Bureau of Waste Site Cleanup Advisory Committee Meeting

November 21, 2024

* ***This meeting is being recorded.***

WSC Advisory Committee Meeting Agenda

Welcome / Agenda Review - Adoption - 5 minutes	**Millie Garcia-Serrano, BWSC**
Administrative Updates - 5 minutes	**Millie Garcia-Serrano, BWSC**
General WSC Staff & Program Updates - 20 minutes	
➢ **Federal Sites Update (5)**	**Diane Baxter, BWSC**
➢ **Brownfields Program Update (5)**	**David Foss, BWSC**
➢ **BWSC Data Management System Updates (5)**	**Brian Roden, BWSC**
➢ **ER & MOSPRA Report Out (5)**	**Cathy Kiley, BWSC**
NRD Program – The Year in Review – 20 minutes	**Michelle Craddock, BWSC**
LSP Board Report Out – 10 minutes	**Terry Wood, LSP Board**
LSP Association Report Out - 10 minutes	**Joe Roman, LSP Association**
2024 MCP Amendments Implementation - 10 minutes	**Ken Marra, BWSC**
➢ **Subpart I Q&A (5) & AUL (5)**	
Soil Reuse Policy Update – 5 minutes	**Millie Garcia-Serrano & Ken Marra**
AFFF-Derived Polyfluorinated Precursor Transformation at Conditions Relevant for In-Situ Thermal Remediation of cVOCs – 30 minutes	**Natalie Johnson, BWSC-NERO**
“On the Horizon” & Wrap-Up- 5 minutes	**Millie Garcia-Serrano, BWSC**
Next “Office Hours” (TBD)	**Millie Garcia-Serrano, BWSC**
Next WSC Advisory Committee Meeting (Feb 20, 2025)	**Millie Garcia-Serrano, BWSC**

TOTAL MINUTES: 110 minutes

Administrative Updates

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Millie Garcia-Serrano, MPH
Assistant Commissioner
MassDEP | Bureau of Waste Site Cleanup

Tamara Cardona-Marek, Ph.D.
Deputy Regional Director
BWSC Western Regional Office

Administrative Updates

- ***Personnel***
  - *New Hire: Tamara Cardona-Marek*
  - *Thank You: Catherine Skiba*
- ***"At the Podium"***
  - *LSPA Fall Mtg*
  - *ASTSWMO CaBS Symposium*
  - *ASTSWMO Board & Annual Mtg*
  - *NEWMOA Board Mtg*
  - *EPA National Site Assessment Symposium Training Program – RCRA Tech Presentation*
  - *AEHS Conference – 3 Tech Presentations*
- ***"Staying the Course on Priorities"***
  - *PFAS, Soils, eDEP, Engagement*

General WSC Staff & Program Updates

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Diane Baxter, David Foss, Brian Roden, Cathy Kiley
MassDEP | Bureau of Waste Site Cleanup

Federal Sites Program Updates

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Diane Baxter, Division Director, Federal Sites Division
MassDEP | Bureau of Waste Site Cleanup

FEDERAL SITES PROGRAM UPDATE

- Role: Provide oversight of Sites managed under CERCLA to ensure that the site investigations and response actions meet the objectives and requirements of federal and state laws and regulations / Concur with selected remedies / Perform long-term Operation, Maintenance, and Monitoring (OMM) at Fund-Lead sites
- 31 CERCLA National Priorities List (NPL) "Superfund" Sites (non-military)
  - 9 Sites – Remedial Design (RD)/Remedial Action (RA) in progress
  - 3 sites – Comprehensive investigation/evaluation of remedial actions (RI/FS) ongoing
  - 20 sites – RA complete, long-term OMM ongoing
  - 5 sites – Long-term OMM, remedy being re-evaluated
  - + 1 site in process of being proposed for NPL listing
- 12 Military Installations – all include multiple sites in various phases of investigation, RA, OMM; Large PFAS investigations at most; munitions concerns at some
- 10 Formerly Used Defense Sites – some including multiple sites, in various stages of investigation, RA, OMM; hazardous/toxic substances and munitions/explosives

MassDEP

Brownfields Program Updates

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

David Foss, Statewide Brownfields Coordinator
MassDEP | Bureau of Waste Site Cleanup

Brownfields – 128a BIL Funding

BIL Funding

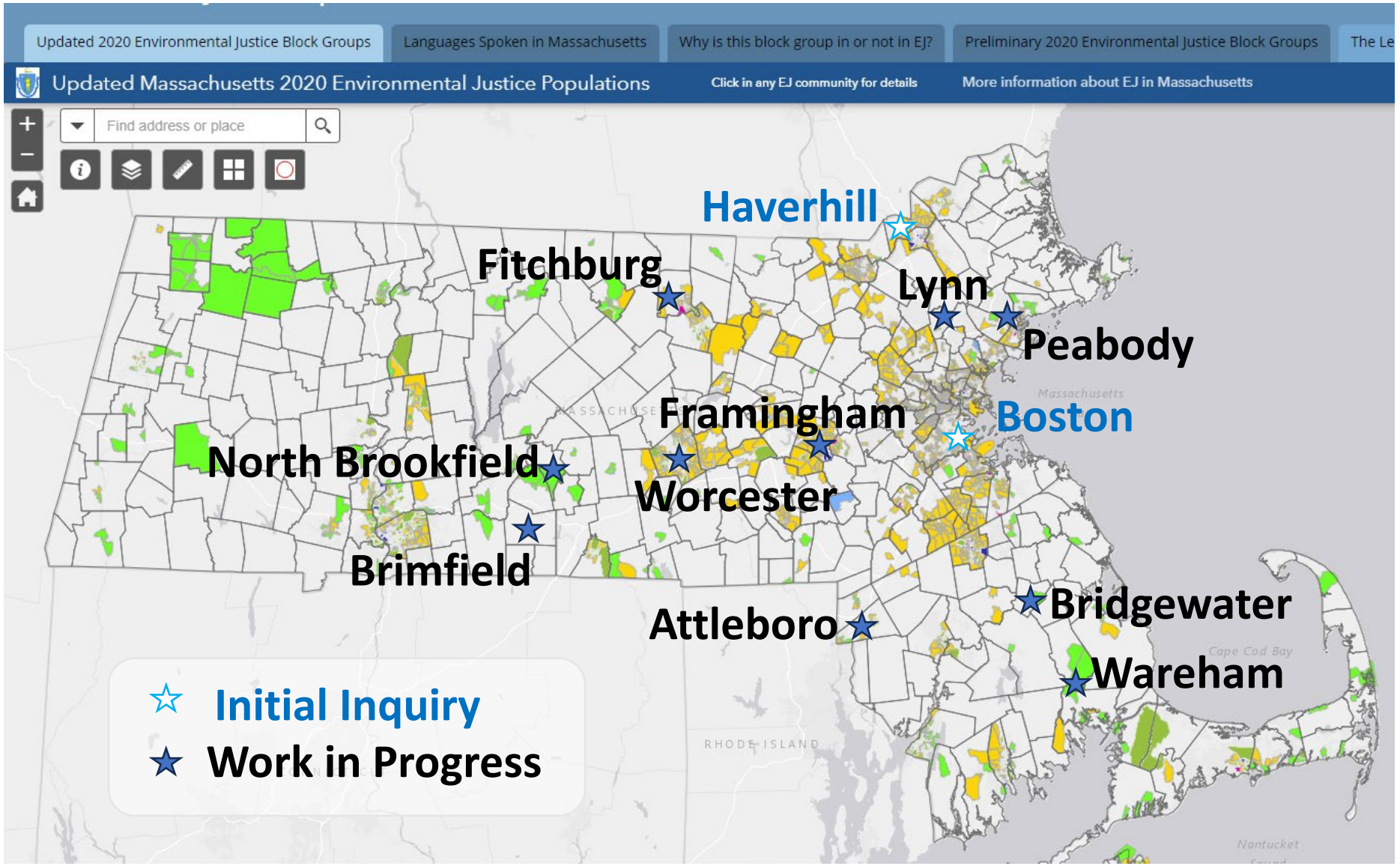
$880,000 - FY22
$840,000 - FY23
$761,000 - FY24

≈ $4 Million over 5 years

≈ $1.5 Million obligated

Targeted to work with:

- Environmental Justice communities or
- Low population towns (< 10,000 residents)

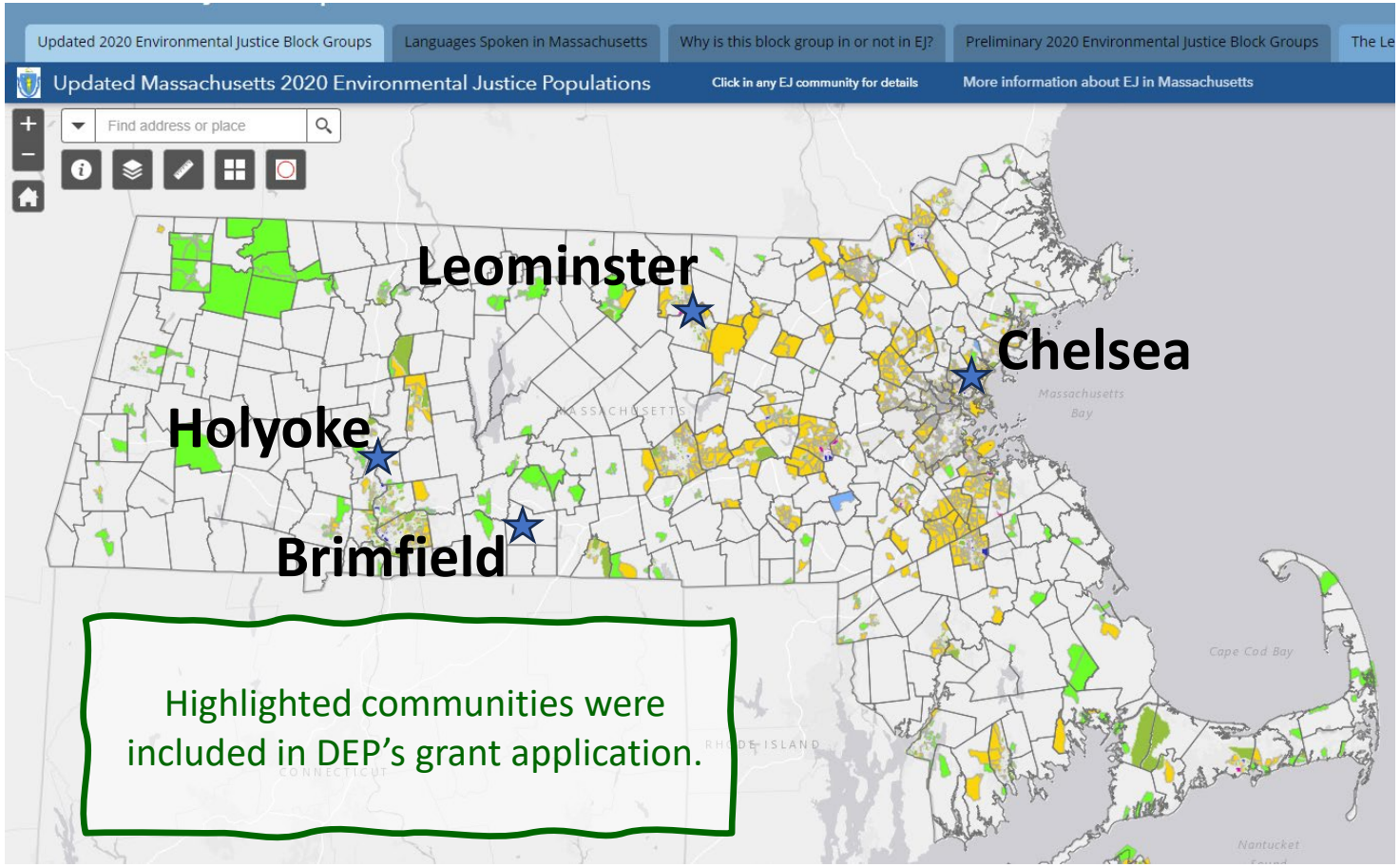


Brownfields CWAG-ST

Community Wide Assessment Grant

(For States & Tribes)

$2,000,000 over 5 years
104k Funding



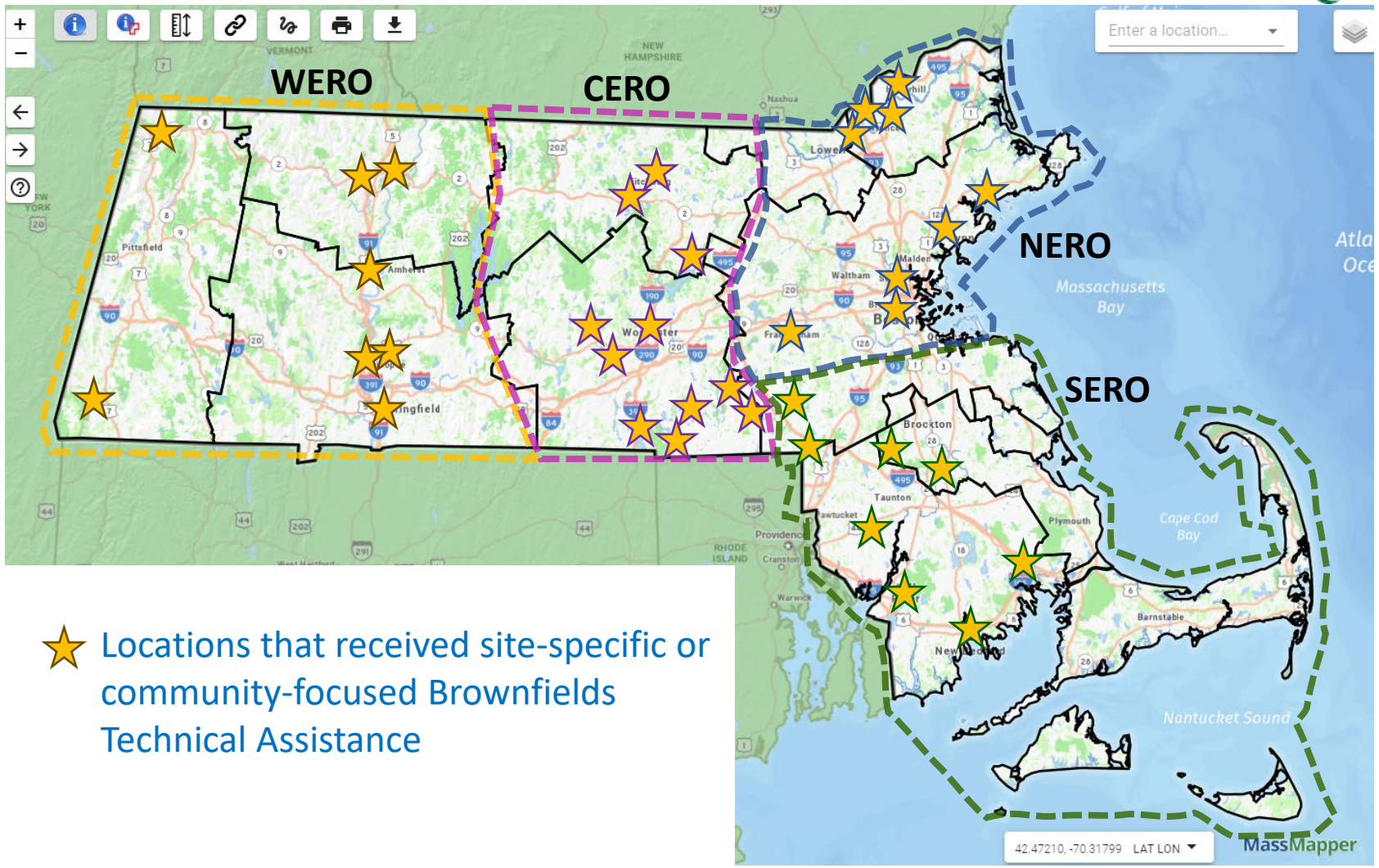
Priority Areas include:

- Communities with EJ Concerns
- Gateway Cities
- Low Population Towns

Assistance Services Offered:

- ASTM Phase I ESAs
- ASTM Phase II LSIs
- MCP Phase II / Phase III
- Hazardous Building Material Surveys
- Cleanup Planning
- Community Outreach

2024 Interagency Coordination & Technical Assistance



★ Locations that received site-specific or community-focused Brownfields Technical Assistance

BCONE
BROWNFIELD COALITION OF THE NORTHEAST

NEWMOA
NORTHEAST WASTE MANAGEMENT OFFICIALS' ASSOCIATION

BWSC Data Management System Update

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Brian Roden, Statewide Audits and C&E Coordinator
MassDEP | Bureau of Waste Site Cleanup

Emergency Response & MOSPRA Report Out

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

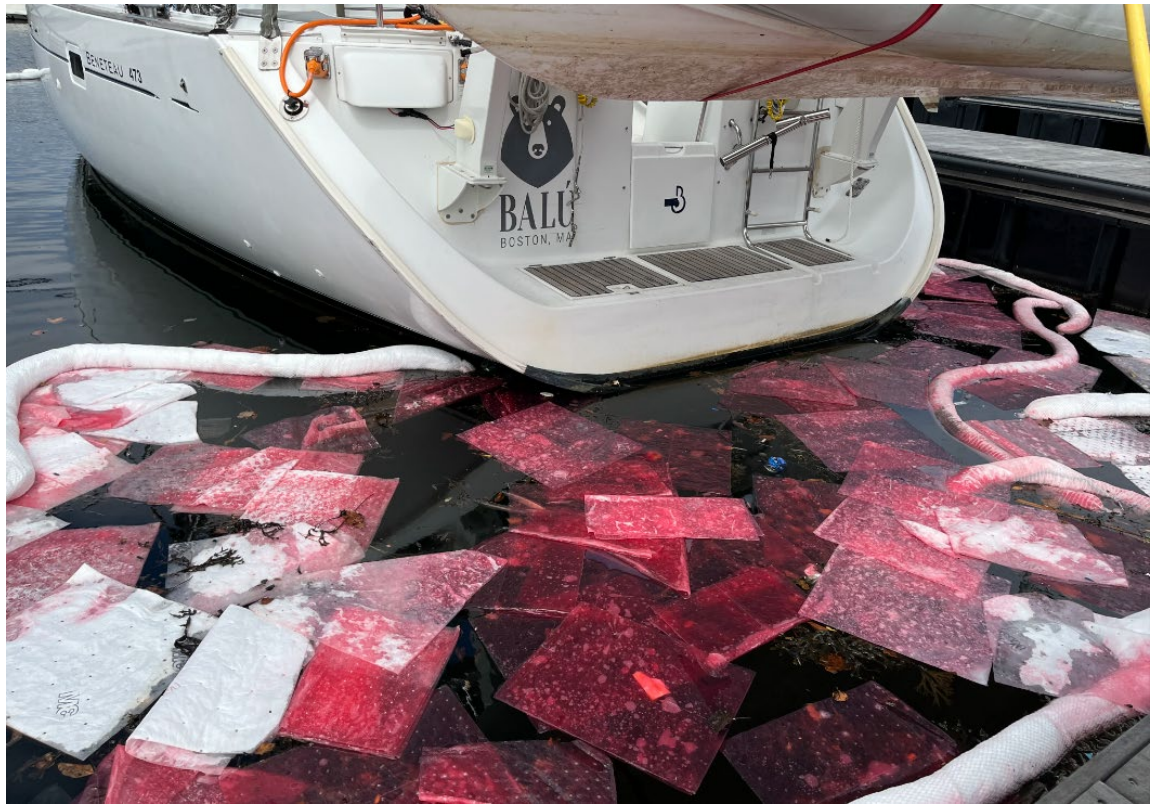
Cathy Kiley, Emergency Planning & Response Coordinator
MassDEP | Bureau of Waste Site Cleanup

ER Program "By the Numbers"

Cathy Kiley, MassDEP; cathy.Kiley@mass.gov, 617-549-6854

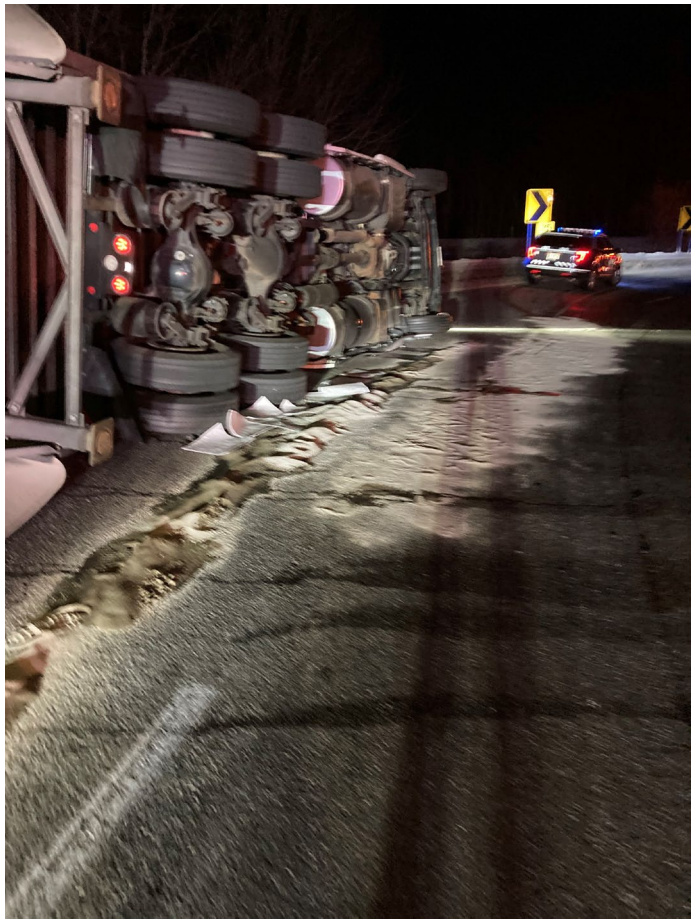
1. Emergency Response Program

- **AFFF Take Back Program**
  - From June 2018 – November 13, 2024, over 409,000 lbs. (over 47,800 gals) of foam have been collected from 159 fire departments and facilities in MA; 74 are in EJ communities
- **Support MEMA**
  - ESF10 – Operations Support Branch, Debris Assessment and Rapid Damage Assessment
  - EMAC Deployment – HI –Operations Section Chief – support for 2023 Wildfires
  - Daily Support to MEMA for Air Quality updates during wildfires (October/November 2024)
- **Emergency Response #s**
  - FY23 - 1,175 releases/1,058 complaints
  - FY24 - 1,083 releases/1,070 complaints
  - FY25 (through 11/12/24) – 366 releases/430 complaints
  - Approximately 81-83% Oil, 11-14% Hazardous Material, 5-6% OHM



8/2024 – NERO ER responded to a release of an unknown quantity of marine diesel in Charlestown. The release was due to an overfill of the boat's fuel tank. NERO-ER personnel coordinated the cleanup, which was conducted by Moran Environmental on behalf of the boat owner. Boston Fire Department and the US Coast Guard also responded to this incident.

11/2024 – NEROER responded to an incident involving a suspected clandestine drug lab, and a related dumping of hundreds of containers of hazardous materials around the city. NERO-ER oversaw the identification, containment, and disposal of hazardous materials involved in the incident, conducted by a contractor (NEDT) hired by MassDEP. EPA Removal is assisting with chemicals found inside the residence, where the clandestine lab was located.



3/2024, CERO ER responded to a sulfuric acid release at the on ramp from Route 12 to I-90 West in Auburn. A tractor trailer carrying automotive lead acid batteries overturned. The batteries inside the box trailer were damaged as a result of the accident and over 50 pounds of sulfuric acid leaked to the paved road surface. Response actions included: deployment of absorbents, sorting damaged batteries from undamaged batteries; recovery and proper disposal of damaged batteries and road debris.

8/2024 - WERO ER responded to a release of Nitric acid from ruptured drums due to cross contamination reaction. MassDFS District 4 Hazmat Tier 2 response.

2024 – SERO ER responded to a release of diesel fuel from paving equipment due to a fire.

2. Massachusetts Oil Spill Prevention and Response Act (MOSPRA) Program

Website: https://www.mass.gov/oil-spill-prevention-response

- **Oil Spill Act Advisory Committee Meeting** – 12/5/24, Hybrid option available
- **GRS First Responder Training and GRS Testing Exercises**
  - 5 Training exercises conducted in the Spring 2024 and 5 conducted in the Fall 2024.

- **Grant Program – 2nd Round**
  - Projects that strengthen spill prevention measures and/or increase spill response capabilities and demonstrate a community benefit.
  - 15 Grants Awarded in May 2024; more than $691,000 – 9 municipalities, 3 non-profit community groups, and 2 private organizations
  - https://www.mass.gov/info-details/marine-oil-spill-prevention-response-grant-program

Natural Resource Damages Program: The Year in Review (CY24)

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Michelle Craddock, Statewide NRD Coordinator
MassDEP | Bureau of Waste Site Cleanup

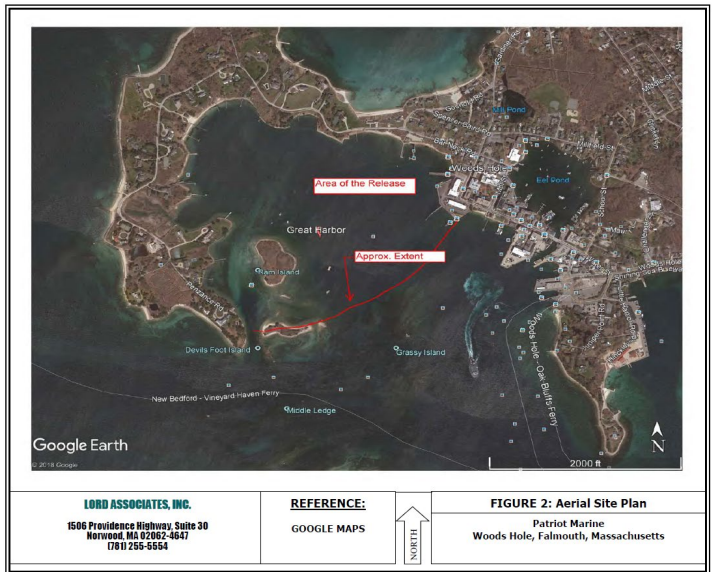
NRD Program 2024 Highlights

NEW SETTLEMENTS

Woods Hole Harbor Fuel Spill

- $100,000 NRD settlement in 2024**.**
- Additional $285,000 in funds obtained from U.S. Department of the Interior.
- Injury to migratory birds, shoreline habitat, recreational shellfishing

Great Harbor, Woods Hole 01/21/2018 (MassDEP)



Great Harbor, Woods Hole 01/21/2018 (MassDEP)

NRD Program 2024 Highlights

RESTORATION PLANNING & SOLICITATIONS

Gloucester Harbor Coal Tar Site:

- $5.38M NRD settlement in 2023, Public meeting held on October 29, 2024. Project solicitation until 12/20/24.

Woods Hole Harbor Fuel Spill

- $100,000 NRD settlement in 2024, Public meeting held on 11/13/24. Project solicitation until 1/13/25.

Bouchard B-120 Oil Spill

- Trustees released Final Restoration Plan for Terns and Ram Island; $5.5M to restore nesting habitat, salt marsh, and shoreline habitat on Ram Island in Mattapoisett.

North River Restoration (Colrain) Grant Solicitation

- Grant solicitation issued in October 2024. $225,000 in settlement funds available for natural resource restoration.

Gloucester Harbor (Doug Kerr/Wikimedia Commons)

Gloucester Public Meeting (USFWS)

MassDEP

NRD Program 2024 Highlights

ACTIVE GRANTS

Industri-Plex

- Winchester – Davidson Park Riverine, Floodplain, and Riparian Restoration
- Woburn - Shaker Glen Wetland and Stream Restoration & Scalley Dam Fishway

Nyanza

- Lowell Parks and Conservation Trust - Centennial Dam Fish Passage

Sutton Brook

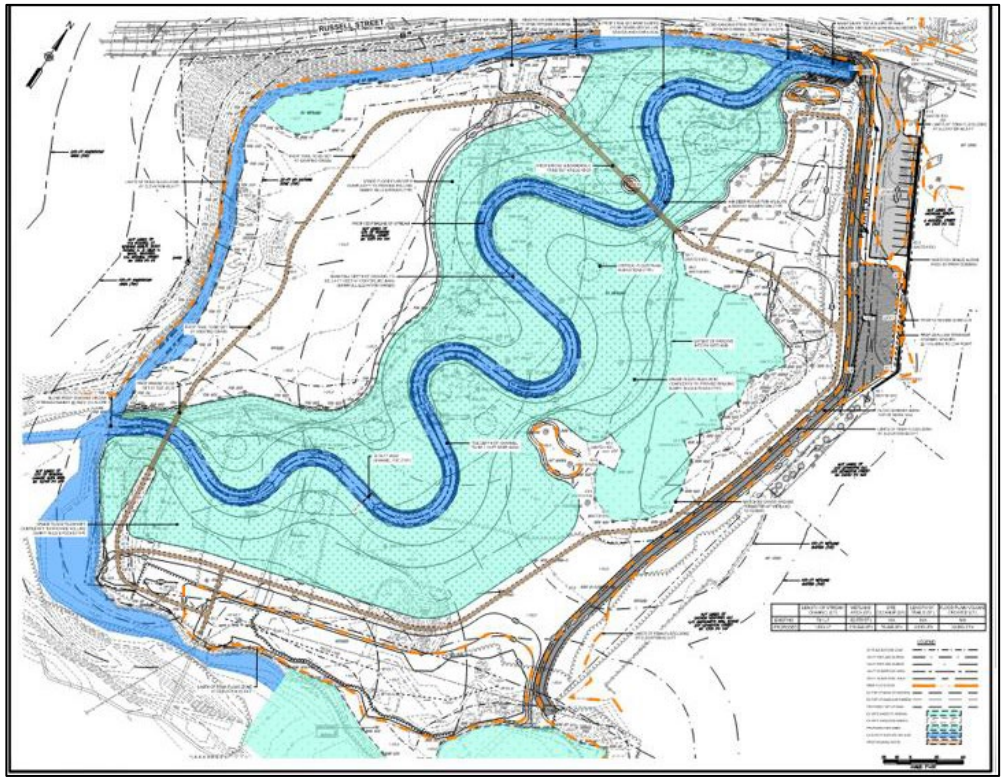
- Tewksbury - Mollie Drive and Poplar Street Wetland and Groundwater Restoration

Blackburn & Union

- Walpole – Stormwater/Green Infrastructure Upgrades

GE/Housatonic

- Housatonic Valley Association – Flood Resilient and Fish Friendly Road Stream Crossings, Churchill Brook Culvert Replacement



Shaker Glen Conceptual Restoration Design

NRD Program 2024 Highlights

RESTORATION IMPLEMENTATION

Outer Boston Harbor Islands Cleanup (Bouchard B-120)

- Public-Private partnership to remove marine debris and improve nesting bird habitat in September 2024.
- More info : https://www.bostonharborislands.org/100-year-boston-harbor-island-clean-up/
- More than 40,000 pounds of debris removed

Mass Audubon Housatonic River Watershed Education Program (GE/Housatonic)

- 5 Year Watershed Education Program completed in 2024
  - Program reached 347 classrooms from 22 schools in the Upper Housatonic River Watershed (3rd to 8th grade)
  - 25 Community Education and Stewardship Events
  - Nature Camp Feasibility and Pilot Program
  - Leveraged significant additional funds to expand and continue programs

Boston Harbor Islands pre-cleanup (Center for Coastal studies)

Third grade fieldtrip to Pleasant Valley Sanctuary (Mass Audubon)

License Site Professional Board Report Out

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Terry Wood, Executive Director
MA Licensed Site Professional Board (LSPB)

Licensed Site Professional Association Report Out

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Joe Roman, President
MA Licensed Site Professional Association (LSPA)

2024 MCP Amendments Implementation: Subpart I Q&A and AUL

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Ken Marra, P.E.
Acting Division Director, Policy & Program Development
MassDEP | Bureau of Waste Site Cleanup

Subpart I – Q&A (310 CMR 40.0900)

- Coal Tar Waste Deposits
- Exposure Point Concentrations
- Systematic Sampling
- Incremental Sampling
- Judgmental Sampling
- Caps and Engineered Barriers

https://www.mass.gov/lists/mcp-amendments#related-information-

AUL Guidance

- Interim Guidance released for public review March 2024; comment period ended June 1, 2024
- Incorporates comments received on the 2010 and 2014 public review drafts and the 2024 MCP amendments, and provides clarifications based on program experience
- Process for finalizing Guidance
  - Estimated timeline: end of 2024 or early 2025
  - Continue reviewing and incorporating comments received
  - Ensure consistency with other documents – e.g., Risk Characterization

Questions: margaret.shaw@mass.gov

Soil Reuse Policy Update

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Millie Garcia-Serrano & Ken Marra, P.E.
MassDEP | Bureau of Waste Site Cleanup

Soils Reuse Update

- COMM-24 Soils Policy currently under review by senior staff
- Policy would allow reuse of contaminated soils at other 21E sites at levels greater than COMM-15 allows
- Public Review of Draft Policy before finalization
- Major acceptance requirements include (but not limited to):
  - Achievement of a Permanent Solution
  - Public Involvement
  - > 250,000 CY

Technical Presentation: *AFFF-Derived Polyfluorinated Precursor Transformation at Conditions Relevant for In-Situ Thermal Remediation of cVOCs*

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Natalie Johnson
BWSC PFAS Program, Northeast Region
MassDEP | Bureau of Waste Site Cleanup

AFFF-Derived Polyfluorinated Precursor Transformation at Conditions Relevant for In-Situ Thermal Remediation of cVOCs

WASTE SITE CLEANUP ADVISORY MEETING

NOVEMBER 21, 2024

NATALIE JOHNSON, PHD; TIFFANY DUHL, PHD; JOHN FITZGERALD, PE

MASSDEP NORTHEAST REGIONAL OFFICE

Motivation: Planned Remediation of General Chemical Corporation Site

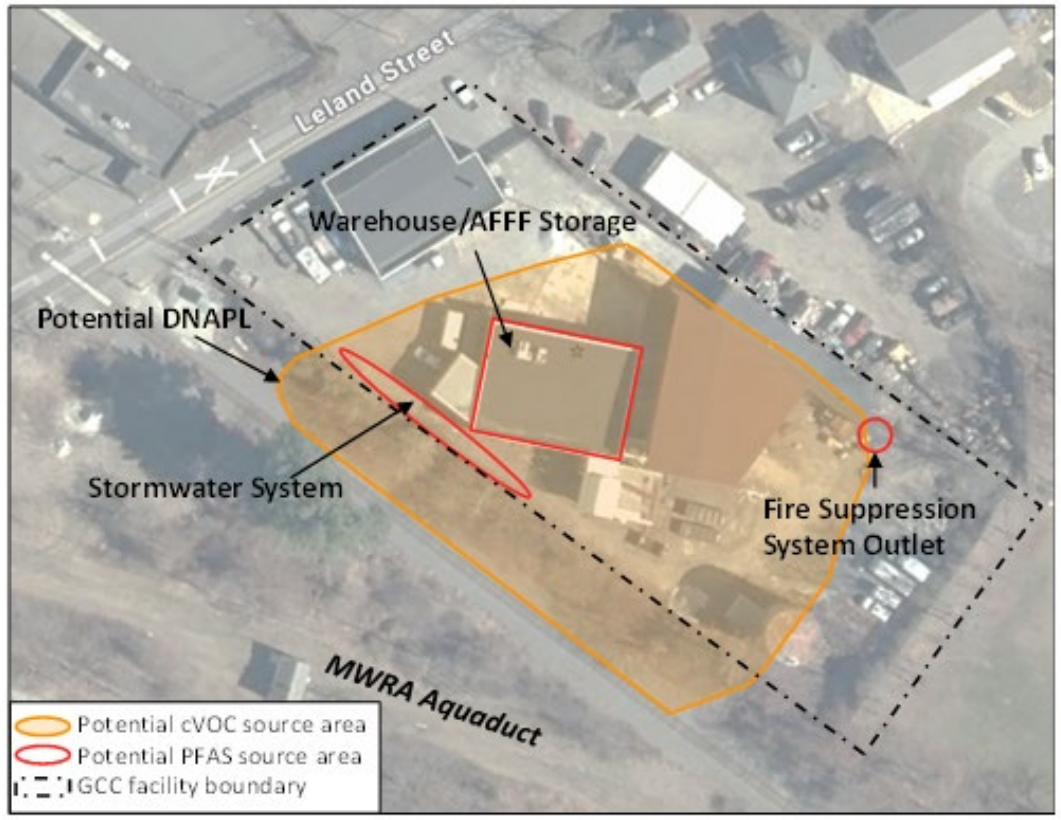


Figure 1. GCC facility and potential contaminant source areas.

Goal of remedial work: to address chlorinated solvent (PCE and TCE) DNAPL

Interest in using thermal treatment (ISTR) to address DNAPL

- The facility had a fire suppression system, which contained AFFF
- Concerns that ISTR may exacerbate PFAS contamination by transforming AFFF into perfluorinated alkyl acids (PFAAs)

AFFF contains a complex mixture of PFAS, some of which transform into PFAAs

Legacy Fluorotelomer Foams

Contain a mix of long-chain and short chain PFAS

Manufactured from 1970s until 2016

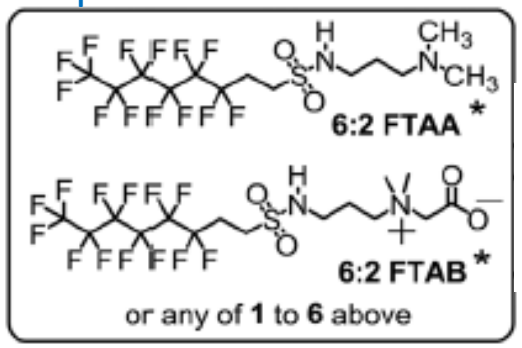
Modern Fluorotelomer Foams

Short-chain poly-fluorinated compounds

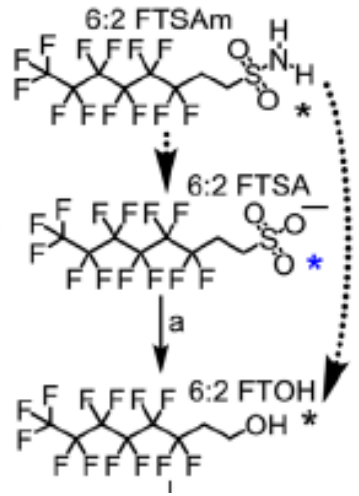
Manufactured from ca. 2010 to present

May contain trace levels of PFOA and PFOA precursors

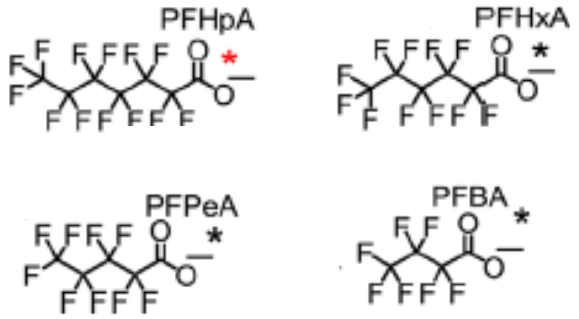
Short chain "precursors" in AFFF



Intermediate transformation products



Terminal transformation products



D'Agostino and Mabury 2017

Bench Scale Study

Experimental conditions designed to mimic *in situ* thermal remediation of chlorinated solvents

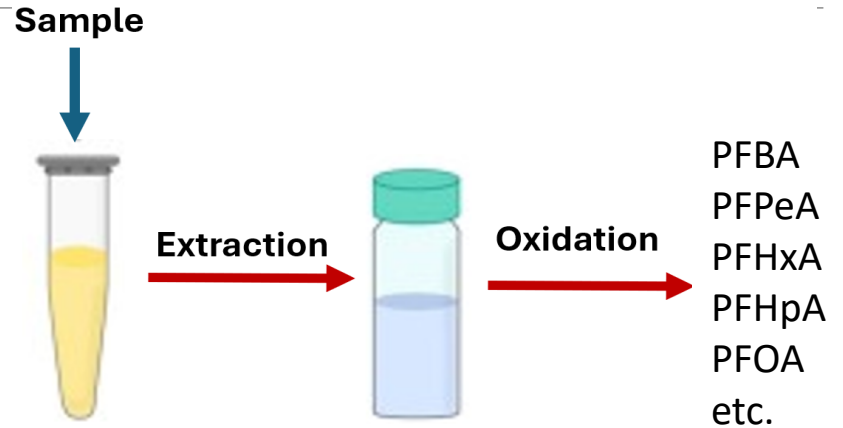
Laboratory analyses conducted to determine if precursor transformation occurred faster in the heated reactors compared to room temperature "control" reactors

Objectives of this study:

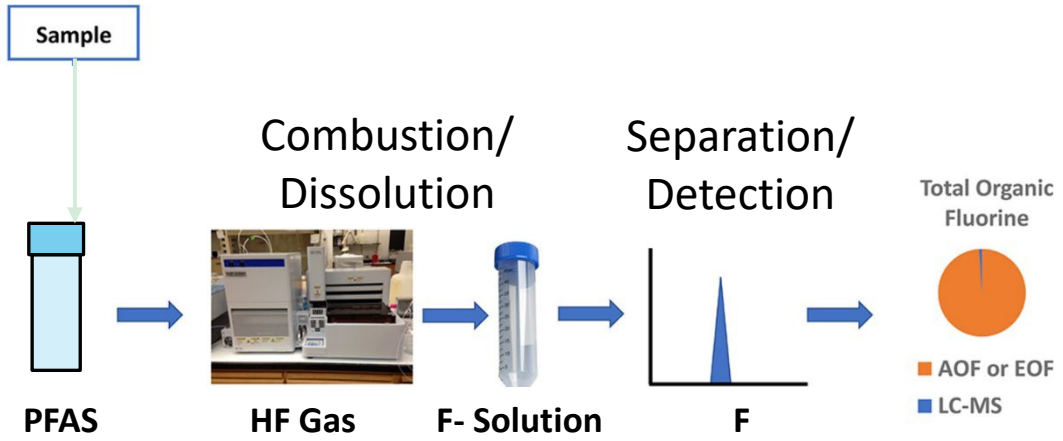
- Compare rate of PFAS transformation at elevated and room temperatures
- Quantify mass of PFAS removed from soil during heating

Specialized analytical methods are needed to (indirectly) detect precursor compounds

Total Oxidizable Precursor (**TOP**) assay accelerates transformation of precursor compounds to PFAAs detectable by EPA methods

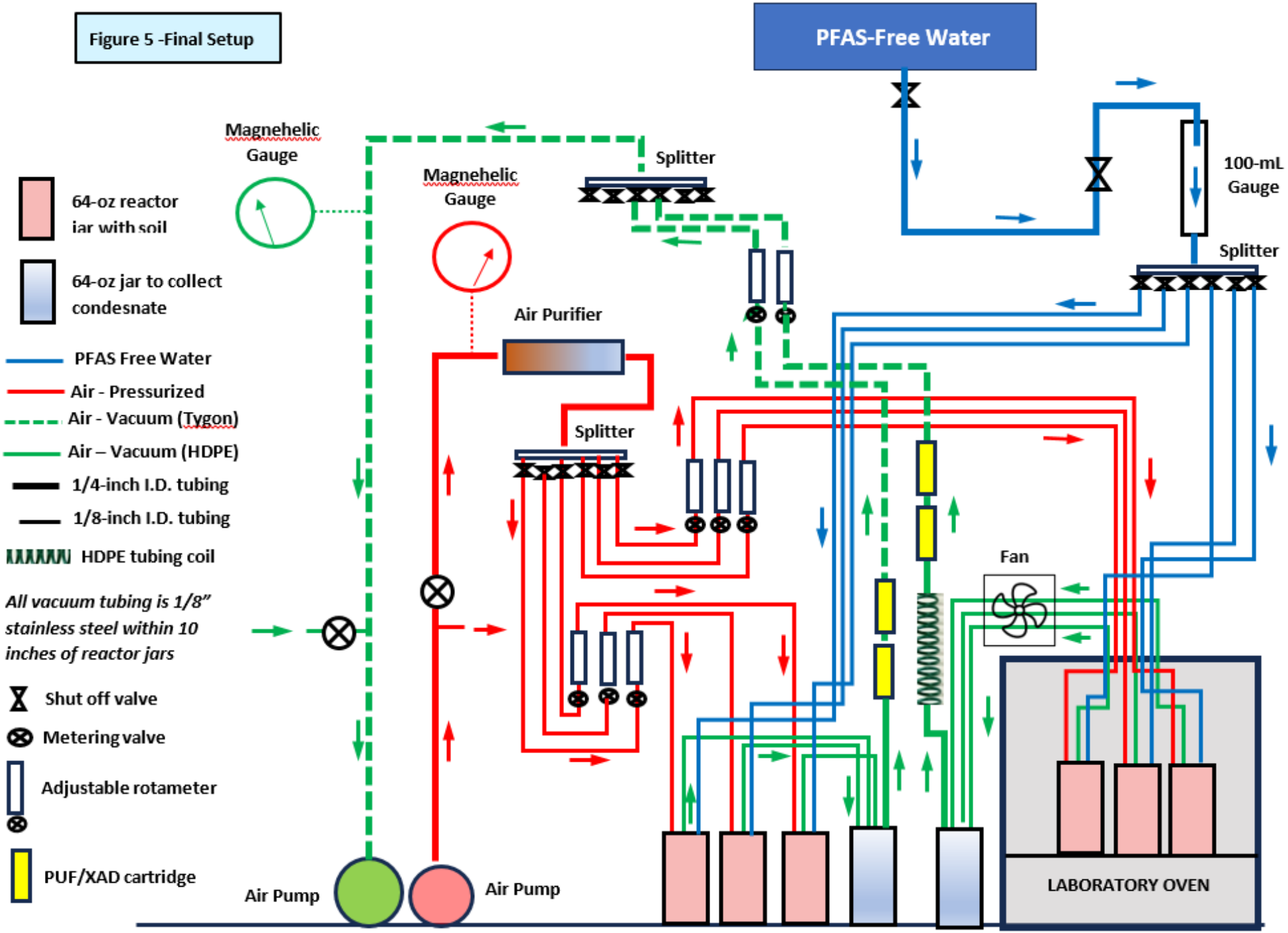


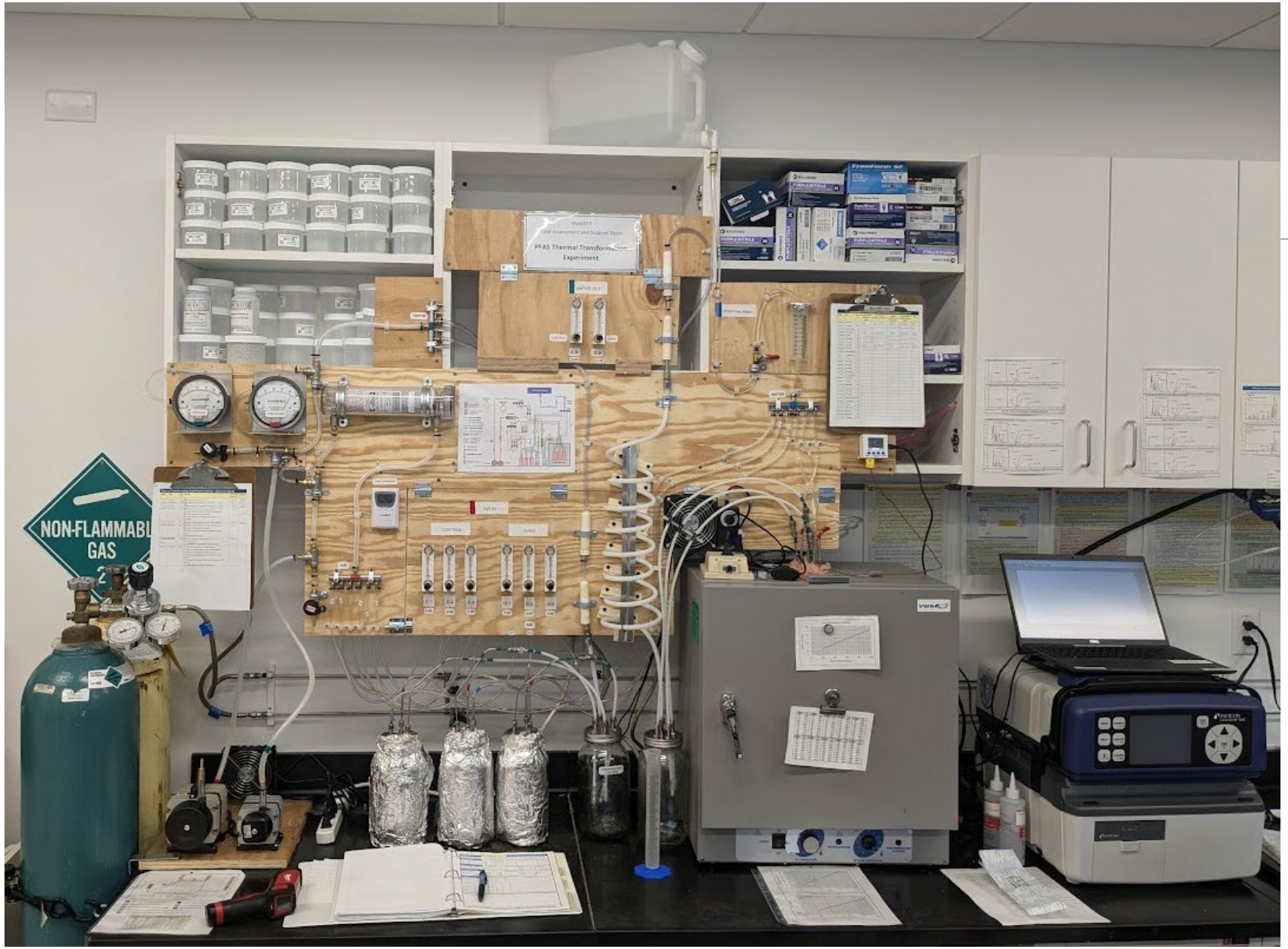
Extractable Organic Fluorine (**EOF**) assay converts PFAS to fluoride ions via combustion, which are then measured to yield the total mass of fluorine in a sample.



Images adapted from: Forster et al. 2023 Water Research; Cioni et al. 2022 Environment International

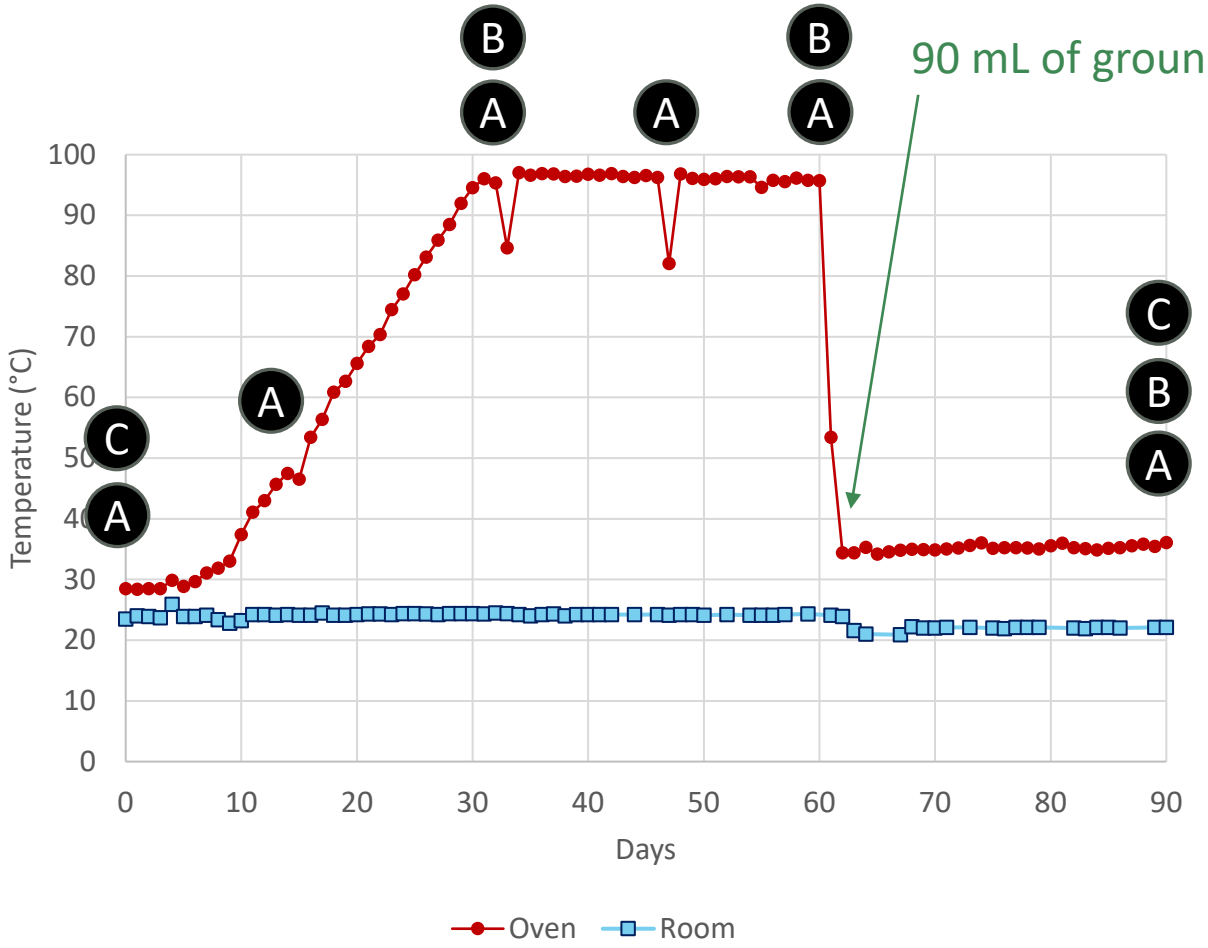
Figure 5 -Final Setup




NON-FLAMMABL
GAS
PFAS Thermal Transformation
Experiment


Oven 1
Oven 2
Oven 3

Temperature Profile and Sampling



- **A** Soil collected from each reactor and analyzed for PFAS by EPA method 1633
- **B** Composite condensate samples (hot reactors only) sent for analysis by EPA method 1633; vapor capture cartridges sent for analysis by EOF
- **C** Soil collected from each reactor and analyzed for fluorine by EOF; composite soil samples analyzed for PFAS by TOP

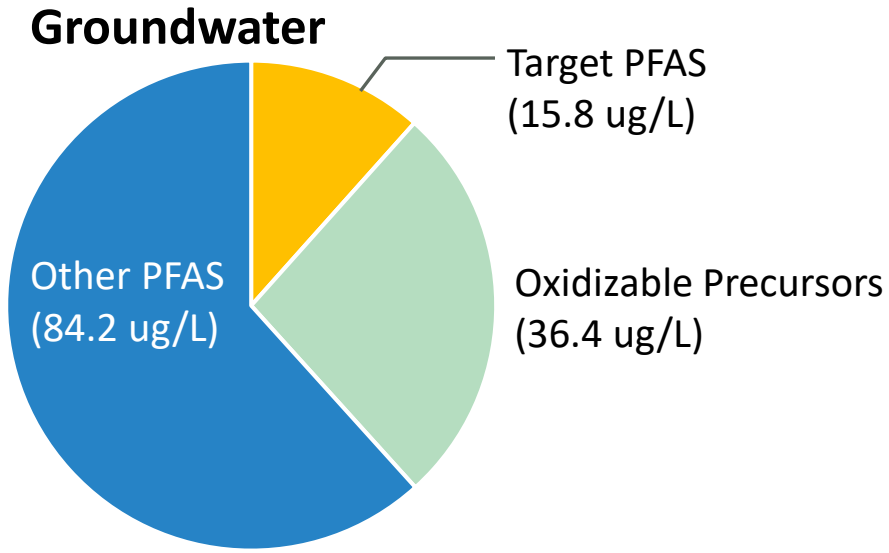
Preliminary characterization of soil and groundwater

Groundwater collected from one well downgradient of AFFF tank

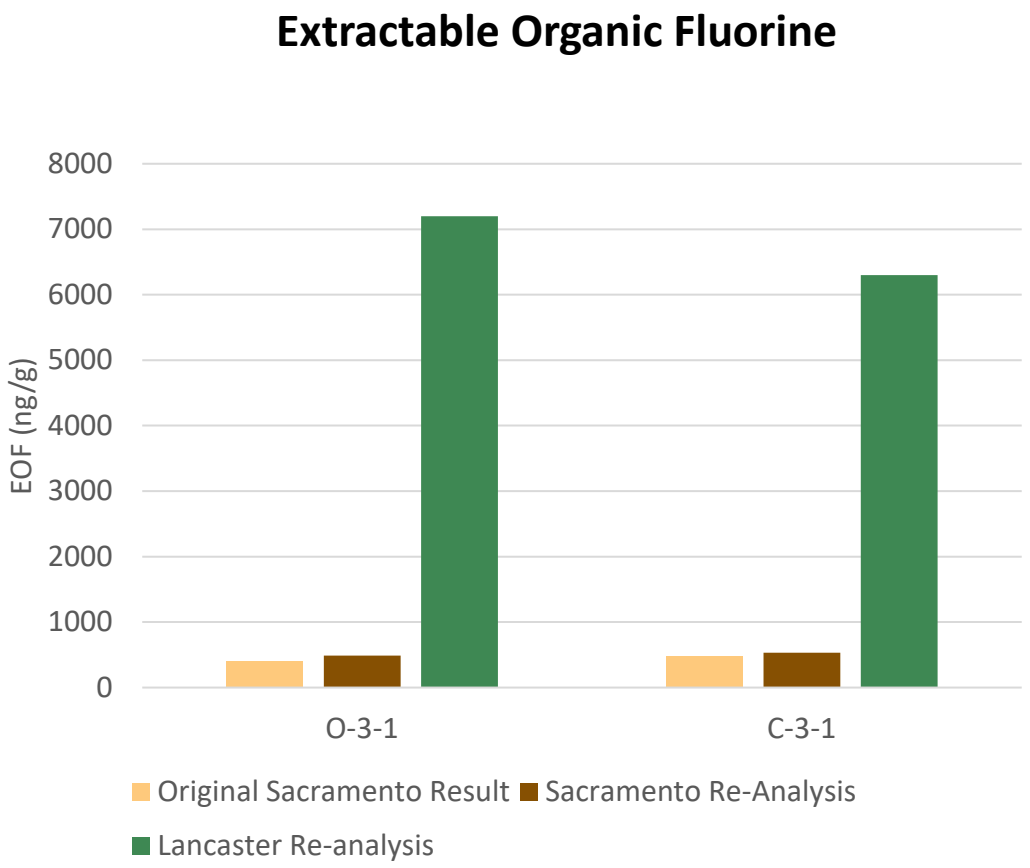
- Sent for analysis via AOF, TOP, and 1633

20 L of soil were collected, sieved, and homogenized

- Soil was subsampled and sent for analysis via TOP and EOF
- Results indicated high levels of PFAS precursors



Finding 1: Non-targeted PFAS methods are a work in progress (for soils)



For samples with high total fluorine, slight differences in extraction method yield very different results

Hypothesis: soil impacted by a mixture of complex cationic and zwitterionic PFAS, which are not well-extracted

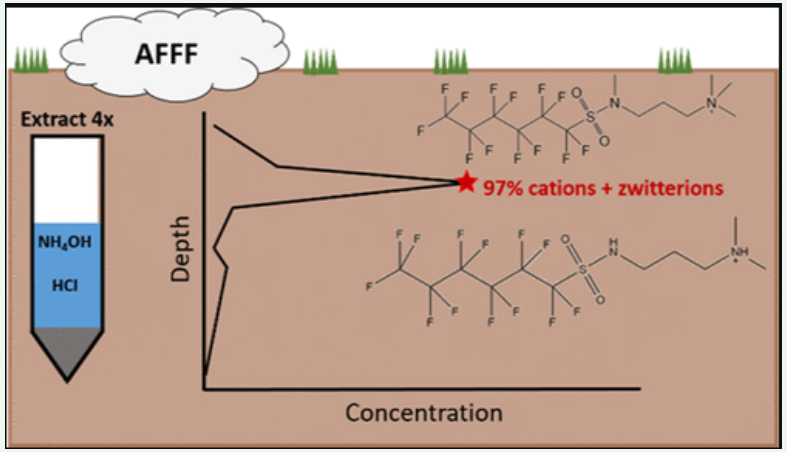
The EOF method may need more study to evaluate extraction efficiencies of non-anionic PFAS

Unable to attempt a fluorine mass balance

Extraction may be incomplete due to the presence of positively-charged PFAS

Method 1633 (soil): Extraction with basic methanol (0.3% methanolic ammonium hydroxide), has clean up steps to eliminate matrix interferences

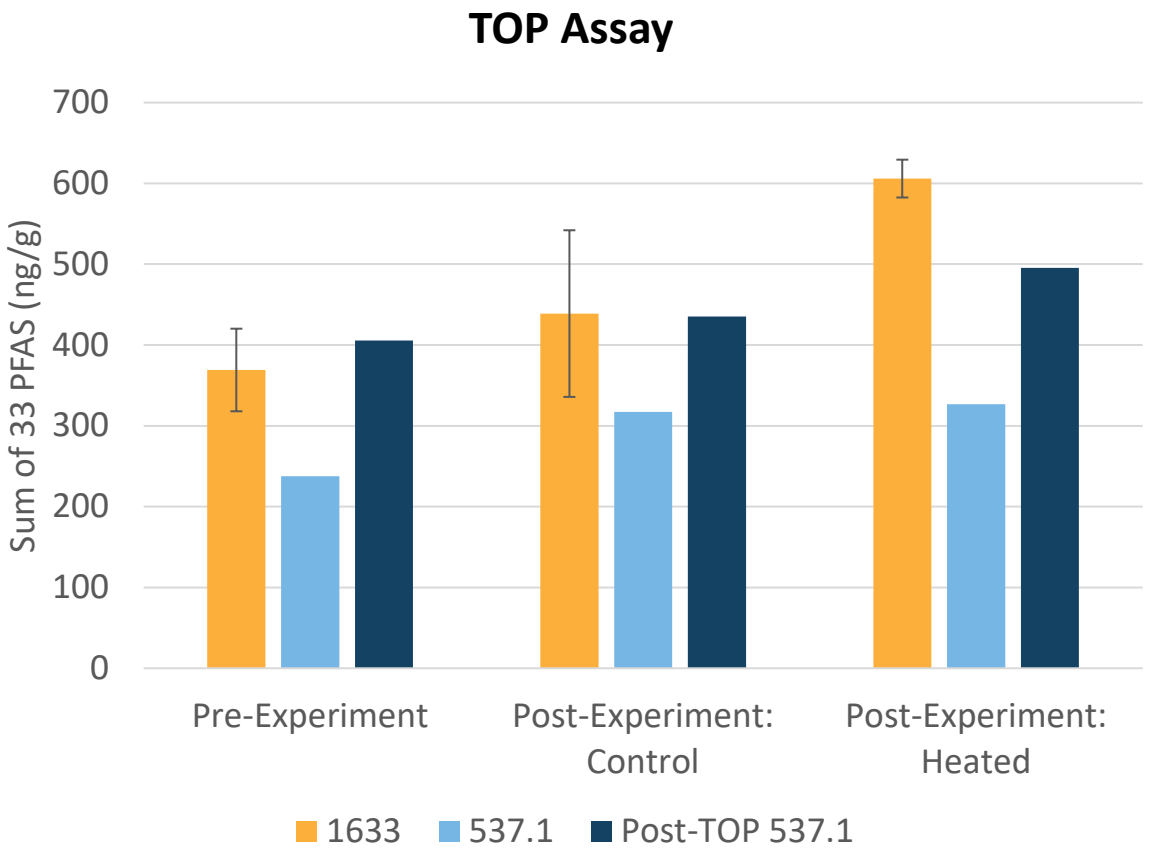
EOF: No approved method. Laboratory SOP has proprietary elements, including the extraction solvent, but suspected to be methanol or basic methanol. No cleanup steps or attempt to remove inorganic F.



2020 Study found significant PFAS mass in AFFF source zones = cations and zwitterions

Authors developed a 2-step process (basic methanol followed by HCl) to improve extraction of these compounds

Finding 1: Non-targeted PFAS methods are a work in progress (for soils)



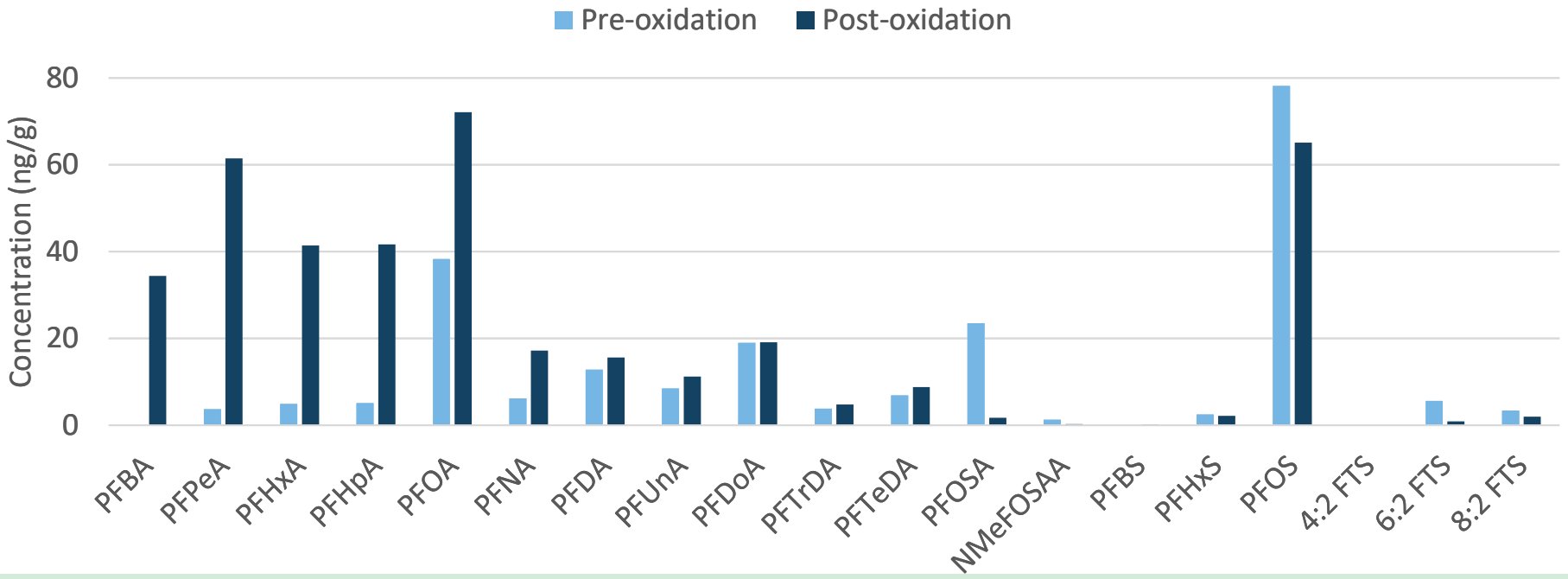
- TOP Assay was performed using method 537.1 for analysis
  - Very high reporting limits for initial soil (50 ppb)
- TOP assay with 1633 may provide more reliable results
- Limitations to TOP: not all precursors transform; chain-cutting can reduce in loss

In soil, PFOS and PFOA dominate along with precursors

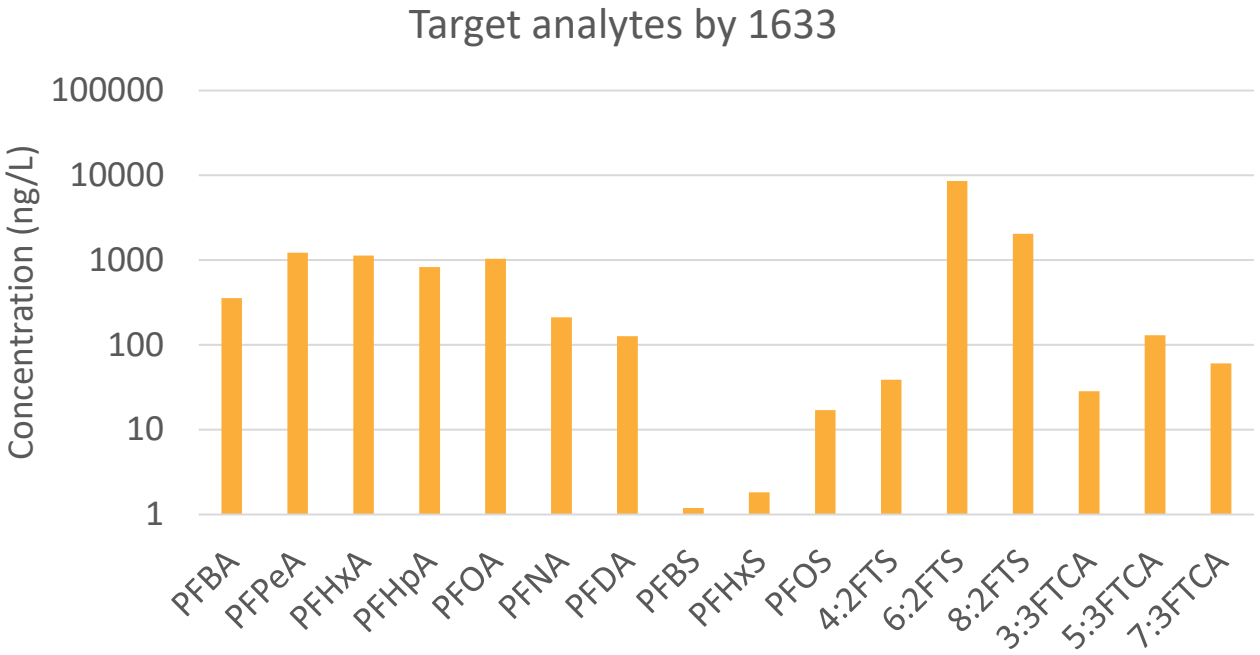
Based on initial analysis, PFOS dominates in soil. May indicate impacts from 1st Gen. AFFF (PFOS-based)

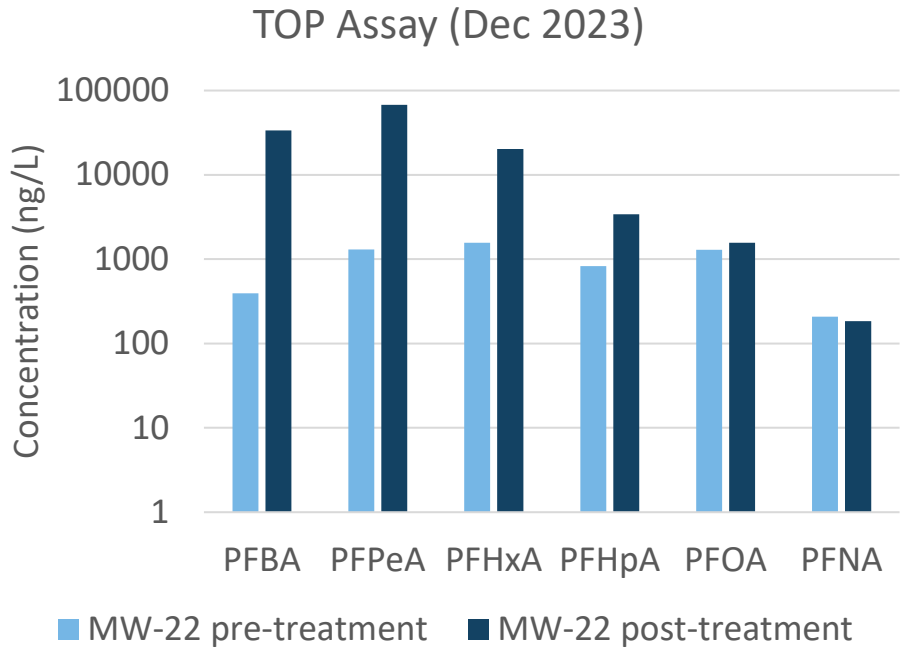
Post-oxidation, levels of C4-C9 PFCAs increase

- Mix of short-and long-chain precursor compounds are present in soil



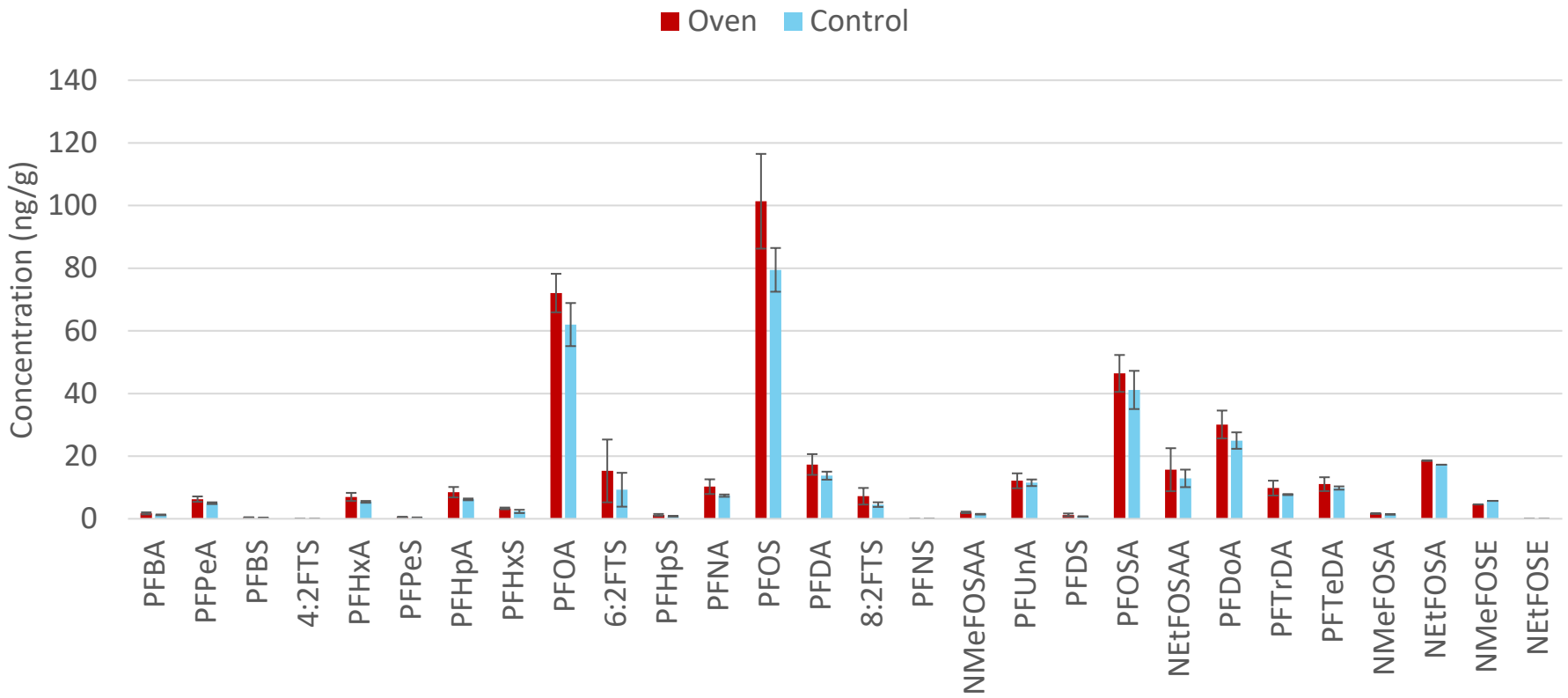
Groundwater PFAS consists mostly of PFCAs and PFCA precursors



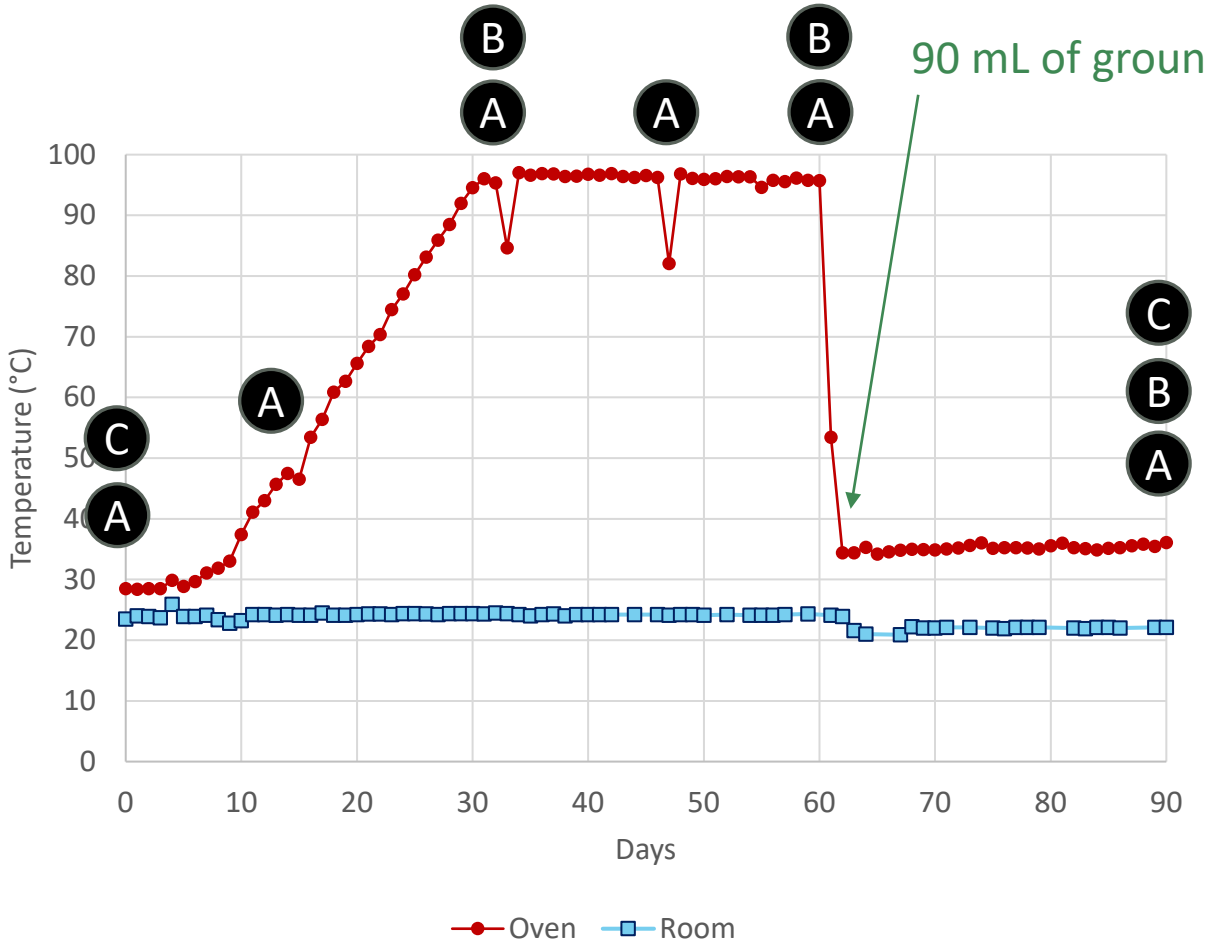


Likely impacted by legacy fluorotelomer AFFF (mix of short and long chain)

Day Zero PFAS concentrations were consistent across six reactors

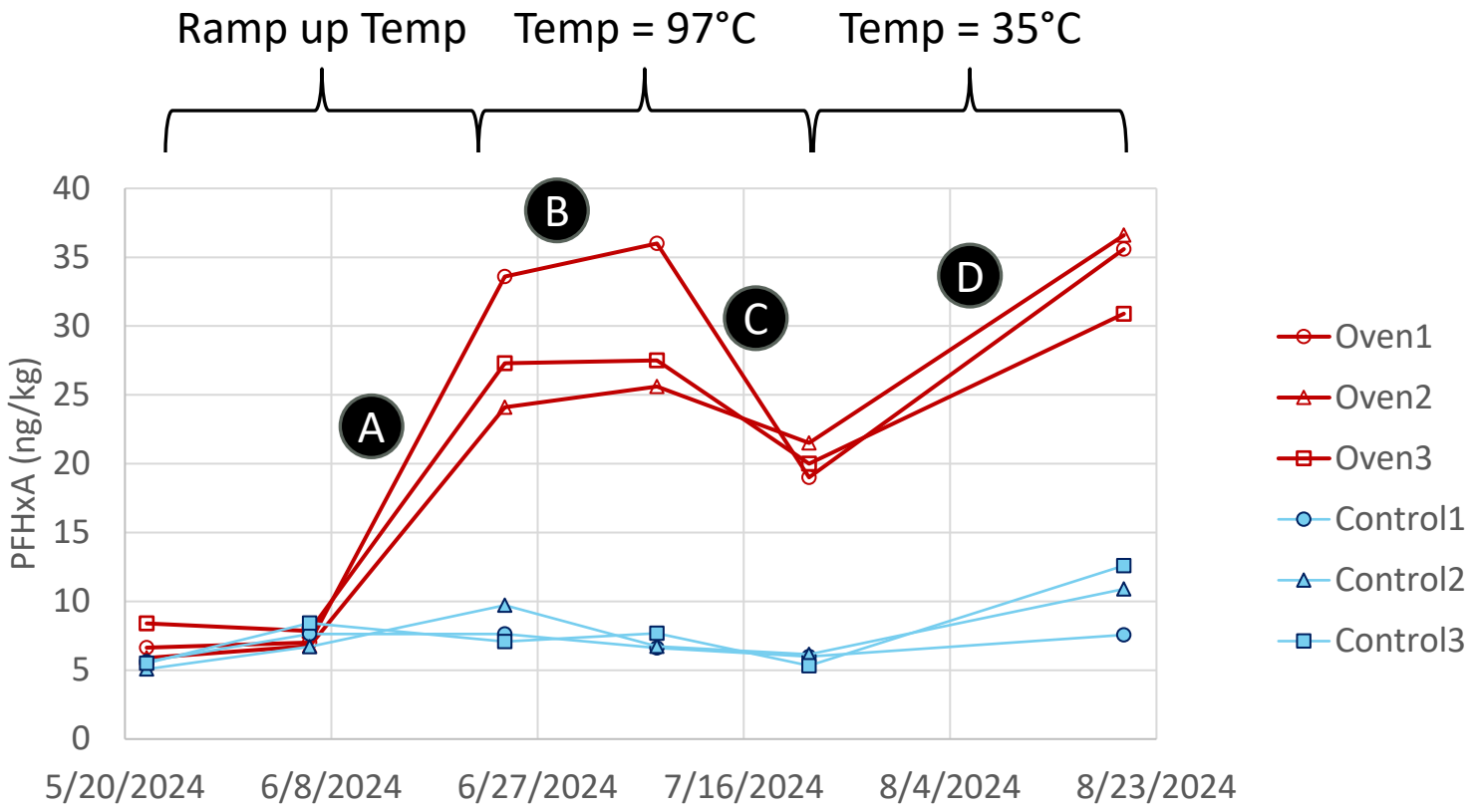


Temperature Profile and Sampling



- **A** Soil collected from each reactor and analyzed for PFAS by EPA method 1633
- **B** Composite condensate samples (hot reactors only) sent for analysis by EPA method 1633; vapor capture cartridges sent for analysis by EOF
- **C** Soil collected from each reactor and analyzed for fluorine by EOF; composite soil samples analyzed for PFAS by TOP

Finding 2: PFCAs increased in hot reactors relative to control reactors



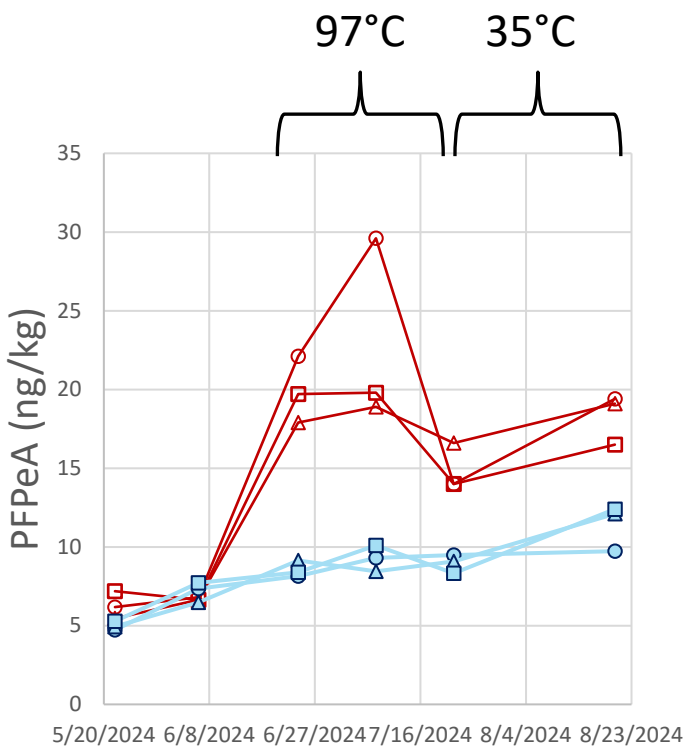
A. 300% increase in PFHxA during temperature ramp-up (>40C)

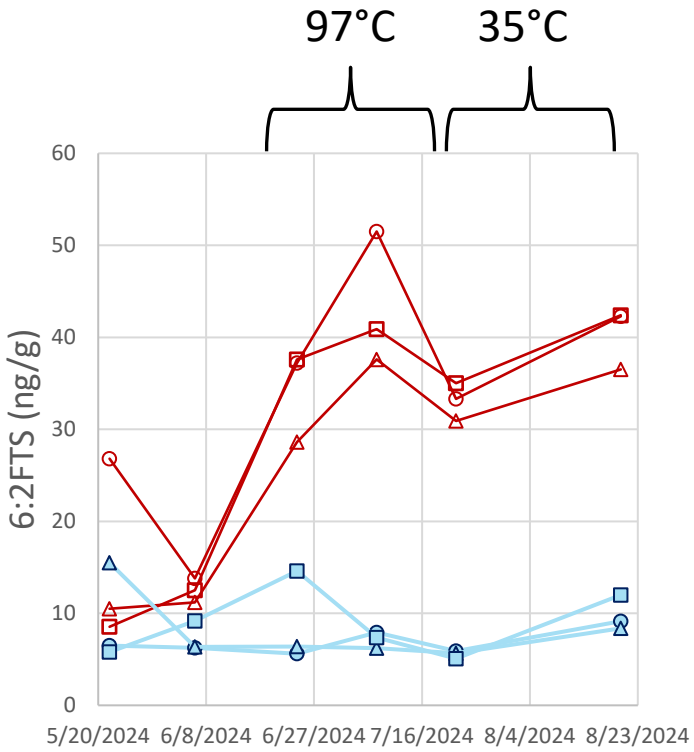
B. Concentration is flat for about 2 weeks at 97C

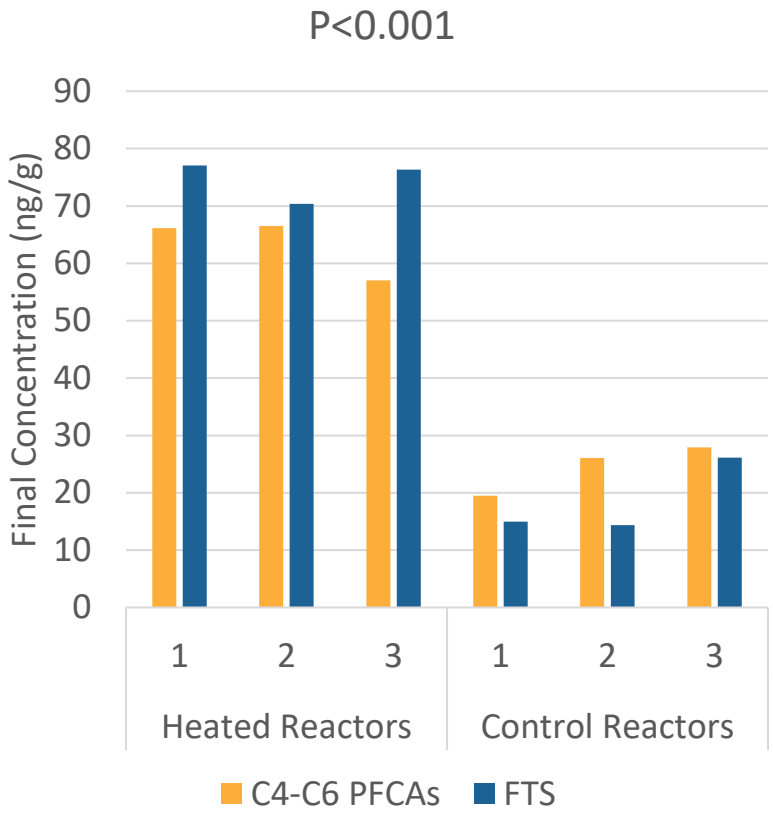
C. 30% decrease in concentration during latter half of elevated T period

D. Increasing PFHxA at moderate temperature

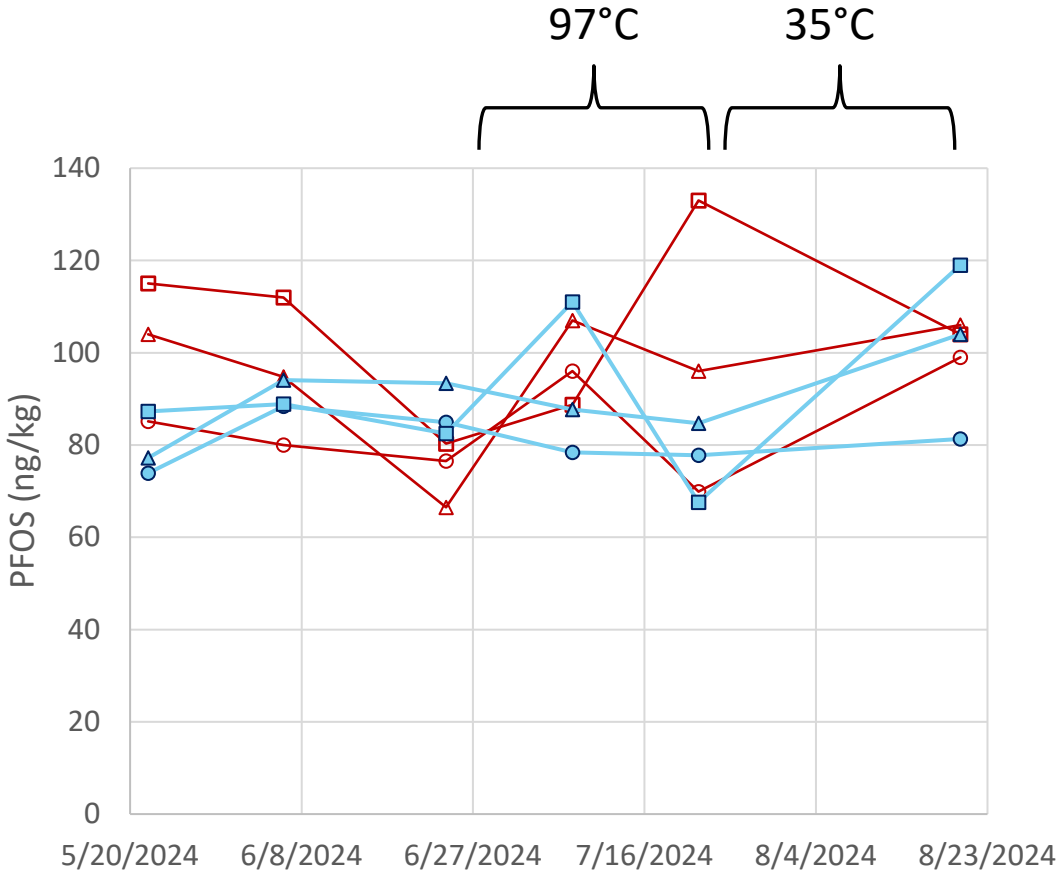
There was a statistically-significant increase in some PFAS concentrations in the heated reactors



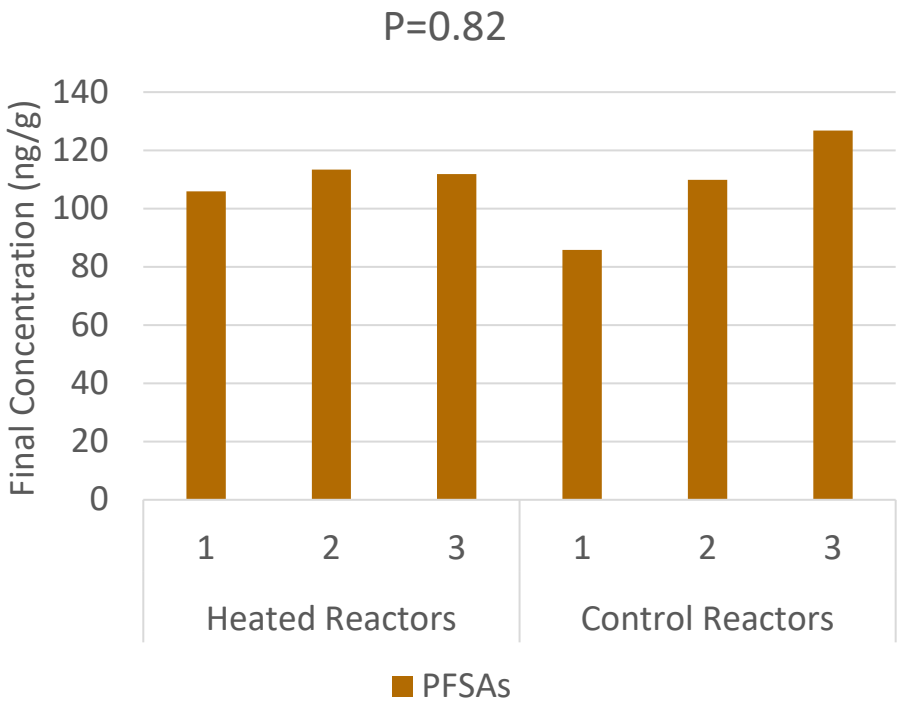




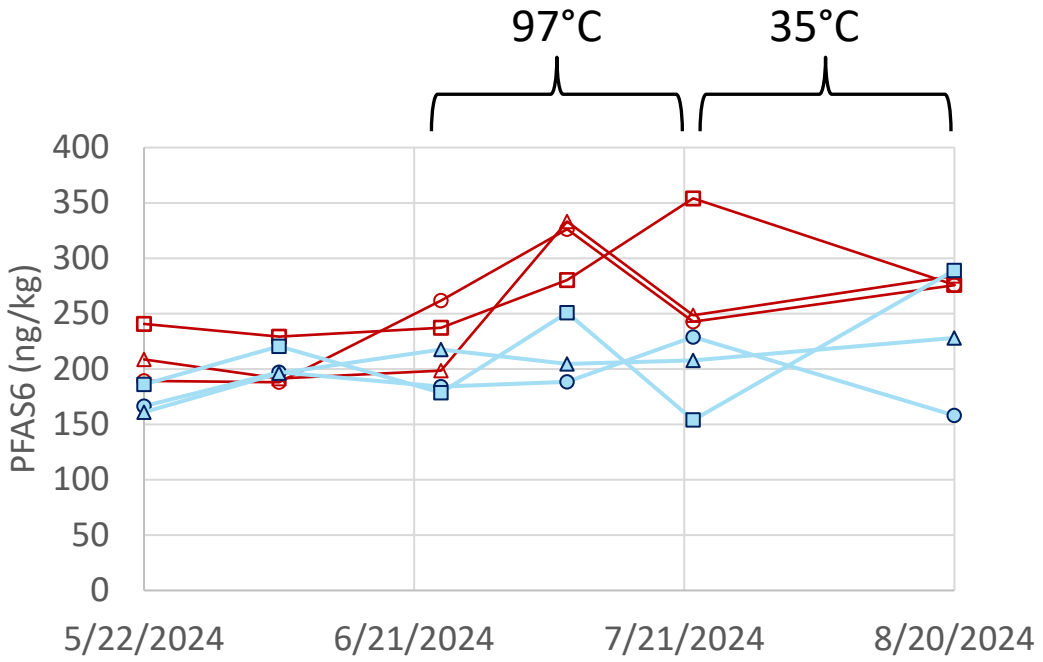
There was no significant difference between PFOS in heated and control reactors

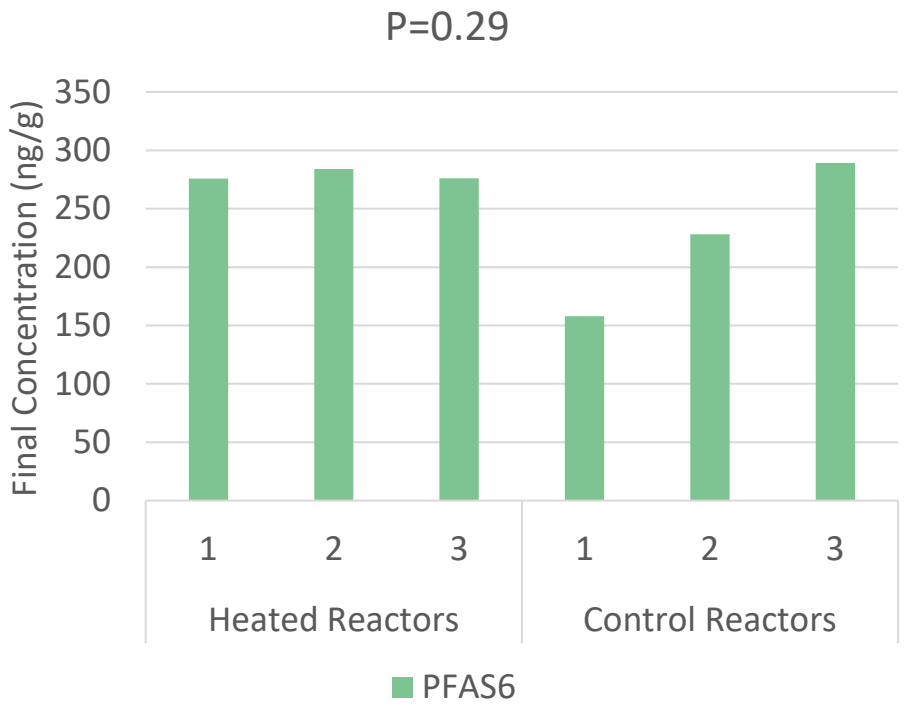


PFOS is *not* a transformation product of fluorotelomer AFFF



PFAS6 was 25% higher in the heated reactors, but the difference is *not* statistically significant.

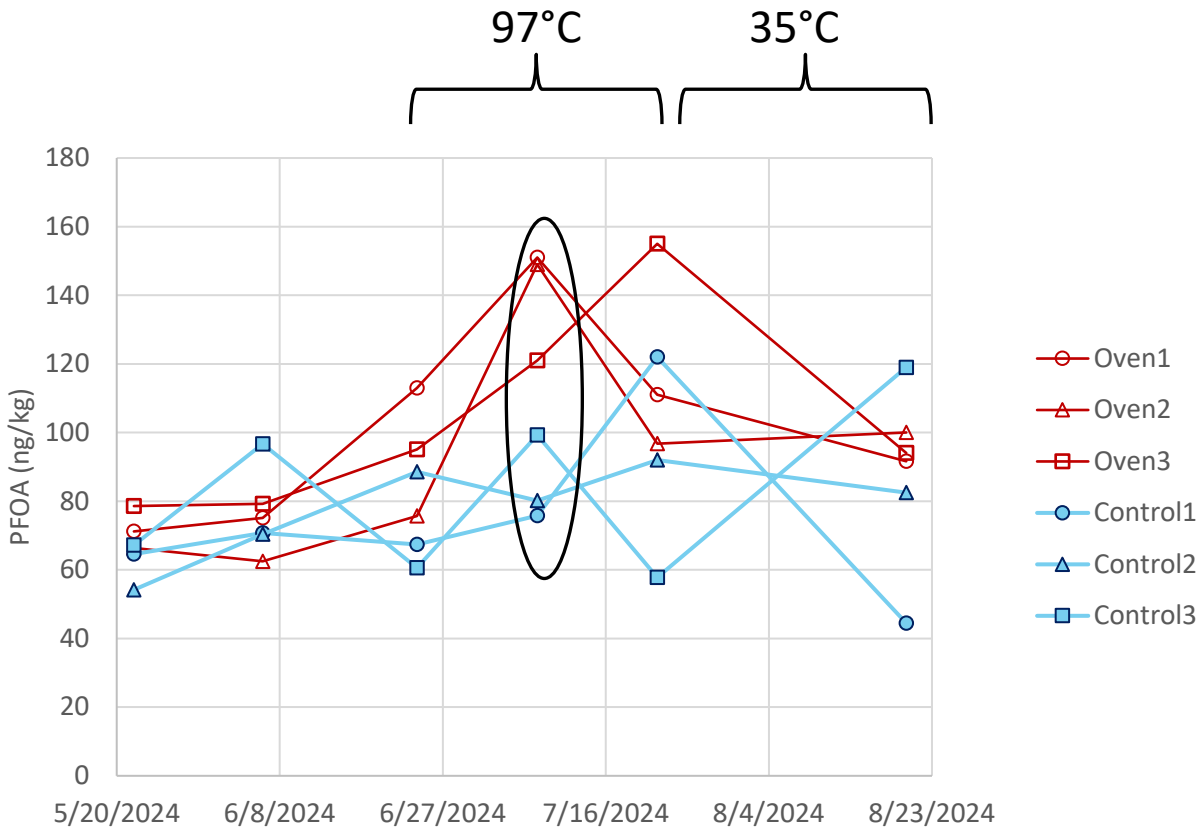




PFAS6 is dominated by PFOS (no difference) and PFOA

Changes in short-chain PFCAs are not captured by PFAS6

Large variability and inconsistent trends in PFOA concentrations



Trends over the first 45 days tracked with other PFCAs

- Significant difference between heated and control at 45 days

Variation between reactors erased statistical significance in the second half of the experiment

- Especially in control reactors, where minimal changes were expected
- Non-AFFF source of PFOA?

PFOA is an outlier among PFCAs

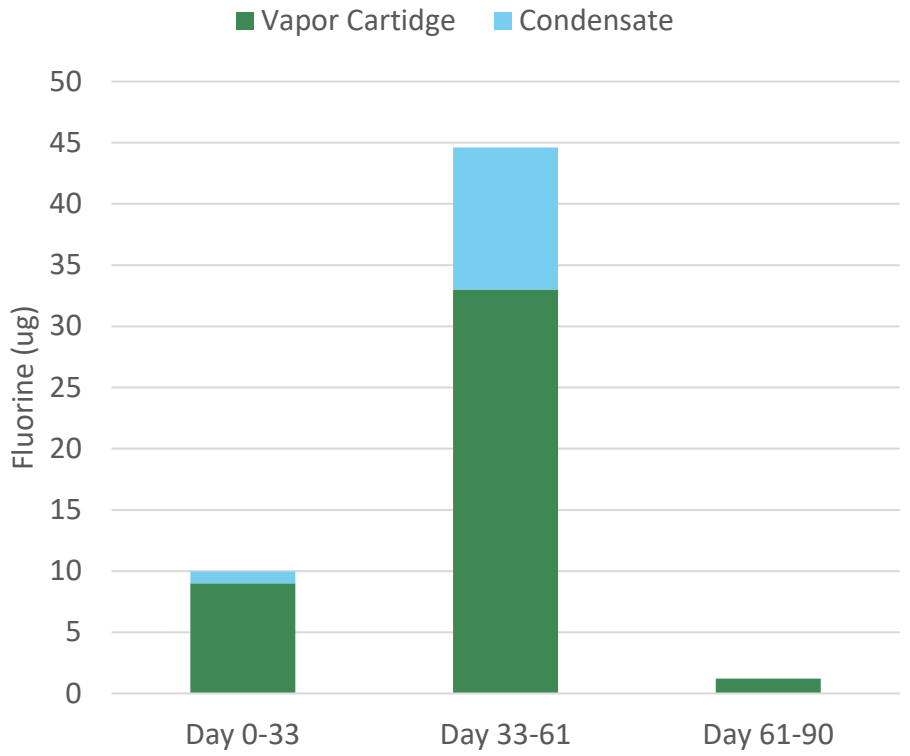
Finding 3: Loss of PFAS is most likely due to evaporative removal

Condensate and vapor cartridges were analyzed for PFAS

Measured values are expected to be biased low

- Only targeted analysis was completed on condensate (1633)
- Capture and extraction efficiencies for vapor capture cartridges are unknown

Control reactors: no condensate generated and no PFAS detected on vapor cartridges



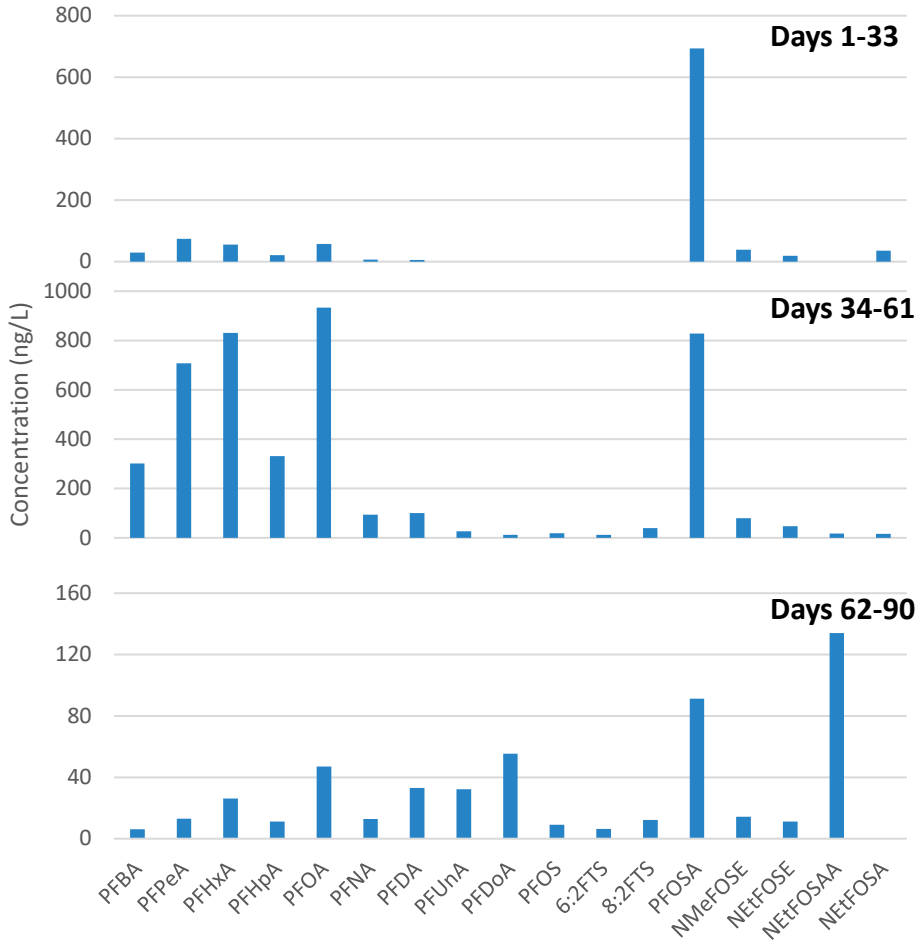
PFAS were detected in all condensate samples from the heated reactors

PFAS profile changed over time

- Three different temperature regimes
  - Ramp-up (0 – 32 days)
  - Hold at 97°C (33 – 60 days)
  - Hold at 35°C (61 – 90 days)

Large PFCAs (C8+) present in condensate

- Unlikely to be (solely) attributable to direct volatilization
- Direct volatilization from soil/water?
- Transformation products of volatile precursors?
- Associated with LNAPL?



Finding 4: The proportion of precursor mass converted to PFAAs was likely small

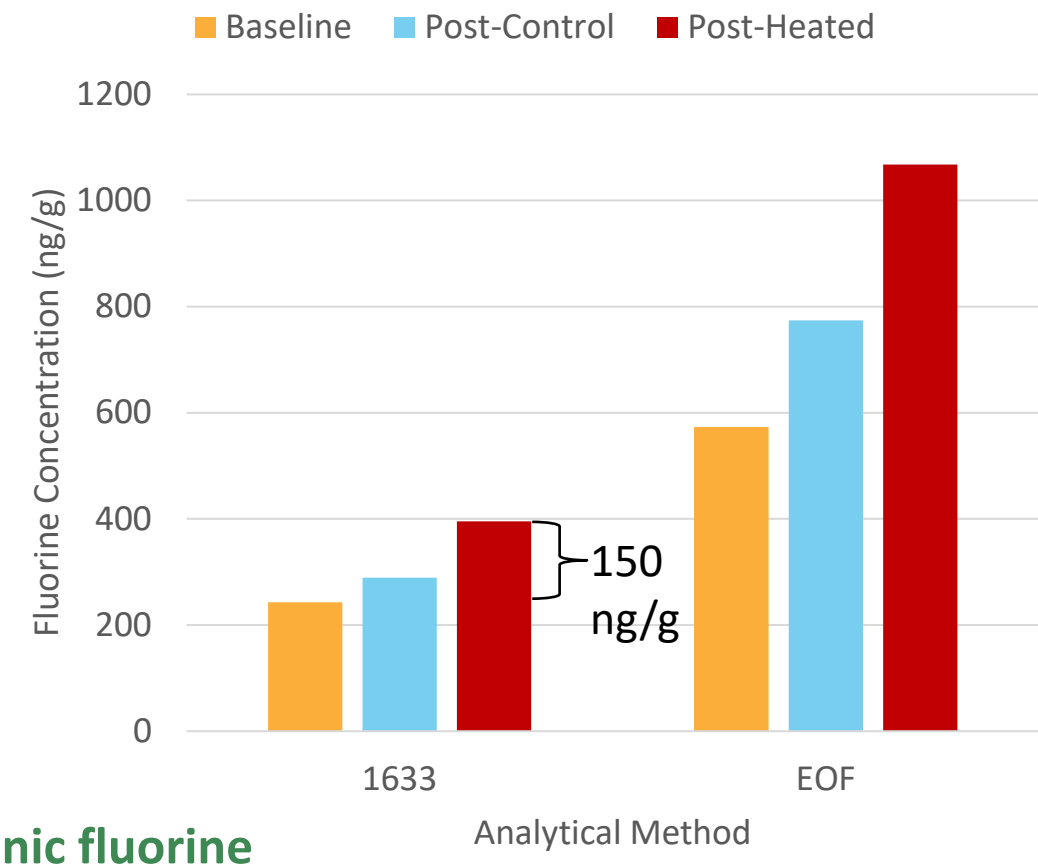
Heated reactors contained more measurable fluorine than baseline

Control reactors contained more fluorine than baseline (but less than heated reactors)

Starting fluorine concentration was likely > 7,000 ng/g

Worst case: ~2% of fluorine mass in non-target precursor compounds converted to target analytes in heated reactors

- <1% of fluorine converted in control reactors



Limitation: EOF results do not represent total organic fluorine

Summary of Findings

Non-target analysis methods have limitations, especially for soils

- Incomplete extraction is possible if non-anionic PFAS are present
- Still an important part of the toolkit for source area investigations

Transformation of precursors to PFCAs occurred faster at ISTR conditions compared to the control reactor

- Especially true for short-chain PFCAs, but also observed for C9 and C10; PFOA was the exception
- No significant difference between heated and control reactors for PFSAs, despite presence of PFSA precursors

No significant difference between heated and control reactors for PFAS6

Evaporative removal of PFAS (PFCAs and precursors) was confirmed

The proportion of PFAS precursor mass transformed to measurable PFAS was likely low

Findings of this study suggest little to no impact on downgradient receptors is expected

Time will tell…check back with us next year!

“On the Horizon” & Wrap Up

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

Millie Garcia-Serrano, MPH
Assistant Commissioner
MassDEP | Bureau of Waste Site Cleanup

On the Horizon… *PFAS!*

- PFAS Q&A
  - Under review by senior staff
- PFAS IH work with support from ORSPFAS cleanup standards to follow BWR's promulgated MMCLs
- For PFAS Questions or Comments:

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Next WSC Meetings & Wrap Up

- Office Hours Meeting: *TBD*
- WSC Advisory Committee Meeting: ***2/20/25***
  - *Hybrid? At MassDEP Offices – 100 Cambridge Center, Boston, MA*

BWSC THANKS YOU!

Wishing you a Wonderful Thanksgiving in New England (or wherever you find yourself at!..

See you in 2025!

MassDEP