal
  - Coconut shell
  - Lignite
  - Wood

Treatment Technologies

- **Ion Exchange Resin**
  - Newer technology
  - Several full-scale installations
  - Ion exchange and adsorption
  - Higher removal capacity
  - PFAS selective, Not chlorine tolerant
  - Single use (for drinking water), incinerated

Pre-filter

- *Ion Exchange Resin Types for PFAS Removal:*
  - Gel resin
  - Macroporous resin

Treatment Method	Potential Removal[1]	Costs	Considerations	
			Pros	Cons
Anion Exchange	PFOA: 77-97% PFOS: 90-99% PFBA: 97% PFBS: 98% PFHxA: 97% PFHxS: 99% PFHpA: 94% PFHpS: 99% PFNA: 98%	$$	• Sorption rates depend on the resin and porosity • Can partially remove PFOA, PFNA, and PFOS • Resin can be specialized for specific PFAS and allows IX to have a higher capacity than activated carbon	• Costs are similar to activated carbon but depend greatly on resin and treatment system • Rate of exchange will depend on many factors, including influent PFAS concentration, design of the IX, solution ionic strength and bead material • Surface water supplies may need clarification/filtration before treatment • Range of efficacy for long and short-chain PFAS

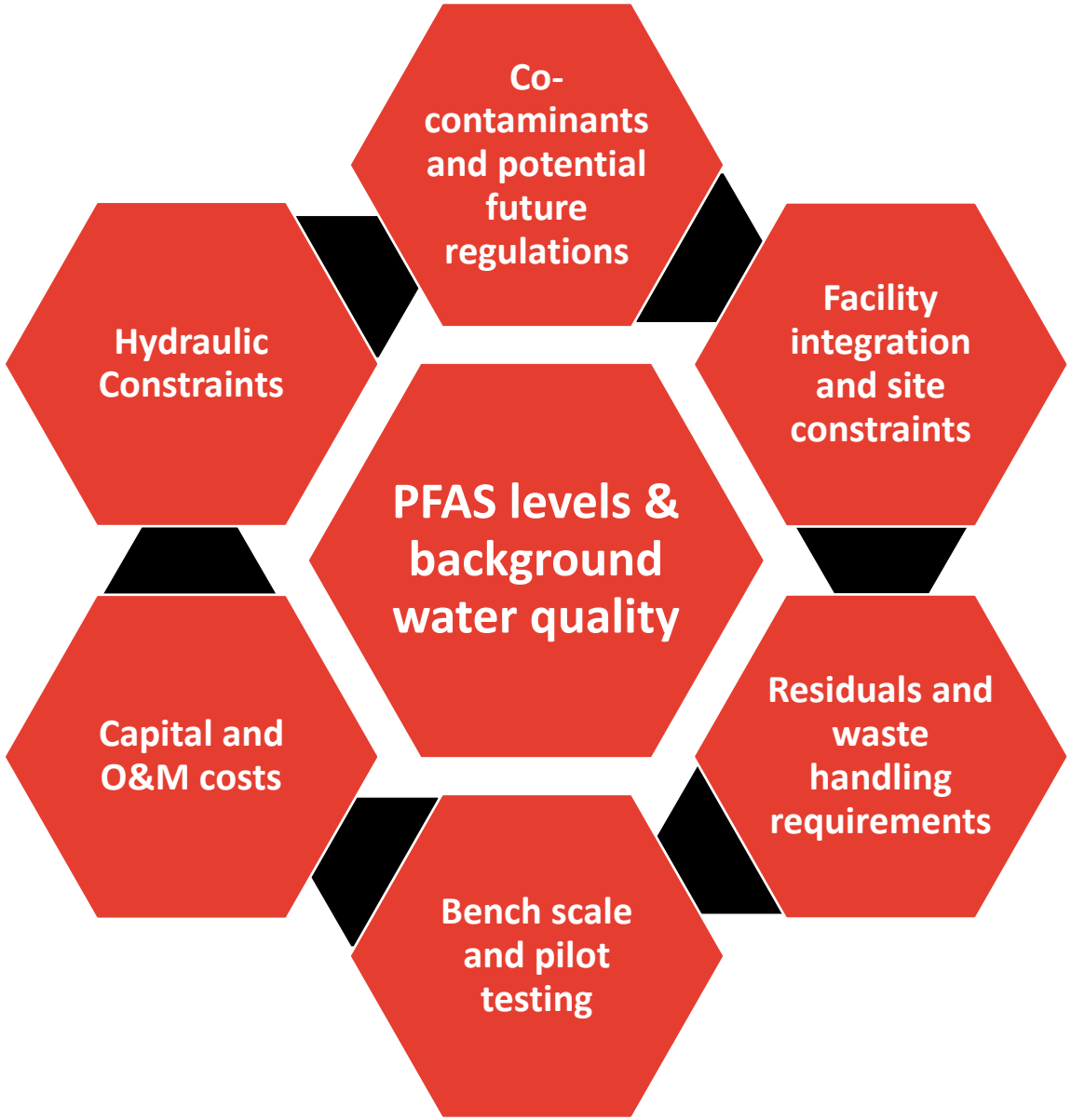
- Purolite: Purofine PFA694E
- Calgon: Carbon CalRes 2301
- Dupont: AmberLite PSR2 Plus
- ECT2: Sorbix Pure LC
- ResinTech: ResinTech SIR-110-HP

Preliminary Space Planning & High-Level Costs

- Preliminary Space Requirements
  - Nano Filtration or RO - ~ 15 to 20 SF per 1000 Gallons
  - GAC - ~ 35 to 45 SF per 1000 Gallons
  - AIX - ~ 30 to 40 SF per 1000 Gallons
- High-Level Costs
  - Nano Filtration or RO - ~ $1 per 1 Gallon and O&M of $0.5
  - GAC - ~ $0.6 per 1 Gallon and O&M of $0.3
  - AIX - ~ $0.7 per 1 Gallon and O&M of $0.35

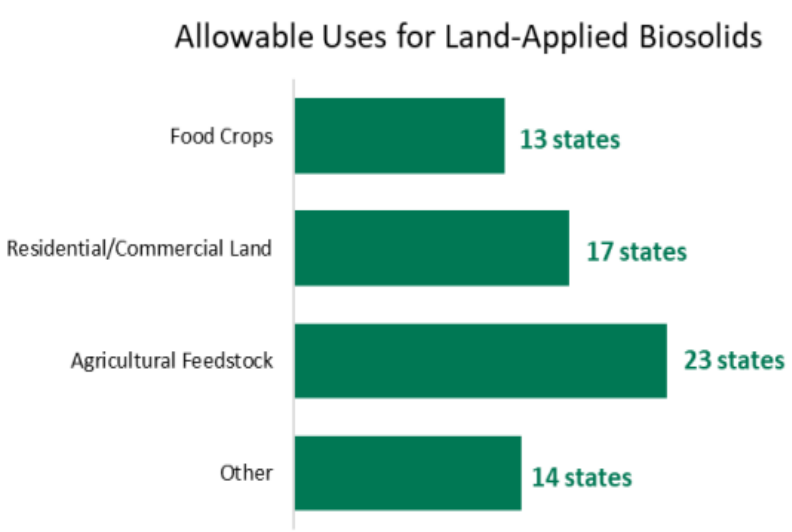
These costs include superstructure, all associated appurtenances and prepared in accordance with an AACE Class 4 estimate (-30% to -50% budget level estimate)

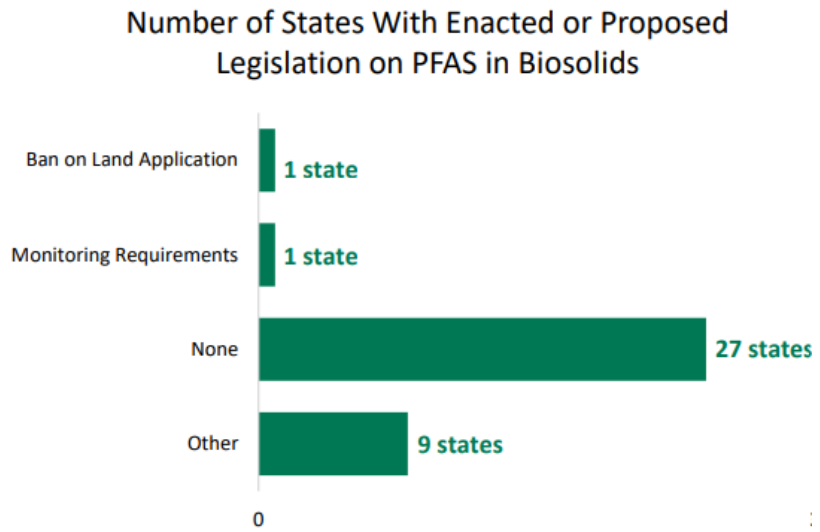
Treatment Selection Considerations

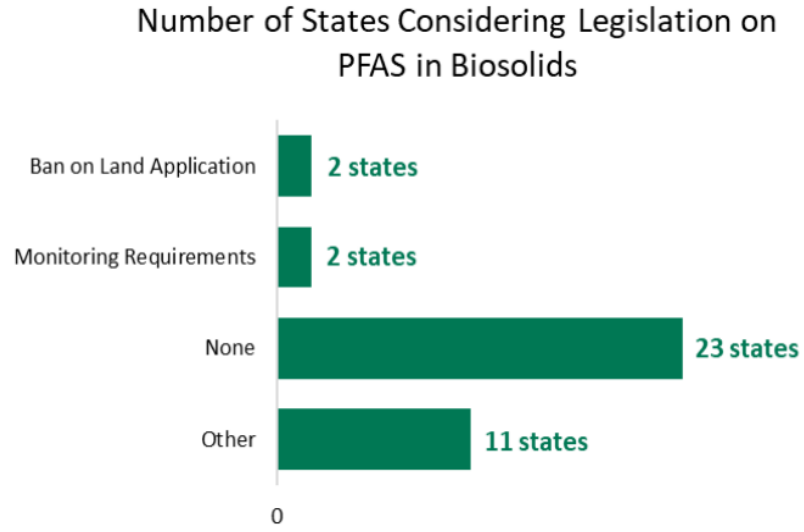


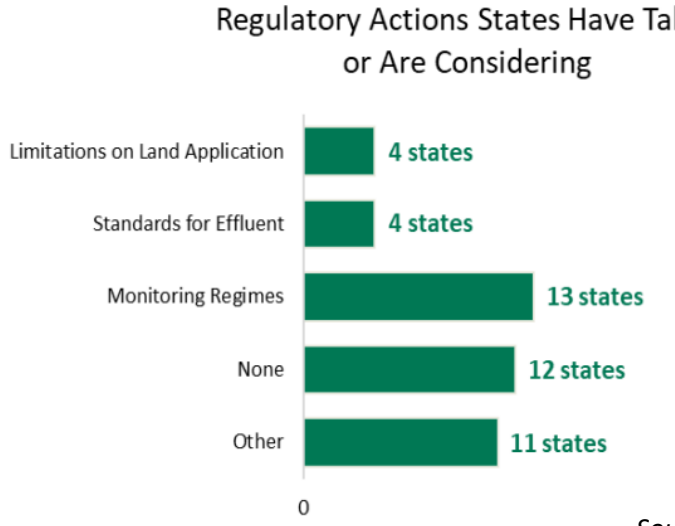
PFAS in Wastewater

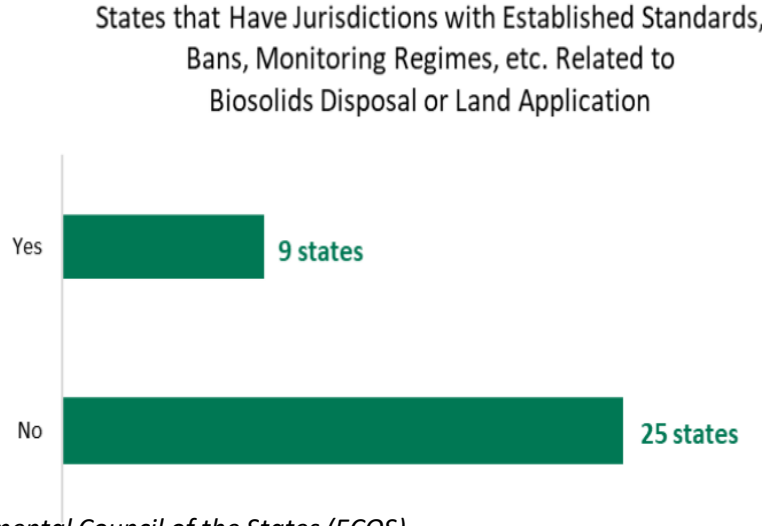
What Other States are Doing











Source: Environmental Council of the States (ECOS)

Emerging Technologies

Adsorbent Media

cyclopure

DEXSORB+

MINERALS TECHNOLOGIES CETCO®

FLUORO-SORB® 400

Pump & Treat, Permeable Reactive Barrier (PRB)

FLUORO-SORB® 100

In-Situ Solidification & Stabilization (ISS)

FLUORO-SORB® 200

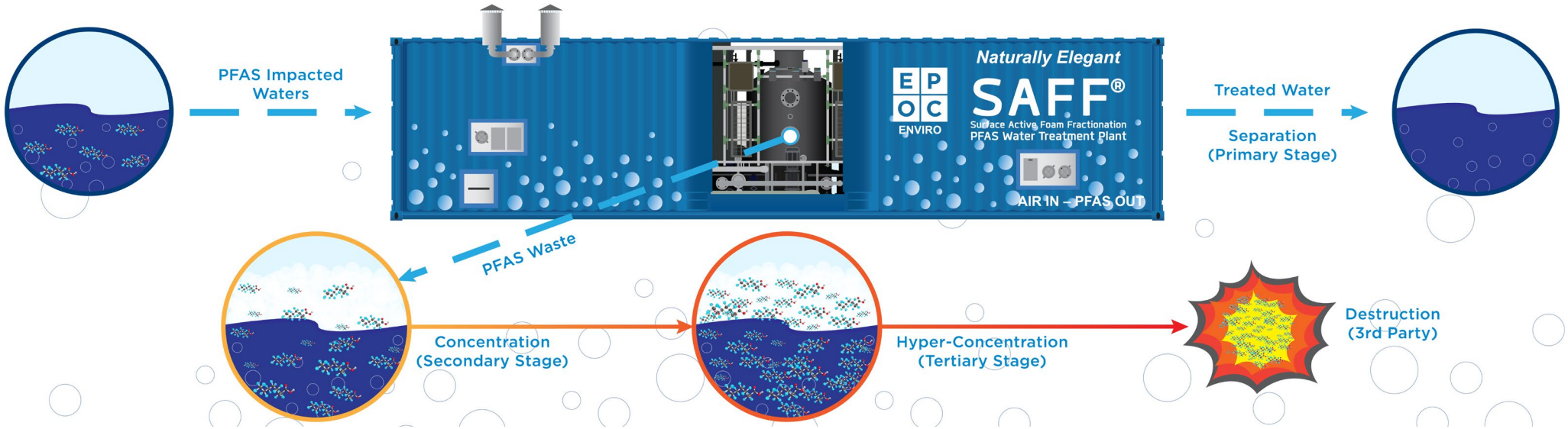
Pump & Treat, Permeable Reactive Barrier (PRB)

FLUORO-SORB® 300

High Organics Wastewater Treatment

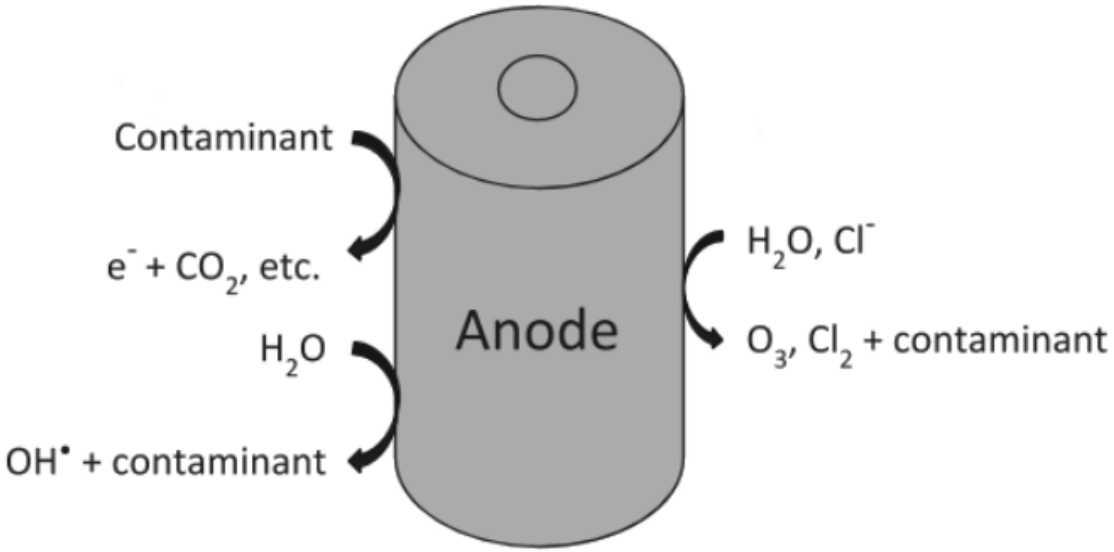
https://youtu.be/HGKawPAMULA

Surface Active Foam Fractionation (SAFF)

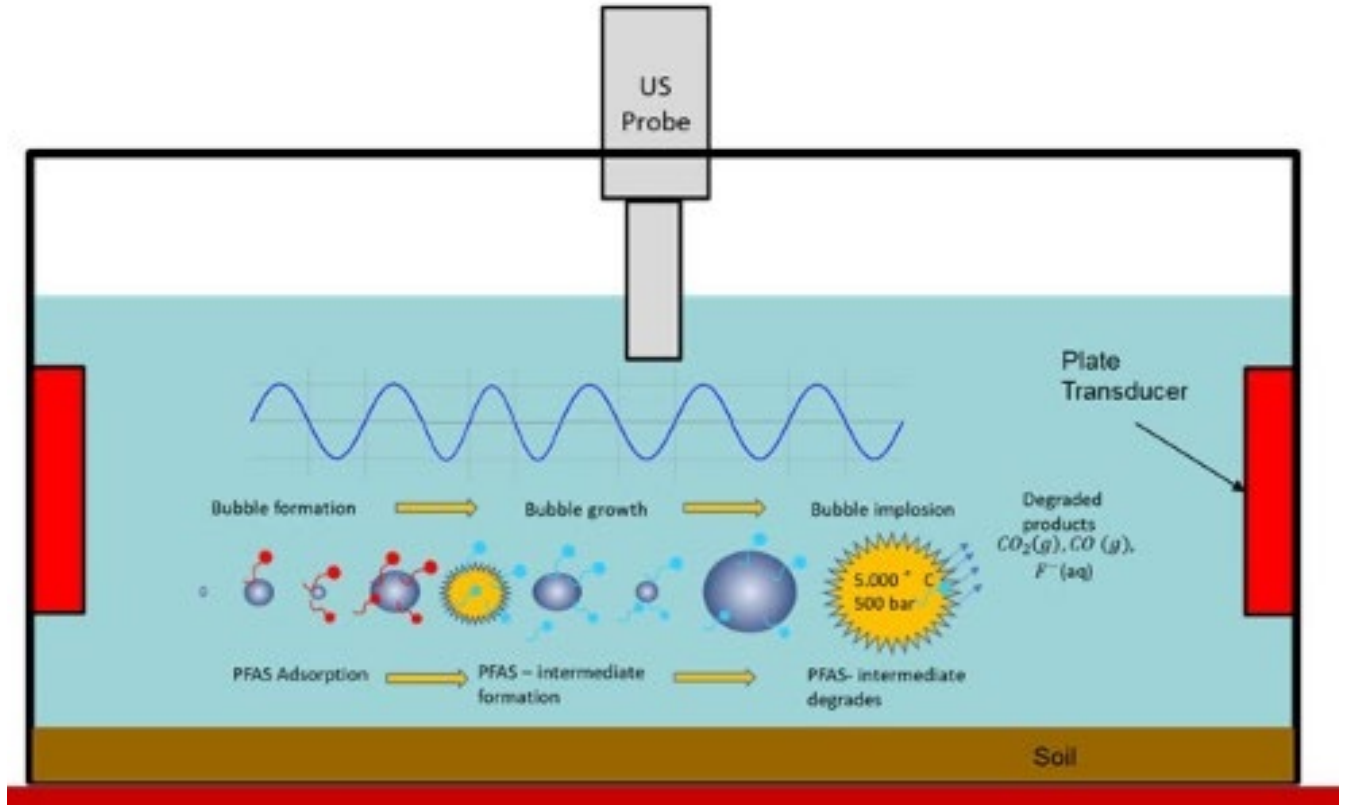


https://youtu.be/uUutrt3VFYU

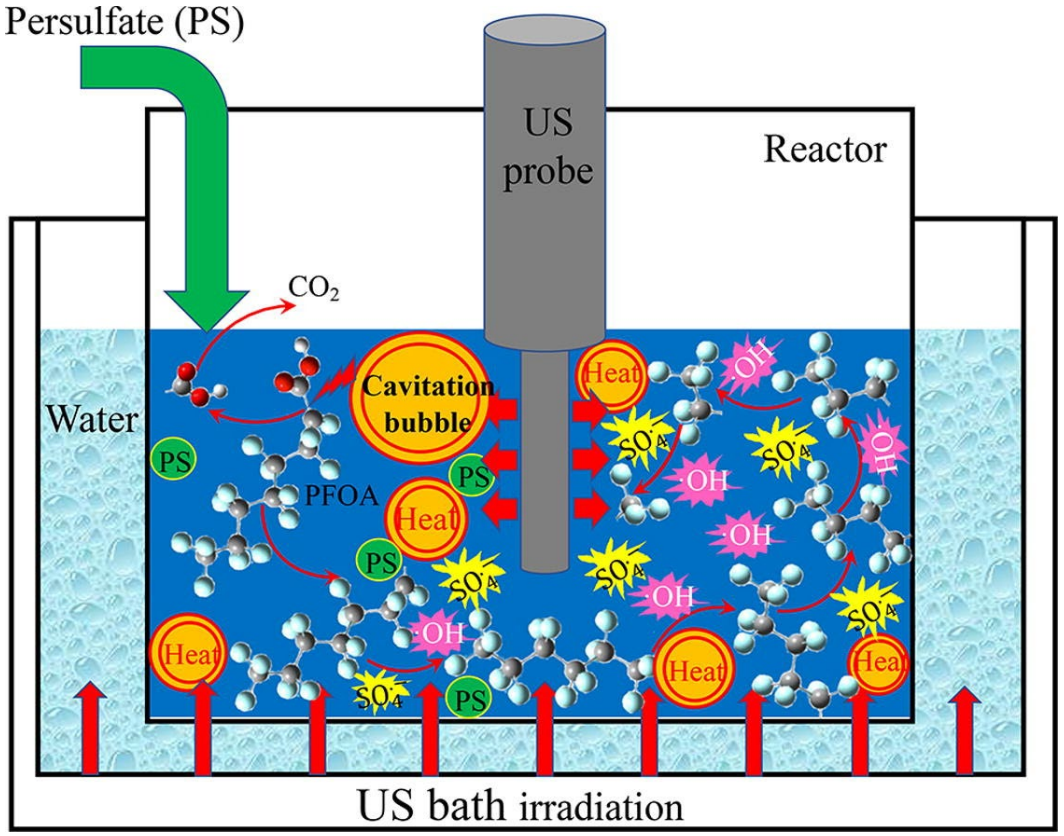
Electrochemical Advanced Oxidation Processes (eAOPs)



Sonochemical Oxidation/Ultrasound



Source: NJIT



Source: Synergistic degradation of PFAS in water and soil by dual-frequency ultrasonic activated persulfate by Yong

- Acoustic waves in liquids at frequencies ranging from 20 kHz to 1,000 kHz
- Process produces high temperatures and pressures

PFAS Funding Opportunities

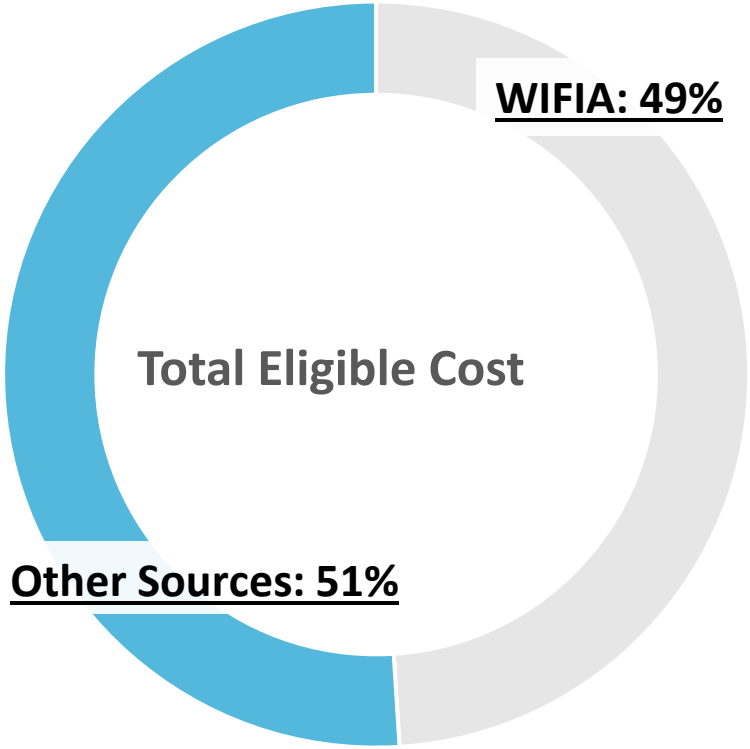
stv

Bipartisan Infrastructure Law (BIL)

- $21 billion
  - $9 billion for PFAS and other emerging contaminants
    - $4 billion - Drinking Water State Revolving Fund (DWSRF)
    - $5 billion - Small/Disadvantaged Communities Grant Program
  - $12 billion - BIL DWSRF funds earmarked for drinking water safety

Water Infrastructure Investment & Jobs Act (WIFIA)

- EPA program for water & wastewater infrastructure financing
  - Administered directly by EPA: no TWDB involvement
  - Finances 49% of total costs at Treasury SLGS rate (AAA)
  - $20 million minimum project cost for populations serving >25k population
  - PFAS projects are eligible and have already been funded
  - Popular program under-utilized in Texas



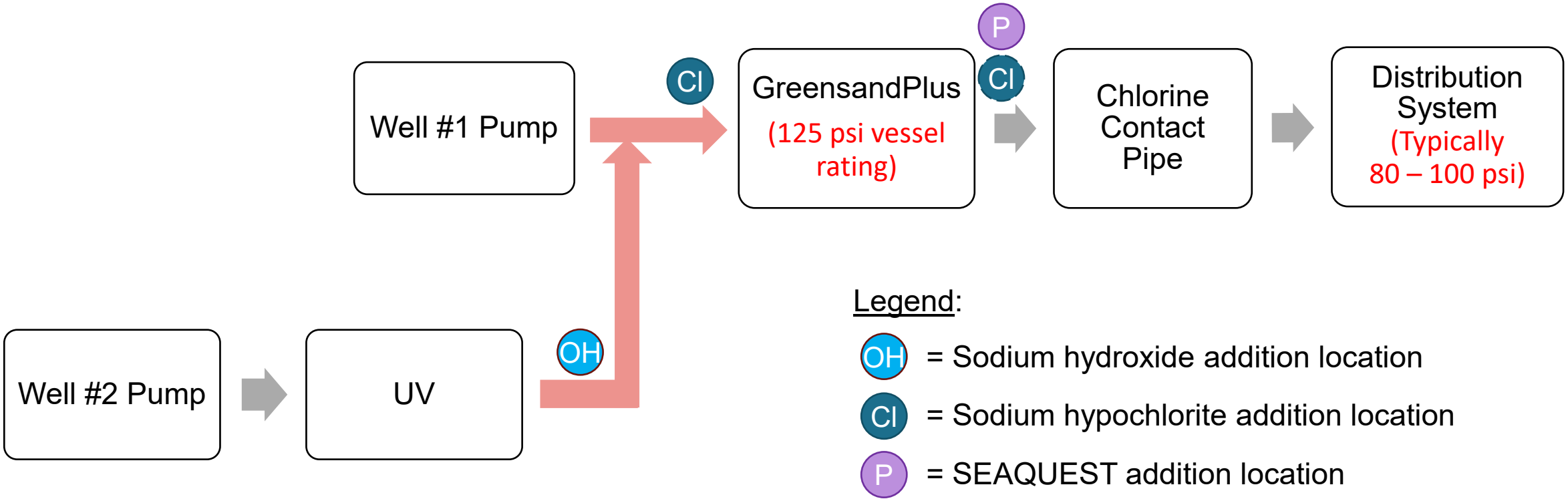
Case Studies

Project 1:
Water Treatment Plant with Challenging Site

Study Phase Started in July 2020

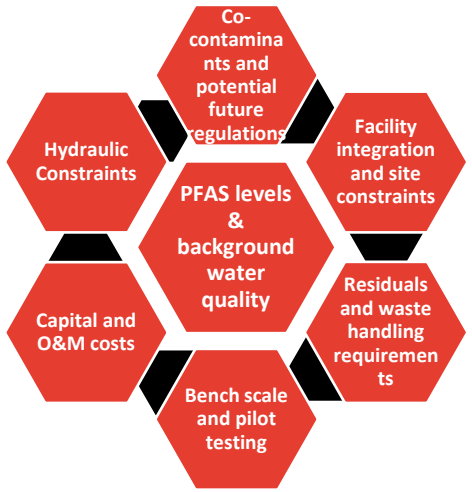
Construction Completed by March 2023

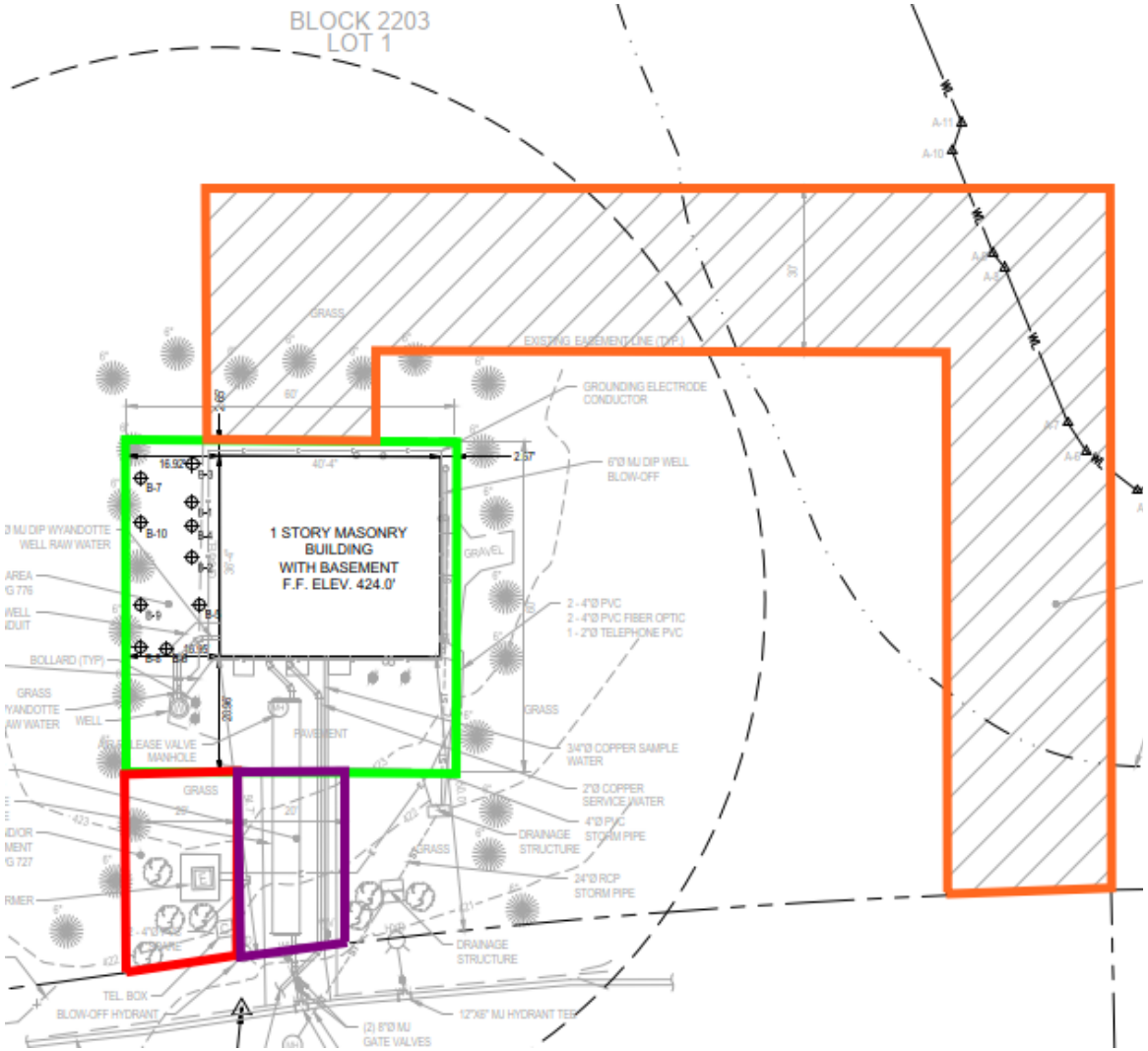
Project 1: Existing Process Flow Diagram



Project 1: Treatment Selection

- Background water quality and PFAS levels
- Facility integration & site constraints
- Hydraulic constraints
- Bench scale and pilot testing
- Schedule concerns





Project 1: Treatment Technology Selected

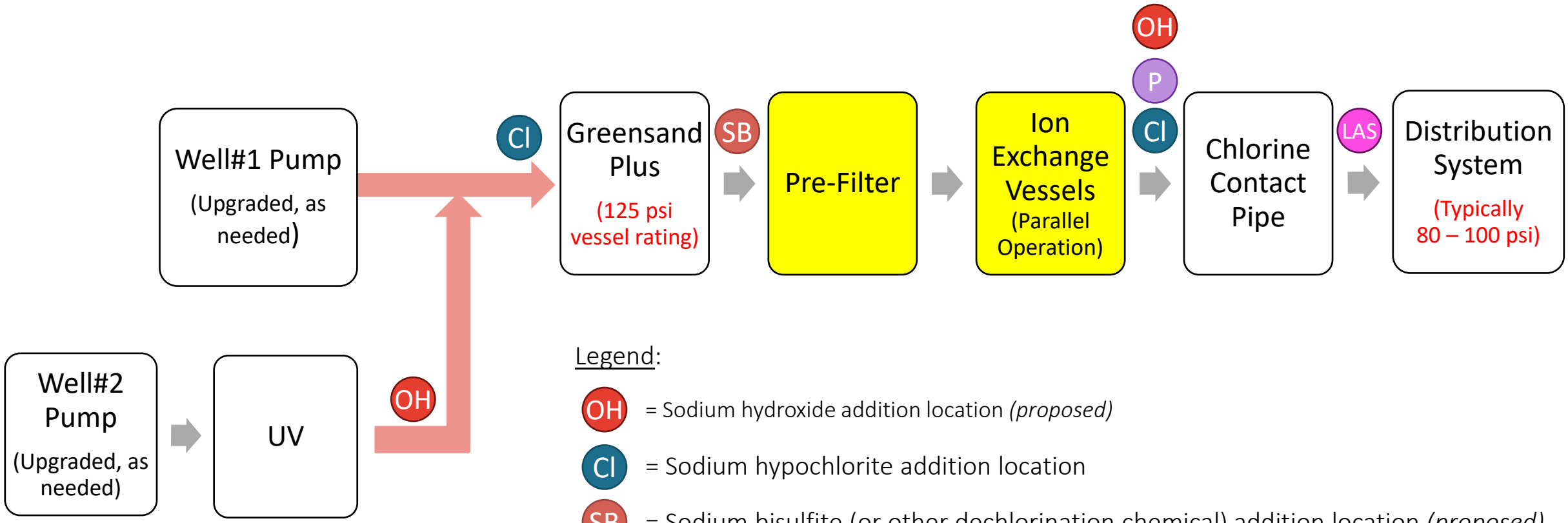
- Ion-Exchange Resin (IX)
  - Effective
  - Smaller footprint
  - Minimizes operational effort - longer life and less frequent media replacement
  - Bench scale testing on several resins
  - Selected 2 resins, with 3rd resin being considered

Ion exchange (PFAS selective resin)

Ion exchange and adsorption

Resin Bench Scale Testing Set-up

Project 1: Proposed Process Flow Diagram



Legend:

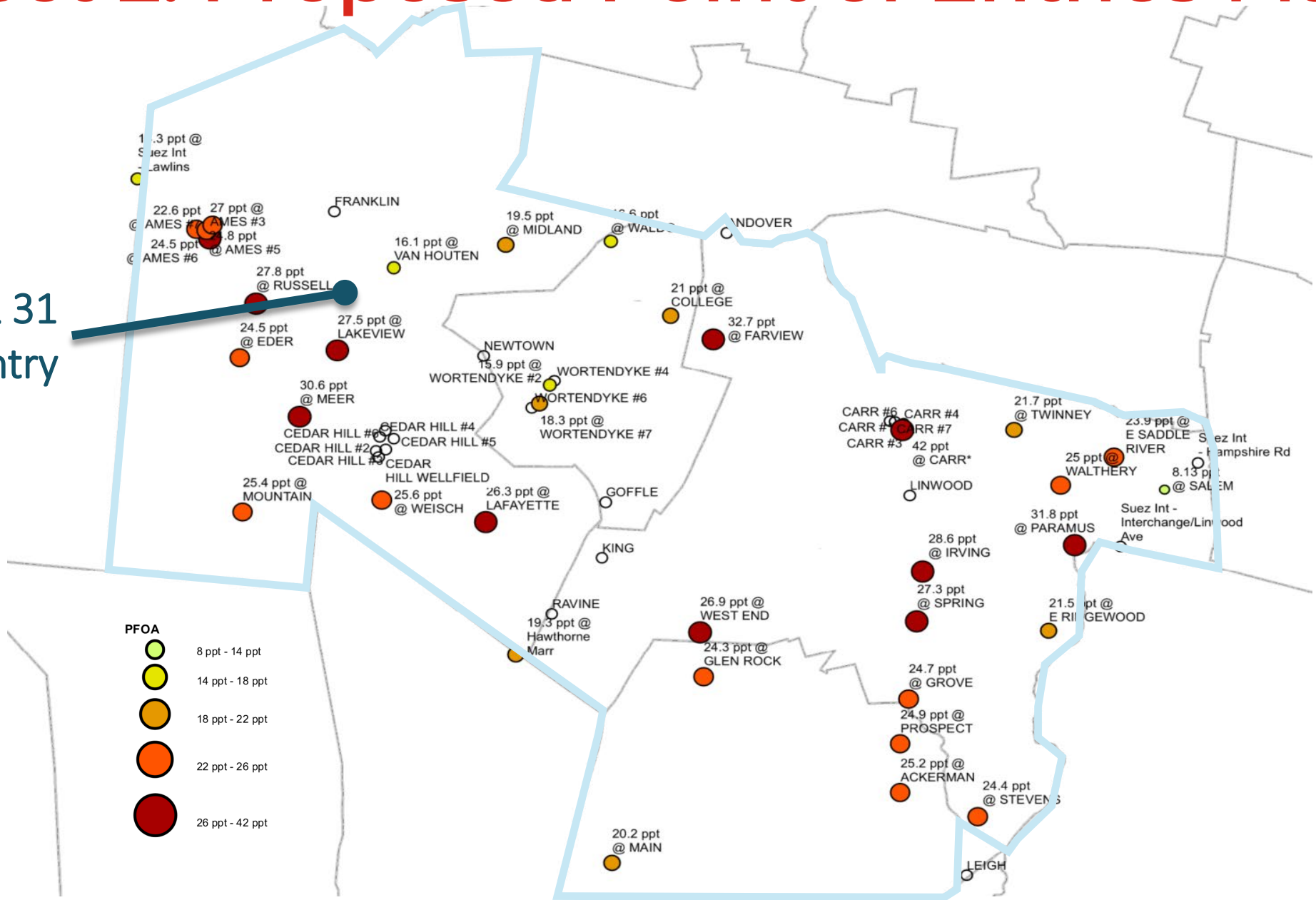
- OH = Sodium hydroxide addition location *(proposed)*
- Cl = Sodium hypochlorite addition location
- SB = Sodium bisulfite (or other dechlorination chemical) addition location *(proposed)*
- P = Zinc orthophosphate addition location *(proposed – replaces Seaquest)*
- LAS = Liquid ammonium sulfate addition location *(proposed)*

Project 2:
Solution for Water System with PFAS in 52 Wells

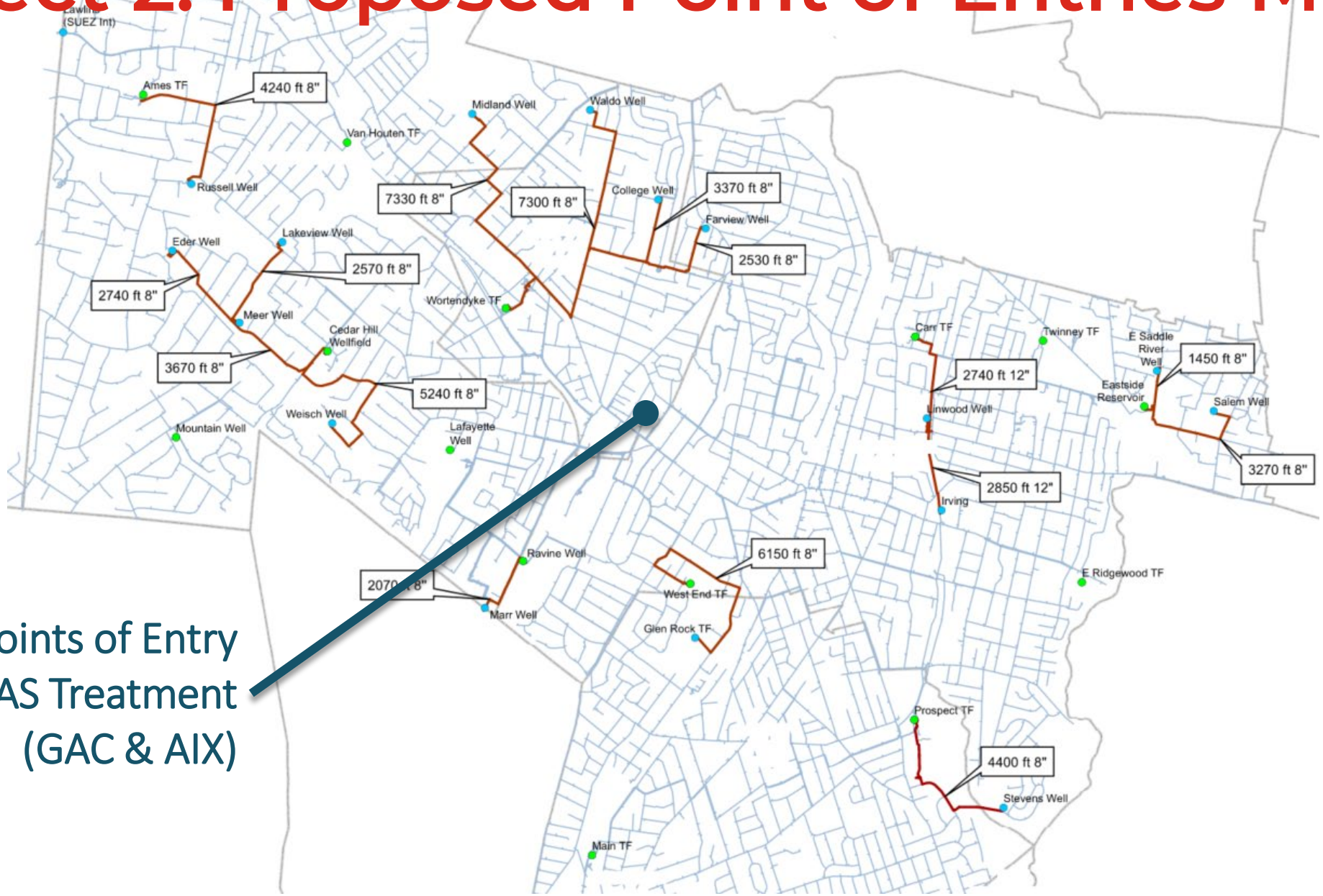
Study Phase Started in 2019

Project 2: Proposed Point of Entries Map

52 Wells & 31 Points of Entry



Project 2: Proposed Point of Entries Map



31 to 13 Points of Entry with PFAS Treatment (GAC & AIX)

Questions?

Swaroop C Puchalapalli, P.E. (TX, NY and CT)
Associate Vice President, Water Group
(o) 214.589.6910 | (c) 216.280.1502
Swaroop.Puchalapalli@stvinc.com

Thank you!

Swaroop C Puchalapalli, P.E. (TX, NY and CT)
Associate Vice President, Water Group
(o) 214.589.6910 | (c) 216.280.1502
Swaroop.Puchalapalli@stvinc.com

Discussion

4. FY2024 Water Resources Council Membership

The Final FY2024 WRC roster, approved by NCTCOG's Executive Board, will be presented to the WRC.

FY 24 WRC Roster

FY 24 WRC Structure

Discussion

5. Water Resources Education and Outreach.

The WRC will be asked to provide input on topics and speakers for webinars or workshops that NCTCOG will hold this fiscal year.

Other Business and Roundtable Discussion

6. NCTCOG Updates

a. Final 2023 Update to the North Central Texas Water Quality Management Plan (WQMP).

The final WQMP was endorsed by NCTCOG'S Executive Board in August and NCTCOG submitted it to TCEQ on August 30, 2023.

Link to Final 2023 WQMP

Other Business and Roundtable Discussion

6. NCTCOG Updates

b. NCTCOG Webinar: *Germinating Equitable Outcomes Through Urban Forestry*

- **Wednesday, October 25, 2023**

  10:00 a.m.

  Register and Add to Calendar

Other Business and Roundtable Discussion

6. NCTCOG Updates

c. Wastewater and Treatment Education Roundtable (WATER)

- Next meeting:

  Thursday, October 19, 2023

  10:00 a.m. Hybrid: In-Person at NCTCOG and online, via Microsoft Teams. Please RSVP prior to attending.

  RSVP and Add to Calendar

Other Business and Roundtable Discussion

6. NCTCOG Updates

c. Wastewater and Treatment Education Roundtable (WATER)

- WATER is accepting financial commitments for the FY2024 WATER Work Program via email at hallen@nctcog.org.
- Cost-shares are based on population size (or number served for special districts) and invoices will be sent this month. FY2024 Work Program is available online.

Other Business and Roundtable Discussion

6. NCTCOG Updates

d. Floodplain Seminar for Elected Officials and Municipal Staff

- **Thursday, October 19, 2023**

  9:30 a.m. In-person at NCTCOG.

  Register and Add to Calendar

Other Business and Roundtable Discussion

6. NCTCOG Updates

e. Public Works Council

- Next Meeting:

  Thursday, November 16, 2023

  9:30 a.m. Virtual, via Microsoft Teams.

  Add to Calendar

Other Business and Roundtable Discussion

6. NCTCOG Updates

f. Annual Holiday Grease Roundup

- **November 13, 2023- January 12, 2024**

  Contact Hannah Allen at hallen@nctcog.org by November 1 to register as a collection site or to join as a marketing participant only.

Other Business and Roundtable Discussion

7. Future Agenda Items

The WRC can request future agenda items & discuss the priority and format of previously requested items. Previously requested agenda items include:

- Water/wastewater workforce and supply chain issues
- Green stormwater infrastructure successes/case studies
- How to prepare for impacts of climate change, i.e. floods, water, drought
- Update on drought situation in DFW

Other Business and Roundtable Discussion

8. Roundtable

The WRC is invited to share what is happening in their communities.

Other Business and Roundtable Discussion

9. Next Meeting

Wednesday, January 10, 2024 (virtual)
10:30 a.m. – 12:30 p.m.
Add to Calendar

- Meeting Dates for the remainder of 2024:
  - Wednesday, April 10, 2024- NCTCOG; Add to Calendar
  - Wednesday, July 10, 2024- Online; Add to Calendar
  - Wednesday, October 9, 2024- NCTCOG; Add to Calendar

10. Adjournment

Staff Contacts

- Elena Berg

  Environment and Development Planner III

  Eberg@nctcog.org

  817-608-2363

- Cassidy Campbell

  Environment and Development Program Manager

  Ccampbell@nctcog.org

  817-608-2368

- Alyssa Knox

  Environment and Development Planner

  AKnox@nctcog.org

  817-695-9221

- Susan Alvarez

  Environment and Development Director

  Salvarez@nctcog.org

  817-704-2549