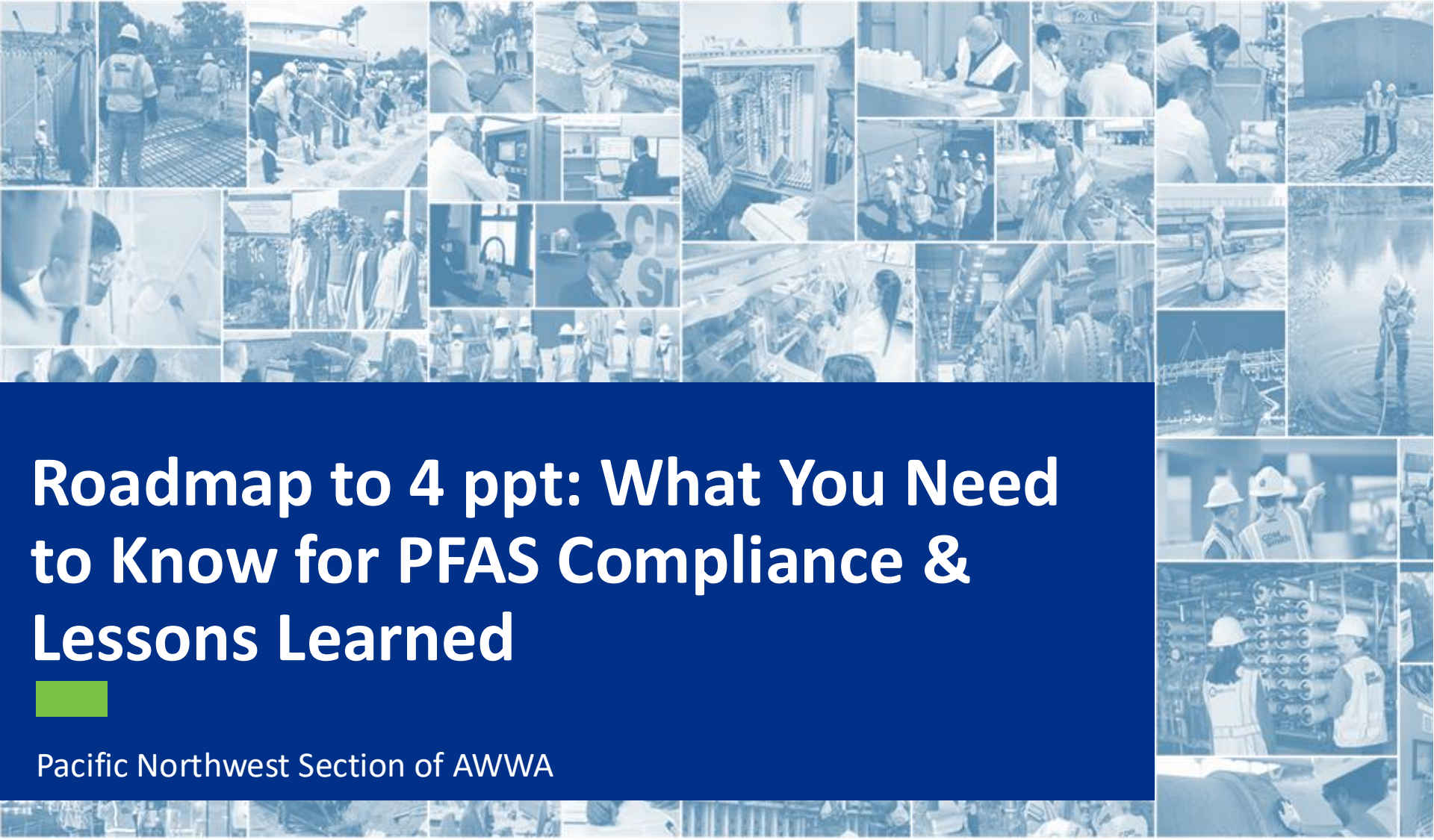


Roadmap to 4 ppt: What You Need to Know for PFAS Compliance & Lessons Learned

Pacific Northwest Section of AWWA

Michael Hill, PE.
Ji Im, P.E.

May 6, 2026

CDM Smith

Agenda

1. Review of Regulations
2. Compliance Approach
3. Case Studies
4. Takeaways and Conclusions



Current Regulatory Status



Final PFAS National Primary Drinking Water Regulation

U.S.

EPA announces first-ever national regulations for "forever chemicals" in drinking water

By Tracy J. Wholf
Updated on: April 10, 2024 / 8:06 PM EDT / CBS News

EPA United States Environmental Protection Agency

Search EPA.gov

Environmental Topics | Laws & Regulations | Report a Violation | About EPA

Safe Drinking Water Act | CONTACT US

Per- and Polyfluoroalkyl Substances (PFAS)

Final PFAS National Primary Drinking Water Regulation

- Summary
- Supporting Materials
  - General Information
  - Communications Toolkit
  - Technical Information for States, Tribes and Water Systems
  - Español
- Regulatory Information and Supporting Documents
- Webinar Registration
- Background



Summary

On April 10, 2024, EPA announced the final National Primary Drinking Water Regulation (NPDWR) for six PFAS. To inform the final rule, EPA evaluated over 120,000 comments submitted by the public on the rule proposal, as well as considered input received during multiple consultations and stakeholder engagement activities held both prior to and following the proposed rule. EPA expects that over many years the final rule will prevent PFAS exposure in drinking water for approximately 100 million people, prevent thousands of deaths, and reduce tens of thousands of serious PFAS-attributable illnesses.

EPA is also making unprecedented funding available to help ensure that all people have clean and safe water. In addition to today's final rule, $1 billion in newly available through the Bipartisan Infrastructure Law to help states and territories implement PFAS testing and treatment at public water systems and to help owners of private wells address PFAS contamination.

EPA finalized a National Primary Drinking Water Regulation (NPDWR) establishing legally enforceable levels, called Maximum Contaminant Levels (MCLs), for six PFAS in drinking water. PFOA, PFOS, PFHxS, PFNA, and HFPO-DA as contaminants with individual MCLs, and PFAS mixtures containing at least two or more of PFHxS, PFNA, HFPO-DA, and PFBS using a Hazard Index MCL to account for the combined and co-occurring levels of these PFAS in drinking water. EPA also finalized health-based, non-enforceable Maximum Contaminant Level Goals

PUBLIC HEALTH

EPA puts limits on 'forever chemicals' in drinking water

APRIL 10, 2024 · 5:01 AM ET

HEARD ON MORNING EDITION

Pien

AP | Eid al-Fitr 2024 | Israel-Hamas war | Arizona abortion ban | M

EVEN WHEN THE NEWS IS FREE, JOURNALISM IS NOT. SUPPORT INDEPENDENT, FACT-BASED JOURNALISM.

CLIMATE

Biden administration sets first-ever limits on 'forever chemicals' in drinking water

UCMR5 data suggests 10,000 treatment facilities will need to be built potentially costing more than $40B in capital investment. The 5 year window is going to help, but this will still be a sprint to overcome workforce, supply chain, and other issues.

EPA's Regulations

Compliance based on running annual average (quarterly samples)

- **Maximum Contaminant Level (MCL) of 4 ng/L or ppt** for PFOA or PFOS

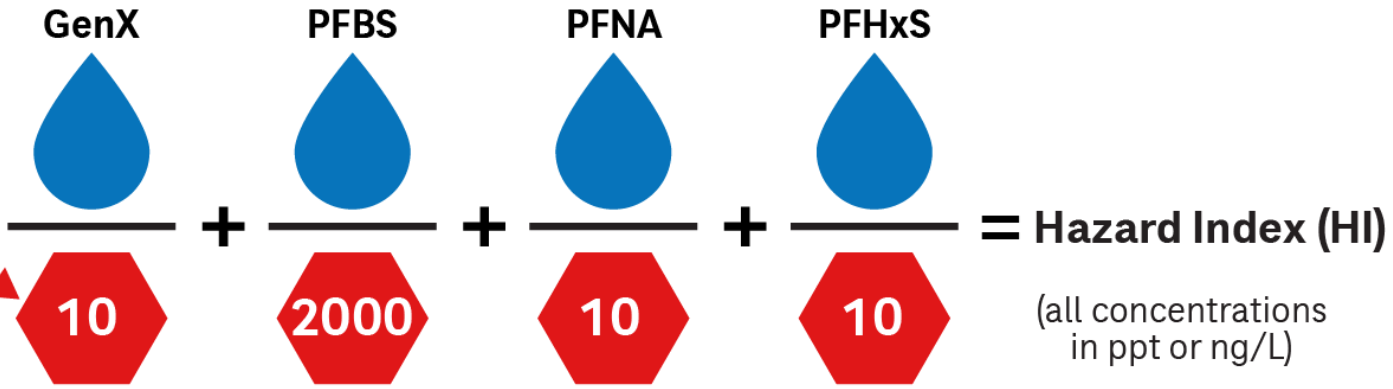
PFAS	Practical Quantitation Limit or PQL (ppt)
PFOA	4.0
PFOS	4.0
GenX	5.0
PFHxS	3.0
PFNA	4.0
PFBS	3.0

EPA's Regulations

Compliance based on running annual average (quarterly samples)

- **Maximum Contaminant Level (MCL) of 4 ng/L or ppt** for PFOA or PFOS
- **Hazard Index (HI) of 1** (unitless) for PFNA, PFHxS, PFBS & GenX
- **Individual MCLs of 10 ng/L** for PFNA, PFHxS & GenX

HI denominators are called Health-Based Water Concentrations (HBWC)



Compliance Calculation

- Compliance based on running annual average (RAA) calculation
- Results <PQL will be summed as zero
  - Example using PFOA results:
  - 2.0, 1.5, **5.0** & 1.5 ppt (results below PQL)
  - Running annual average = (0.0 + 0.0 + **5.0** + 0.0) / 4 = **1.3 ppt** for 2 significant figures

PFAS	PQL (ppt)
PFOA	4.0
PFOS	4.0
GenX	5.0
PFHxS	3.0
PFNA	4.0
PFBS	3.0

Rounding happens at the end!

Significant Figures Are Significant!

PFAS	MCL (ppt)	S.F.	Rounding of Running Annual Average (RAA) for Reporting Examples
PFOA or PFOS	4.0	2	4.04 ppt = round to 4.0 ppt = **Compliance** 4.05 ppt = round to 4.1 ppt = **Exceedance**
PFNA, PFHxS, or GenX	10	1	14.9 ppt = round to 10 ppt = **Compliance** 15.0 ppt = round to 20 ppt = **Exceedance**
PFNA, PFHxS, GenX & PFBS	HI of 1	1	1.49 = round to 1 = **Compliance** 1.50 = round to 2 = **Exceedance**

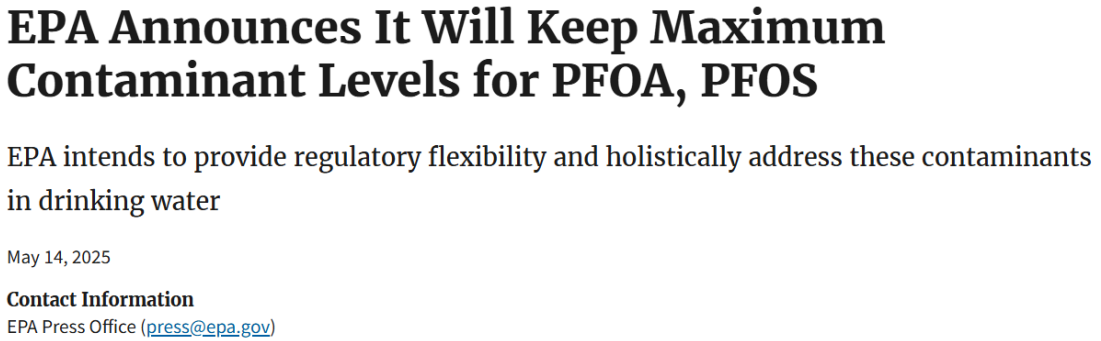
Compliance Monitoring

- Not in violation until completing one year of quarterly sampling
  - EXCEPT when one quarterly sample result causes the RAA to exceed the MCL immediately (e.g. result is >4 times of the MCL)
- If more than one sample taken per quarter, all samples are used in the RAA calculation
  - Average all the results in a quarter then average the quarterly averages
- “The State may increase the required monitoring frequency, where necessary, to detect variations within the system”
- No monitoring waivers allowed

EPA May 2025 Announcement

1. **Most important non-change**: keeping the 4 ppt limits for PFOA/PFOS
2. Compliance deadline extension from 2029 to 2031
3. PFHxS, PFNA, GenX & PFBS: Reconsidering the hazard index approach & 10 ppt MCLs
4. Schedule: Targeted issuing a proposed revised draft rule in the fall of 2026 & finalize in the spring of 2026 – ***DELAYED***

Proposals for #2 & #3 currently being reviewed by the Office of Management & Budget



EPA Announces It Will Keep Maximum Contaminant Levels for PFOA, PFOS

EPA intends to provide regulatory flexibility and holistically address these contaminants in drinking water

May 14, 2025

Contact Information
EPA Press Office (press@epa.gov)



Compliance Approach



Compliance Schedule Deadlines

April 26, 2024

- Final PFAS rule published

April 26, 2027

- Complete initial monitoring
- Initiate PFAS compliance monitoring and CCR reporting

April 26, 2029

- Compliance deadline for MCLs

Typical PFAS Project Implementation Steps

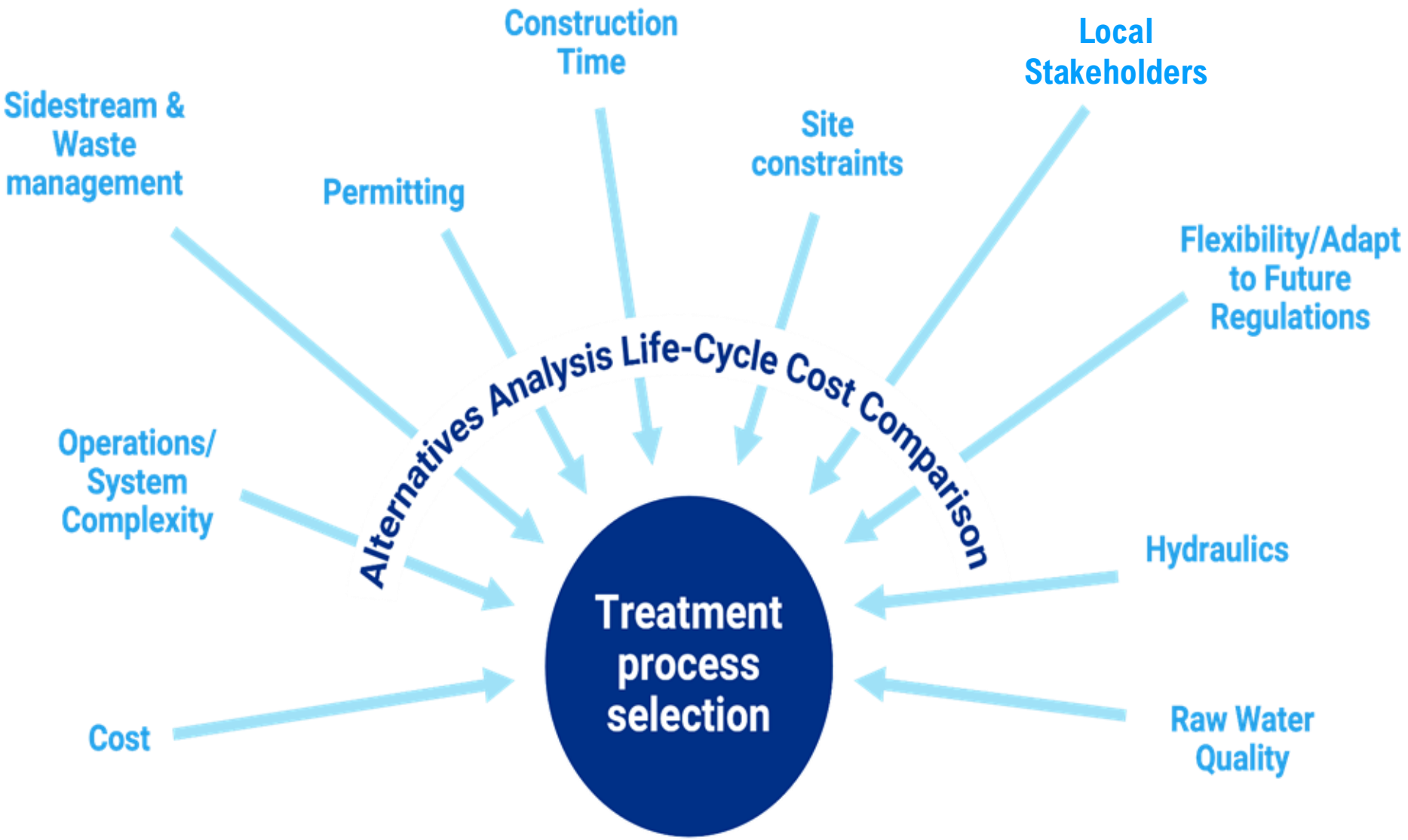
Traditional Delivery

	Activity	Common Duration
1	Gather/Review Data and Prepare Concept Memo	3 months
2	Bench Scale Testing	>=4 months
3	Pilot testing (if needed)	3-12 months
4	Design and Permitting	4-12 months
5	Bidding and Contract Award	2 months
6	Construction and Commissioning	15-36 months

- Project complexity & state regulatory requirements will affect timeline
- Concurrent performance of testing & design activities is possible
- Alternative project delivery methods can accelerate project schedule!
  - Design-build or equipment/vessel pre-purchase

Example Schedule with May 2026 Start




Construction Time
Local Stakeholders
Sidestream & Waste management
Site constraints
Permitting
Flexibility/Adapt to Future Regulations
Alternatives Analysis Life-Cycle Cost Comparison
Operations/ System Complexity
Hydraulics
Treatment process selection
Cost
Raw Water Quality

Feed Water Quality is Key to Selecting Treatment

PFAS

- Which compounds are you treating for?
- MCLs, PFAS currently regulated by State, or short-chains too?
- Flexibility for future MCLs and/or more compounds regulated

Potential Interferences that May Require Pretreatment

- Organics (including TOC/DOC)
- Metals (e.g. iron & manganese)
- Radionuclides
- Hardness
- Sand/fine sediment
- Entrained air (common in wells)
- Total dissolved solids (TDS)

Treatment of Other Constituents

- Disinfection byproduct (DBP) precursor organics
- Volatile organic carbon (VOC) / synthetic organic carbon (SOC)
- Nitrate
- Emerging compounds – 1,4-dioxane
- Pharmaceuticals & personal care products (PPCPs)
- Perchlorate
- Hexavalent chromium



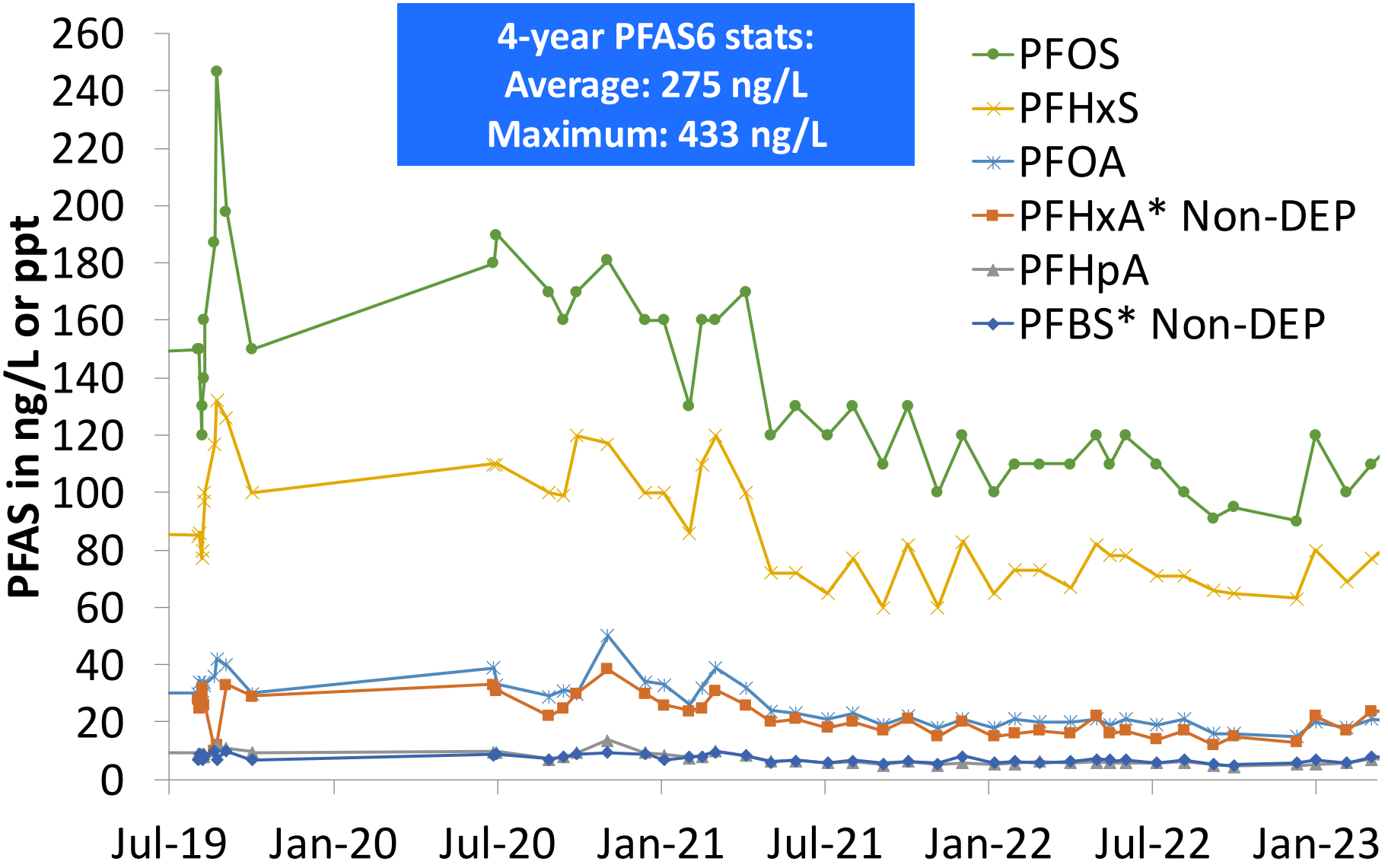
Case Studies



Very Quick Review of Case Studies

	State	Source	Capacity	Description
1	Mass.	**Ground water**	4 mgd	Full-scale facility in operation for 4 years treating high PFAS levels with non-detect treatment goal
2	Maine	**Surface Water**	>4 mgd	Low PFAS levels but looking to be prepared
3	Mass.	**Ground water**	0.8 mgd	Combining 2 different stations for iron, manganese, radon & PFAS
4	Virginia & Illinois	**Surface Water**	>100 mgd	Low PFAS levels with >100 mgd capacity looking to be proactive

Case Study #1: 4 mgd Groundwater in MA



Case Study #1: Granular Activated Carbon

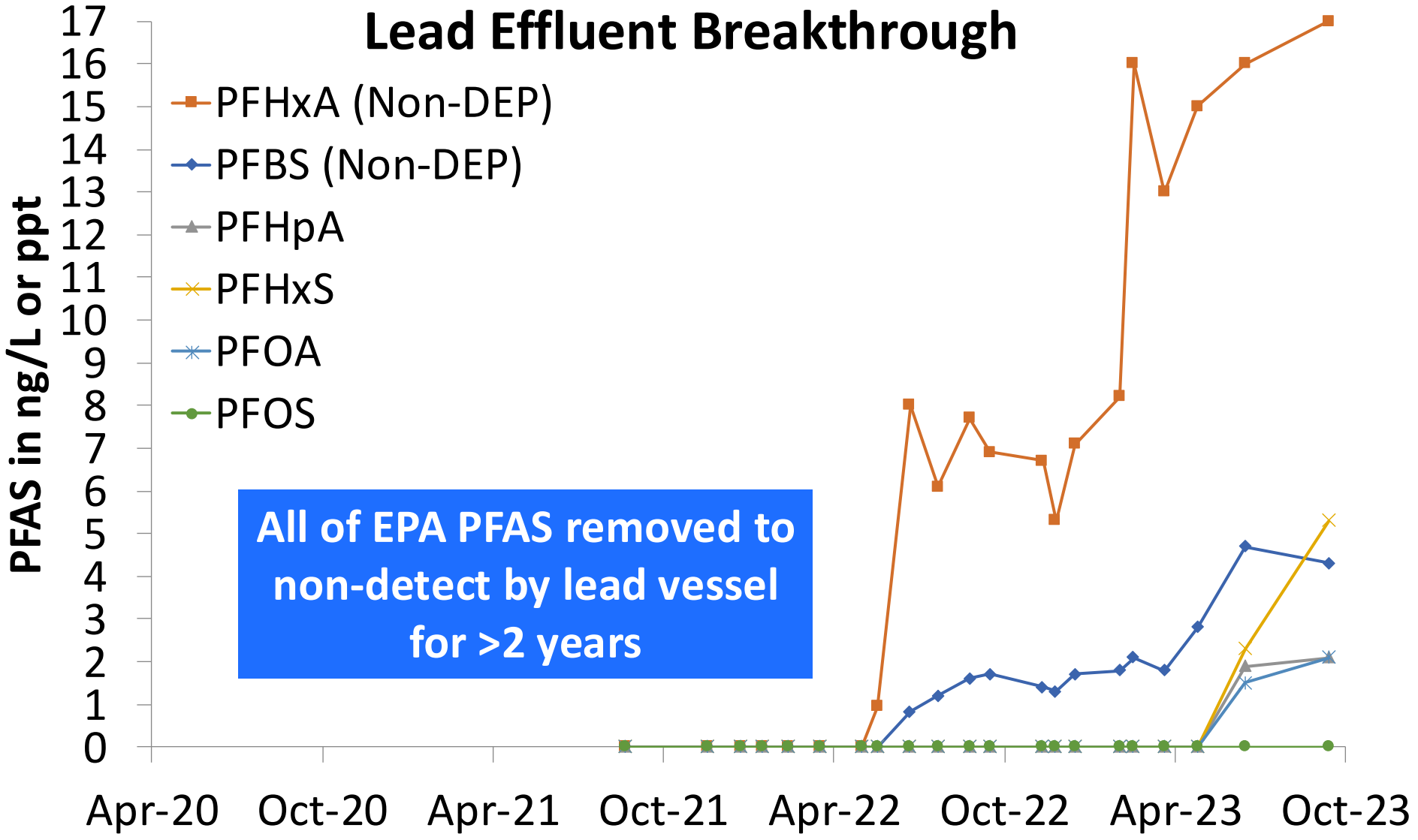






TOC = <1 mg/L

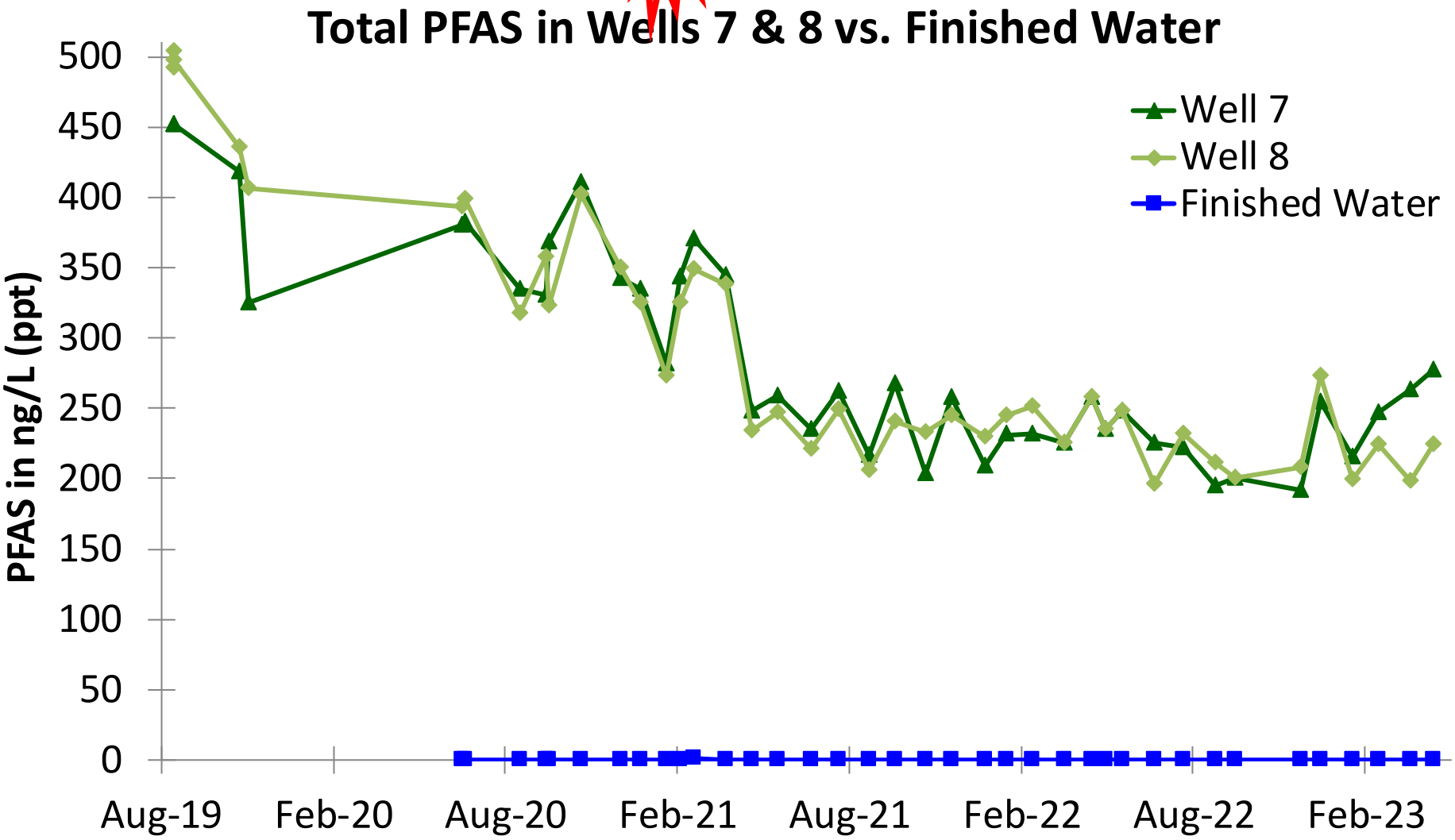
Case Study #1: Treatment Performance



Treatment Performance

~1 billion gallons treated

0 PFAS detections in finished water

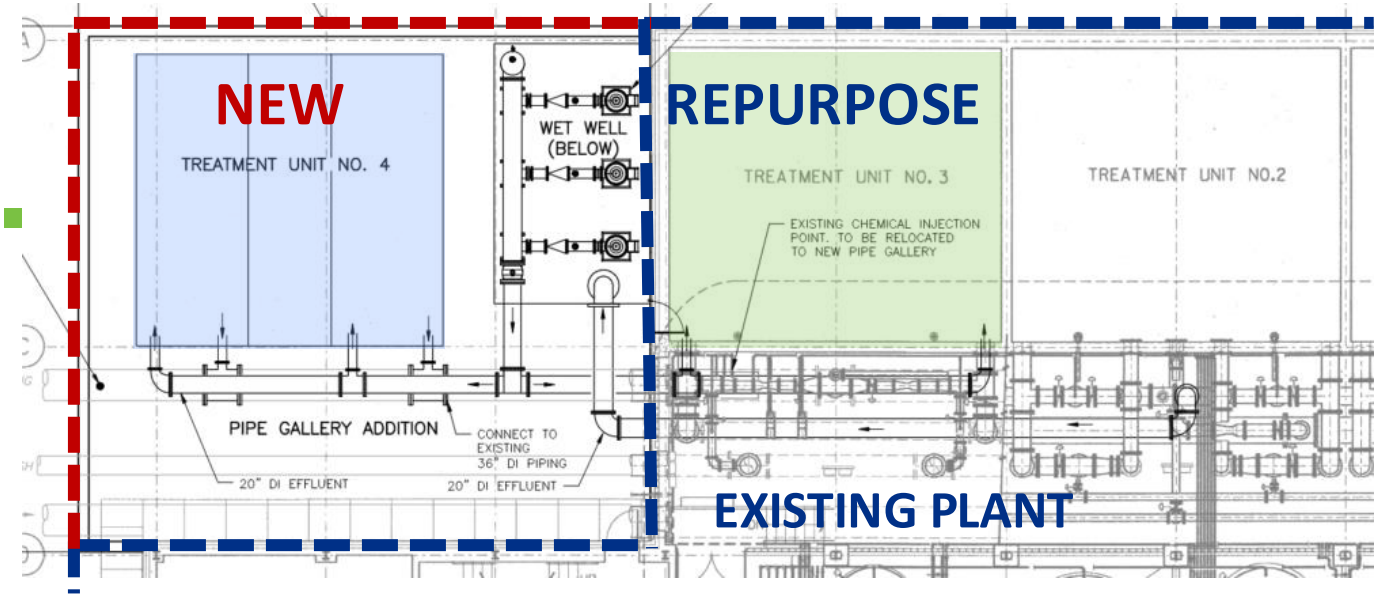


Case Study #2: >4 mgd Surface Water in ME

- Desktop Analysis
  - PFOA at & just over 4 ppt
  - Holistic review for more than PFAS: manganese, corrosion control, organics, algae, etc.
- Alternatives Analysis
  1. New GAC in existing gravity filters
  2. Additional filter + repurpose existing filters for post-filtration PFAS adsorption with GAC
  3. Post-filtration GAC, AIX or novel adsorbent contactors



Case Study #2: >4 mgd Surface Water in



- Alternatives Analysis

1. New GAC in existing gravity filters
2. Additional filter + repurpose existing filters for post-filtration PFAS adsorption with GAC
3. Post-filtration GAC, AIX or novel adsorbent contactors

Planning Process



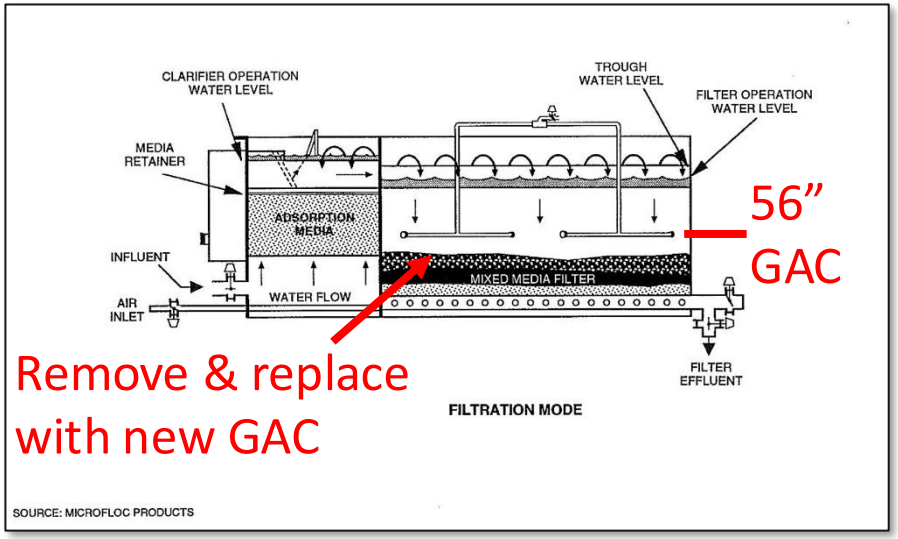
Case Study #2: Comparison of Alternatives

Advantageous Neutral Disadvantageous

Criteria	1. New GAC in existing filters	2. Additional filter + repurpose existing filters for post-filtration GAC contactors	3. Post-Filter GAC Contactors	4/5. Post-Filter AIX Contactors /Novel Adsorbents
Proven Solution for Meeting Treatment Goals	🟡	🟢	🟢	🟢
Regulatory Resiliency for Other PFAS	🔴	🟡	🟢	🟢
Impact to Corrosion Control	🟢	🟢	🟢	🟡
Production Capacity Limitation	🟡	🔴	🟢	🟢
O&M Impacts	🟡	🟡🔴	🔴	🔴
Disposal Requirements	🟢	🟢	🟢	🔴
Speed of Implementation	🟢	🔴	🔴	🔴
Constructability & Maintenance of Plant Operation Impacts	🟢	🔴	🟡	🟡
Capital Cost	🟢🟢	🟢	🟡	🟡
Operating Cost	🔴	🟡	🟡	🟡

Case Study #2: Ongoing Work

- Full-scale piloting with 2 filters by replacing existing media with virgin GAC
  - Confirmed media life of ~1 year without impacting turbidity removal & filter operation
- Conducted bench-scale for different media options for post-filter contactors
- Final design to accommodate frequent media changeouts in the existing filters

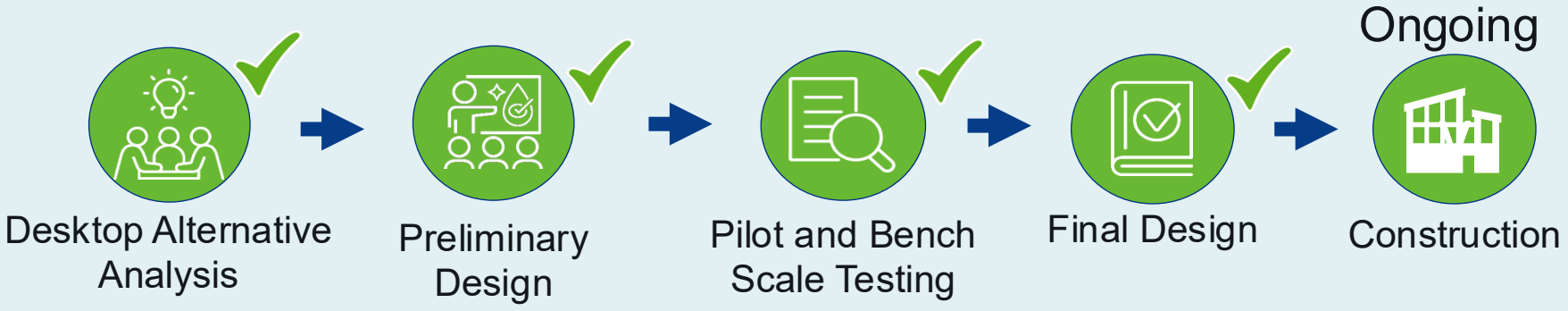




CDM Smith Bellevue Research Laboratory

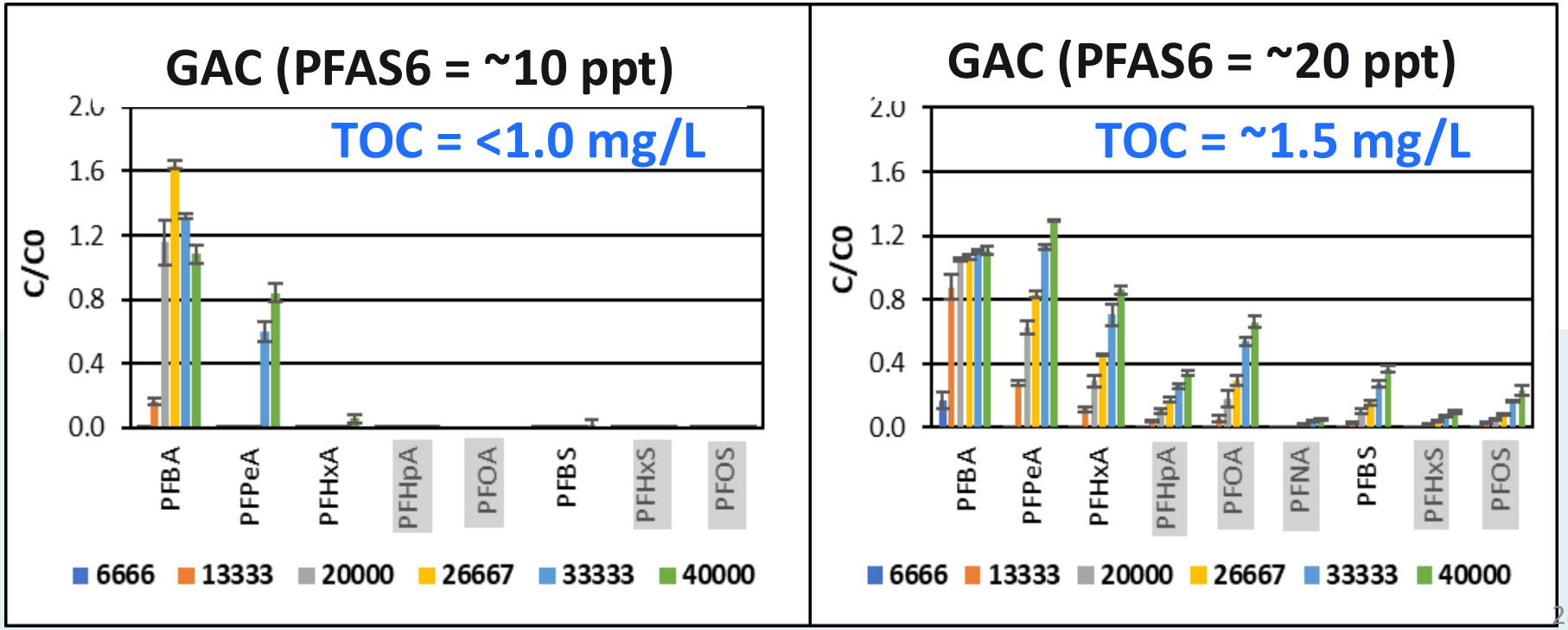
Case Study #3: 0.8 mgd Groundwater in MA

- Desktop analysis & preliminary design for Fe & Mn removal
- **PFAS6 detected at ~10 ppt for PFAS6 & second station at >20 ppt - combined treatment for streamlined approach**



Case Study #3: 0.8 mgd Groundwater in MA

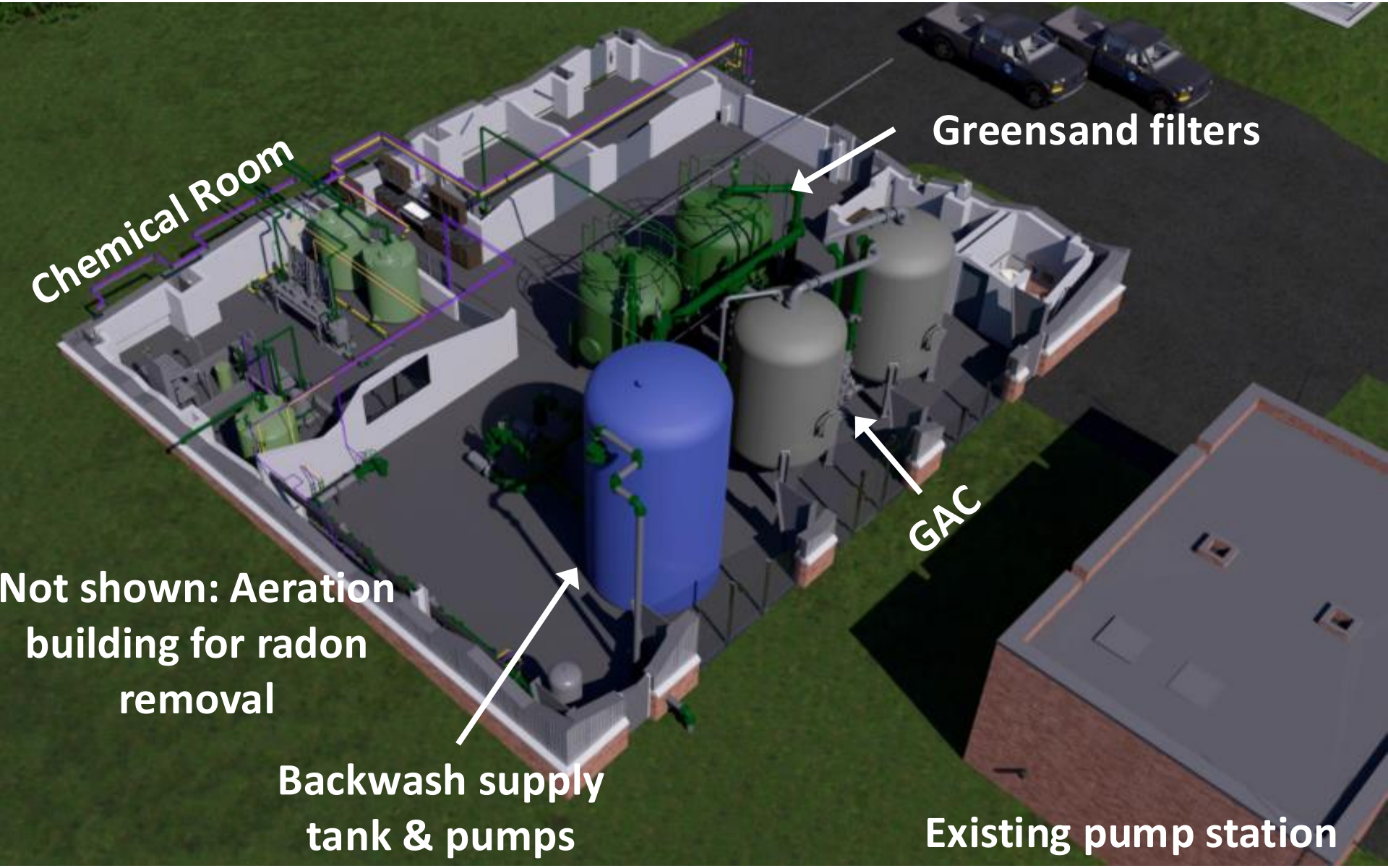
- Desktop analysis & preliminary design for Fe & Mn removal
- **PFAS6 detected at ~10 ppt for PFAS6 & second station at >20 ppt - combined treatment for streamlined approach**
- Bench-scale testing to confirm adsorptive medias for PFAS removal could treat <u>both</u> stations



Case Study #3: New Treatment Plant



Case Study #3: New Treatment Plant



Case Study #3 – Project Status

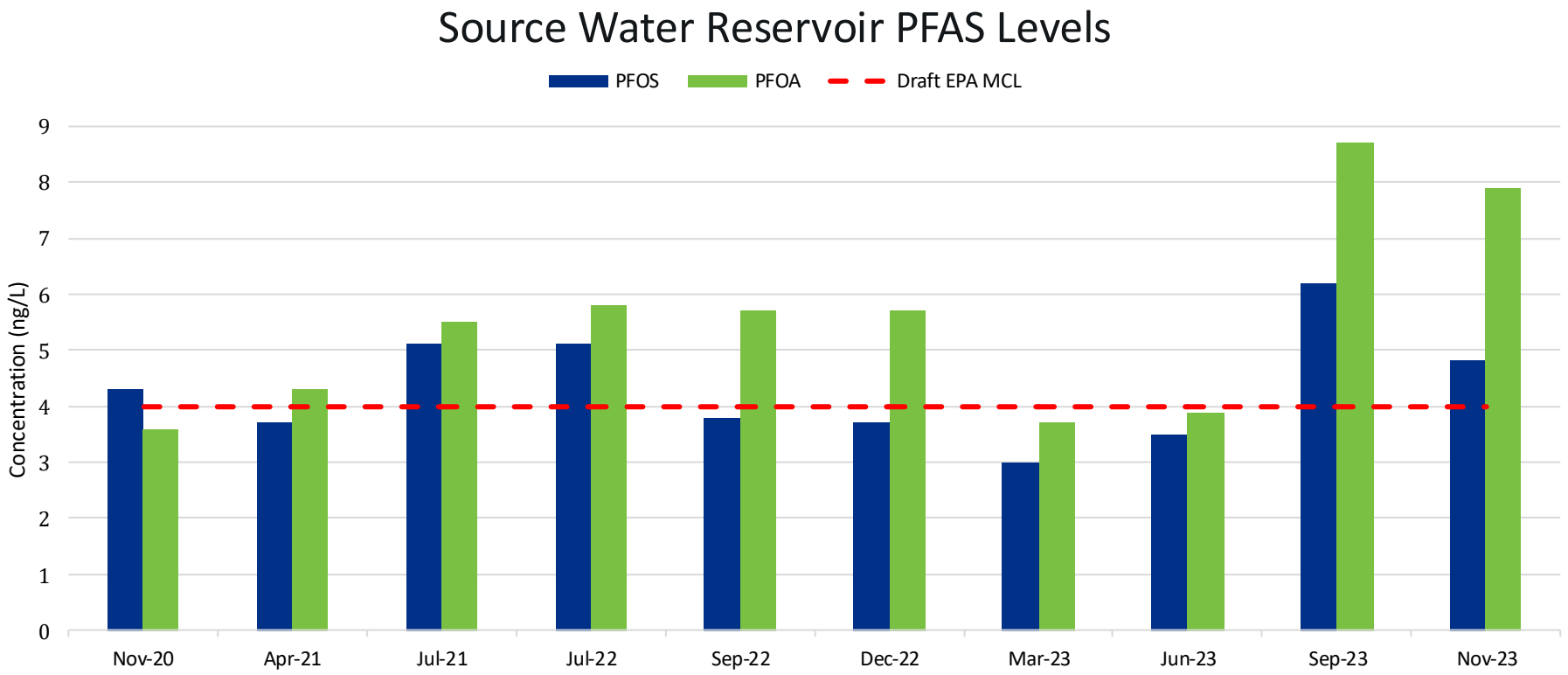
- Bids are in!
  - Opinion of Probable Construction Cost: **$14.7M**
  - Lowest bid: **$14.0M**
- Goal: online by summer of 2026
- Progressing pipeline design to connect the two stations



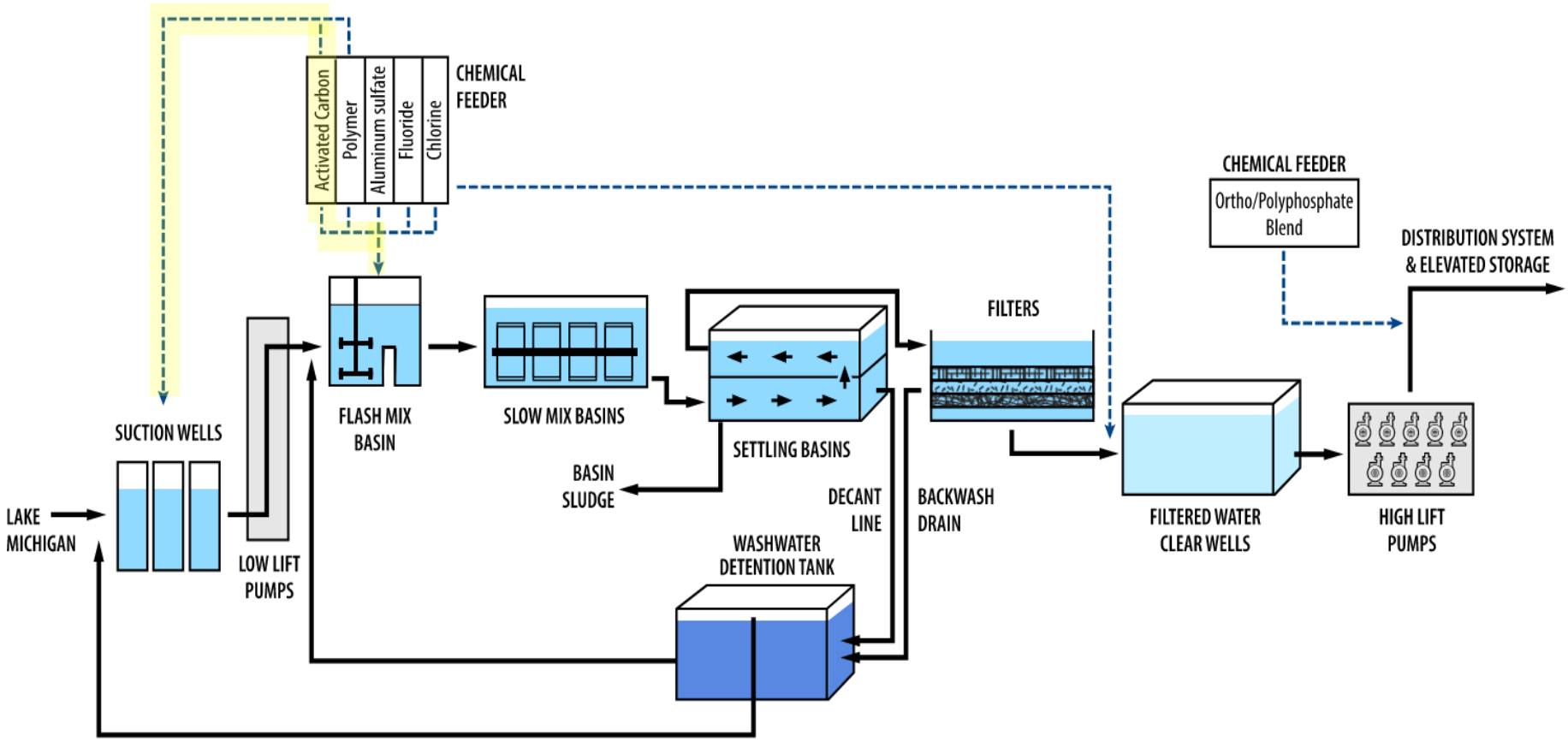
- Forward thinking positioned the project for multiple funding opportunities
  - Received 0% APR SRF for projection funding ($16.7M)
  - Grant funding also secured ($601k)

Case Study #4 – Large VA & IL PWSs

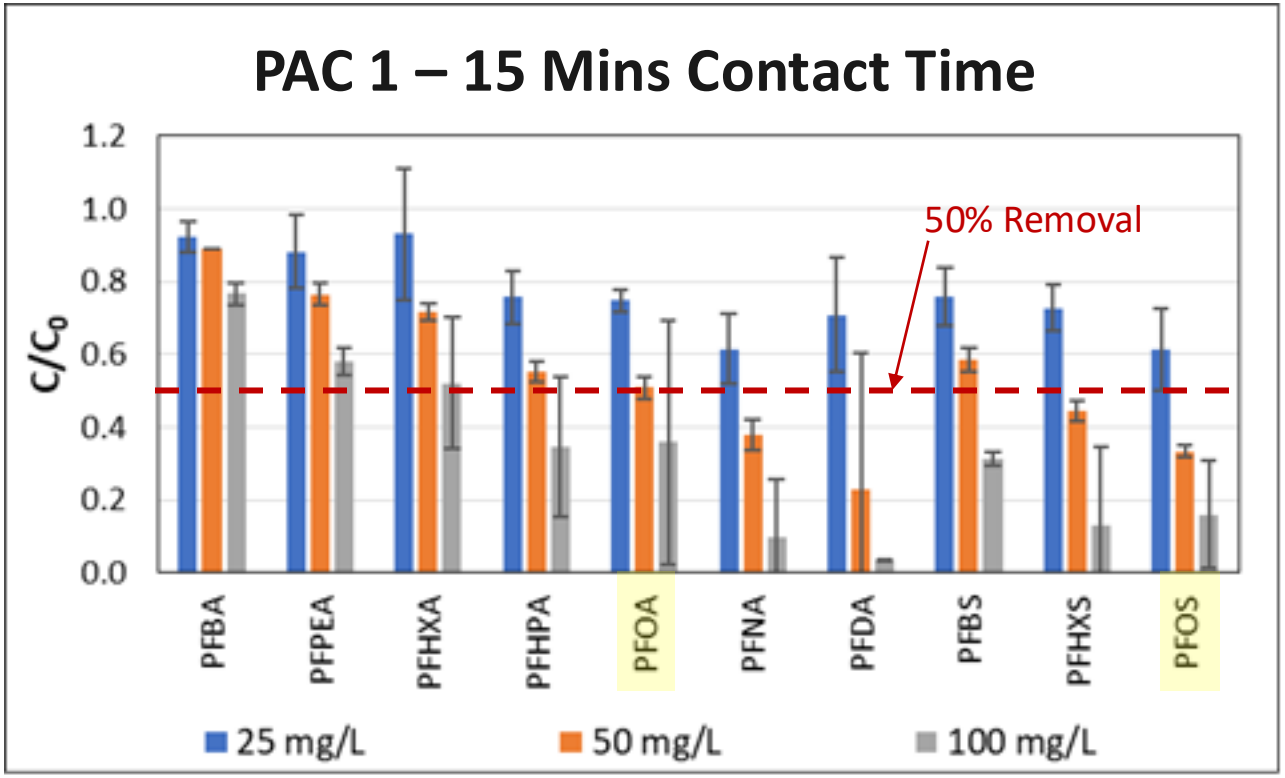
- >100 MGD surface water plant in Virginia
- >100 MGD surface water plant in Illinois



Case Study #4 – Leveraging Existing Infrastructure



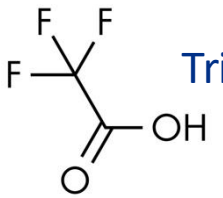
Case Study #4 – Bench-Scale Evaluation of Powdered Activated Carbon (PAC)



- Raw Water Quality
  - PFOA: 7 ng/L
  - PFOS: 5 ng/L
  - TOC: ~6 mg/L
- Lower capital cost
- Potential short-term solution but has residual risks

Case Study #4 – Beyond EPA Regulations

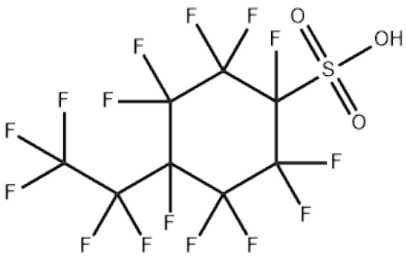
- **Ultra Short Chain PFAS**



Trifluoroacetic acid (TFA)

  - Chain length between C1-C3
  - Study of 13 German drinking water sources found 98% of PFAS concentrations were made of 3 ultrashort chain PFAS: TFA, PRPrA, and triflate

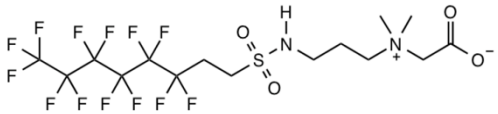
- **Cyclic PFAS**



Perfluoroethylcyclohexane sulfonates (PFECHS)

  - Detected in Great Lakes
  - PFECHS: C8 like PFOS used in aircraft fluids

- **Precursor PFAS**



6:2 fluorotelomer sulfonamide alkylbetaine (6:2 FTAB)

  - Polyfluoroalkyl substances – not fully fluorinated, precursors that can biotransform into terminal products
  - In firefighting foams & detected in Lake Michigan Trout



Takeaways and Conclusions



Take Home Messages

1. The new PFAS regulations are stringent but absolutely achievable
2. A well thought-out compliance plan & its execution are foundational for PFAS compliance
3. It’s more than PFAS – diligence in incorporating each plant’s unique considerations is key for overall treatment success

Water Partnership with CDM Smith

Ji Im, P.E.
imj@cdmsmith.com
603-222-8356

Michael Hill, P.E.
HillMD@cdmsmith.com
425-519-8368

Connect with us!

Find more insights through our PFAS partnership at **cdmsmith.com/PFAS and @CDMSmith**

CDM Smith

Laboratory Methods & Initial Monitoring

Required methods : EPA Method 533 or 537.1 Version 2.0

- Sample location: Entry point to the distribution system (EPTDS)
- No composite samples allowed

Initial Monitoring:

- Quarterly monitoring over 12-months (2-4 months apart) for large GW systems (>10,000 people) & surface water systems
- Twice over 12-months (5-7 months apart) for small GW systems (<10,000 people)
- Previous monitoring results may be used
  - UCMR 5 or other data using Methods 533 or 537.1 after 1/1/2023
  - Data collected in 1/1/2019-12/31/2022 if they are below the MCLs
  - Most recent data must be used (cannot pick & choose old data)

"Triggered Levels" for Reduced Monitoring

- Trigger levels = ½ of the MCLs
- Only eligible for triennial monitoring if all initial samples considered during **initial monitoring** are below the trigger levels
- Eligible for annual monitoring during **compliance monitoring**
  - May allow triennial monitoring after 3 years of results below trigger levels

PFAS	Trigger Level (ppt)
PFOA	2.0
PFOS	2.0
GenX	5
PFHxS	5
PFNA	5
HI	0.5

Public Notification

- MCL violations: Tier 2 public notification, no later than 30 days after a system learns of the violation (starting 2029)
  - One PN if multiple PFAS MCLs are violated
- Monitoring & testing procedure violation: Tier 3 PN, no later than 1 year (starting 2027)
- Annual notice as long as the violation persists
- States have authority to require PNs before compliance date
- CCR reporting
  - Initial monitoring results required starting 2027 CCRs
  - MCL violations are reported starting in 2029 CCRs

Consecutive Systems

- "For finished water that is provided through a system interconnection, the wholesale systems will be responsible for conducting the monitoring requirements at the entry point (EP) to the distribution system."
- Does not require any system interconnection monitoring
- Where a violation occurs:
  - The wholesale system must notify any consecutive systems
  - Consecutive system's responsibility to provide PN to their customers.