

PFAS in the Water Supply of the National Capital Region

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Engineering

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Kirin Emlet Furst, PhD



Associate Professor and
OWML Co-Director, Dept of
Civil and Environmental
Engineering (2025–)



NSF CAREER Award (2024)



Assistant Professor, Civil
and Environmental
Engineering (2020-2024)

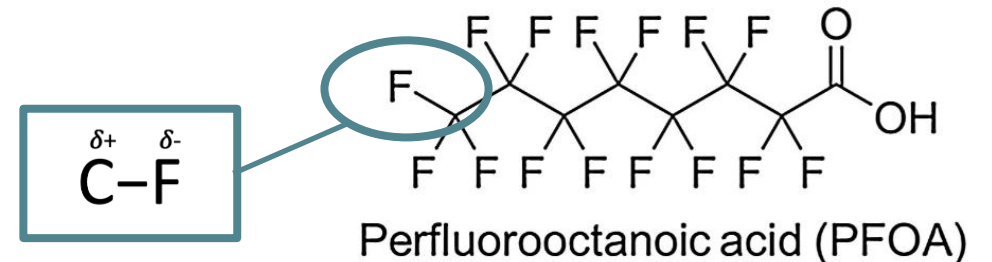


MS/PhD, Civil and
Environmental Engineering
(2017/2020)

Research interests:

- Organic contaminant fate and transport
- Water treatment processes and potable reuse
- Drinking water policy

Per- and polyfluoroalkyl substances (PFAS)



Virginia Tech's Occoquan Watershed Monitoring Lab (OWML)

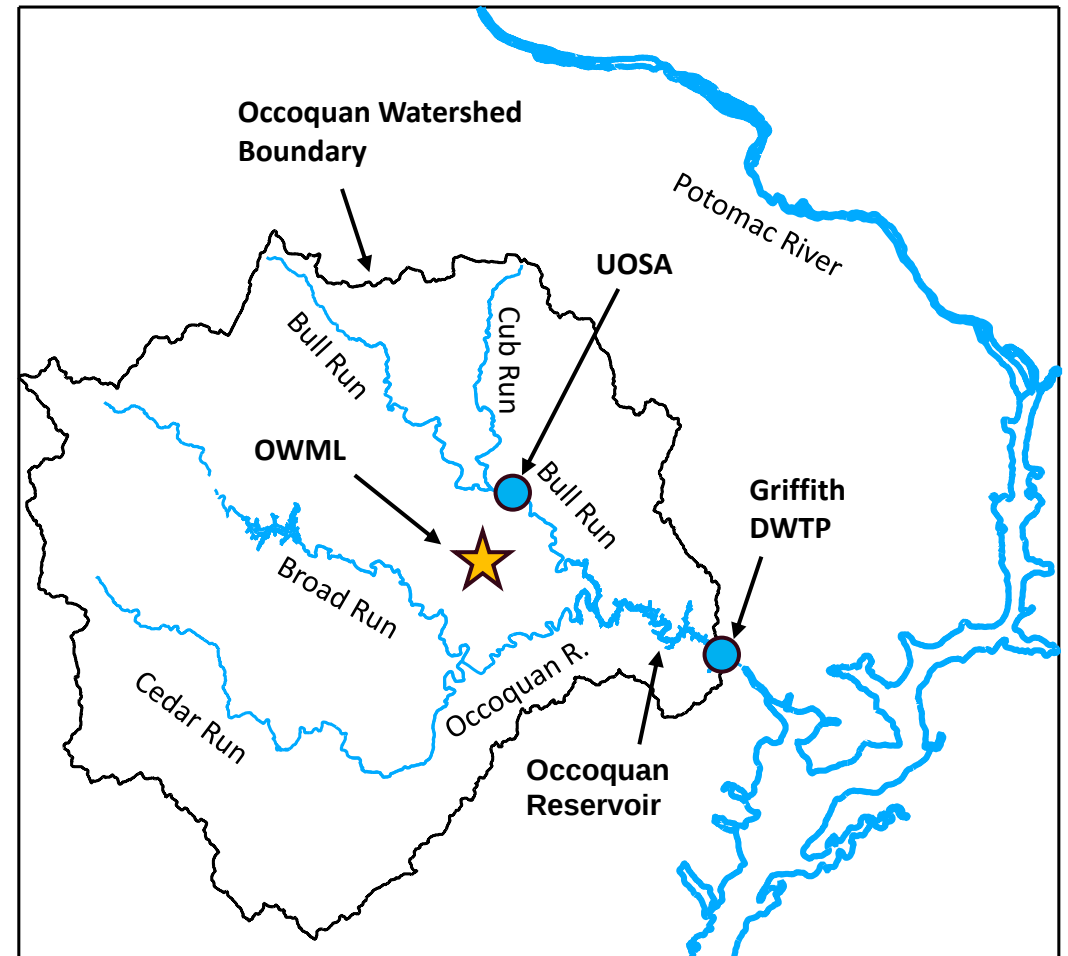
An innovative partnership between VT Dept. of Civil and Environmental Engineering, Virginia DEQ, and public water supply and water reclamation agencies, city and county governments in Northern Virginia.



Dr. Stanley Grant
Nick Prillaman Professor
& Director OWML



Dr. Kirin Furst
Associate Professor
& Co-Director OWML

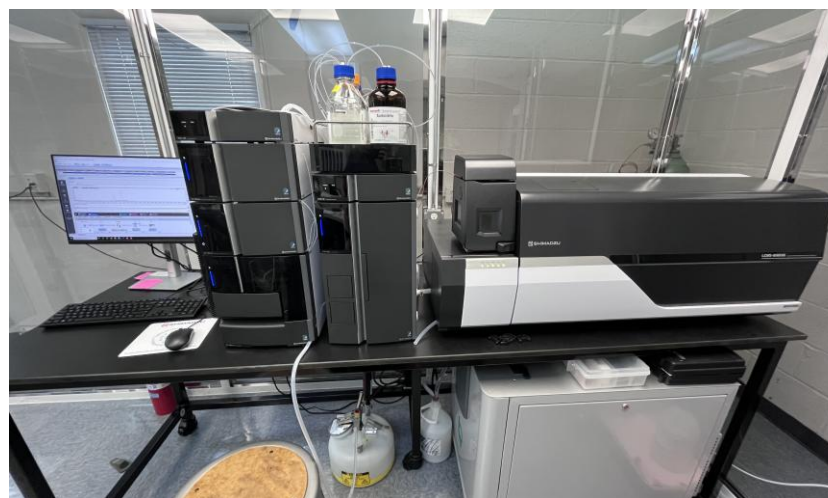


PFAS research at OWML

- >\$4.5 million in grants and contracts
- Core team: 3 faculty, 2 research faculty, 6 students, 3 post-docs, 2 staff
- VELAP-accredited for PFAS analysis (EPA Method 1633)
 - Growing portfolio of advanced analytical methods



Some of the OWML PFAS lab rats



UHPLC-MS/MS for PFAS analysis



Field crew trained for PFAS sampling

PFAS monitoring and source tracking projects

Stakeholder-sponsored

- **Fairfax Water (PI Furst):** PFAS Forensics in the Occoquan Watershed
- **COG (PI Bradley Schmitz (WSSC), Co-I Furst):** Continued Monitoring in the Potomac River Basin
- **Fairfax County (PI Rippy):** Monitoring of PFAS in Sediments in the Occoquan Watershed
- **Loudoun Water (PI Husic):** Broad Run facility monitoring

Water Research Foundation

- **Fairfax Water, WRF 5345 (Grant):** A One Water Approach to Managing PFAS Pollution
- **Loudoun Water, WRF 5269 (Furst):** Understanding the Factors Affecting PFAS Variability in the Potomac River Watershed
- **DC Water, WRF 5386 (Furst):** Applying Environmental Forensics to Characterize PFAS and Precursor Compounds in Source Waters
- **WRF 5355 (Furst):** Developing a Robust Framework for PFAS Source Identification and Characterization

COG

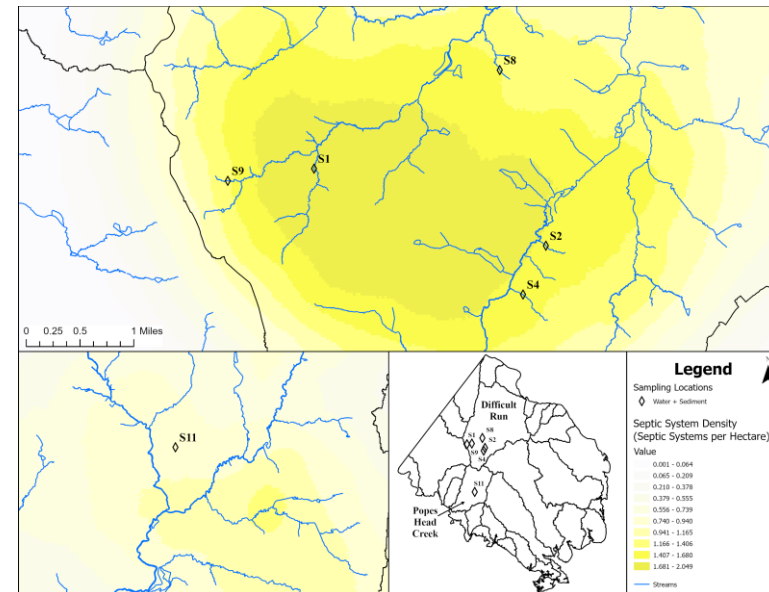
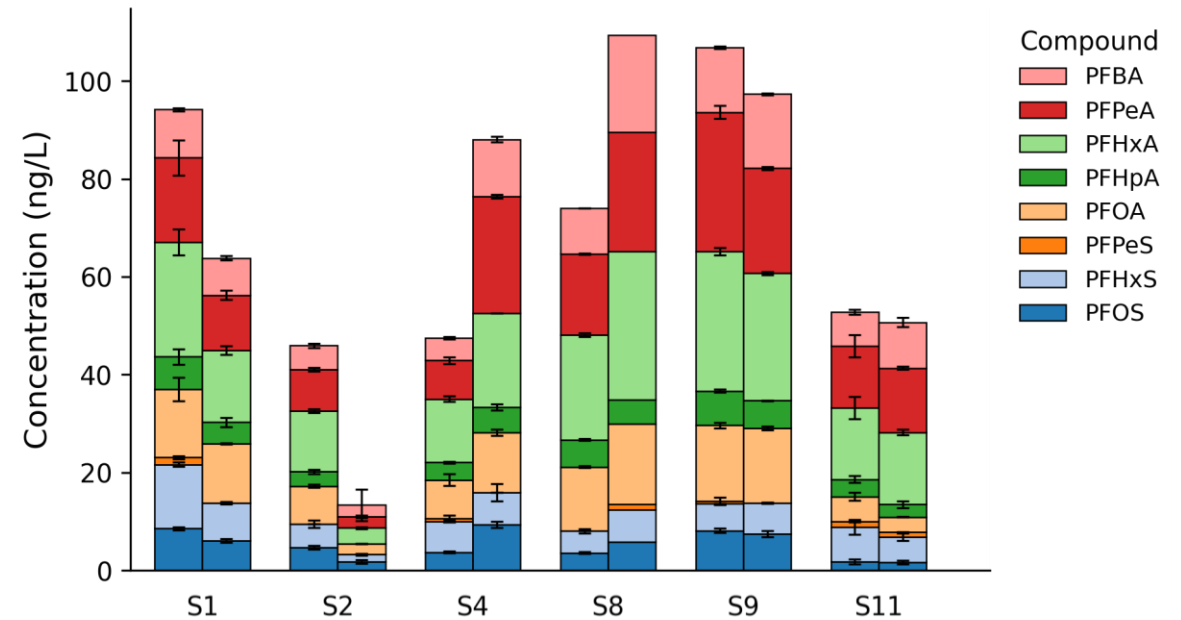
COG

COG

COG

Federally-sponsored PFAS research in the region

- **USGS 104g (Furst):** Sanitation infrastructure in vulnerable communities: Current and future risks to water security (2024–2027)
 - *Septic systems as a source of PFAS?*
- **NSF CAREER (Furst):** Transformation potential of PFAS in drinking water distribution systems (2025–2029)
 - *What happens to PFAS that breaks through treatment trains?*



The Potomac PFAS Program

- FY26 NIST Community Project Fund, \$1.03 million (in administrative review)
- Overarching goal is to accelerate efforts to identify source control and remediation opportunities
- Will serve as a regional hub for PFAS research collaboration and coordination, develop regional research strategy and funding acquisition



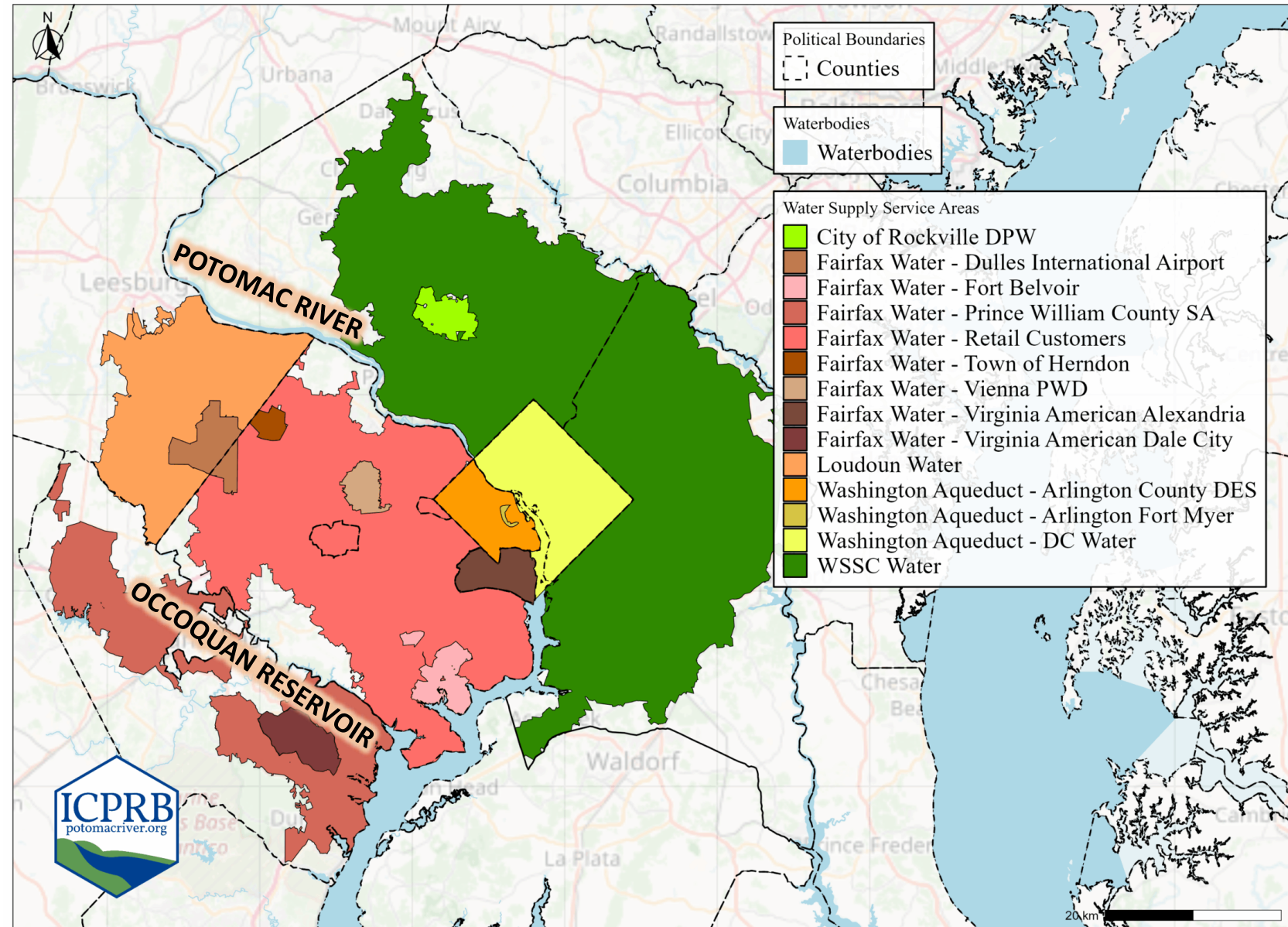
*Official launch anticipated by
January 2027 – stay tuned!*

What we know about PFAS in the National Capital Region water supply

A brief summary of data from 2024-2026

Drinking water supply of the National Capital Region

**Population served by public water systems:
~6.4 million**

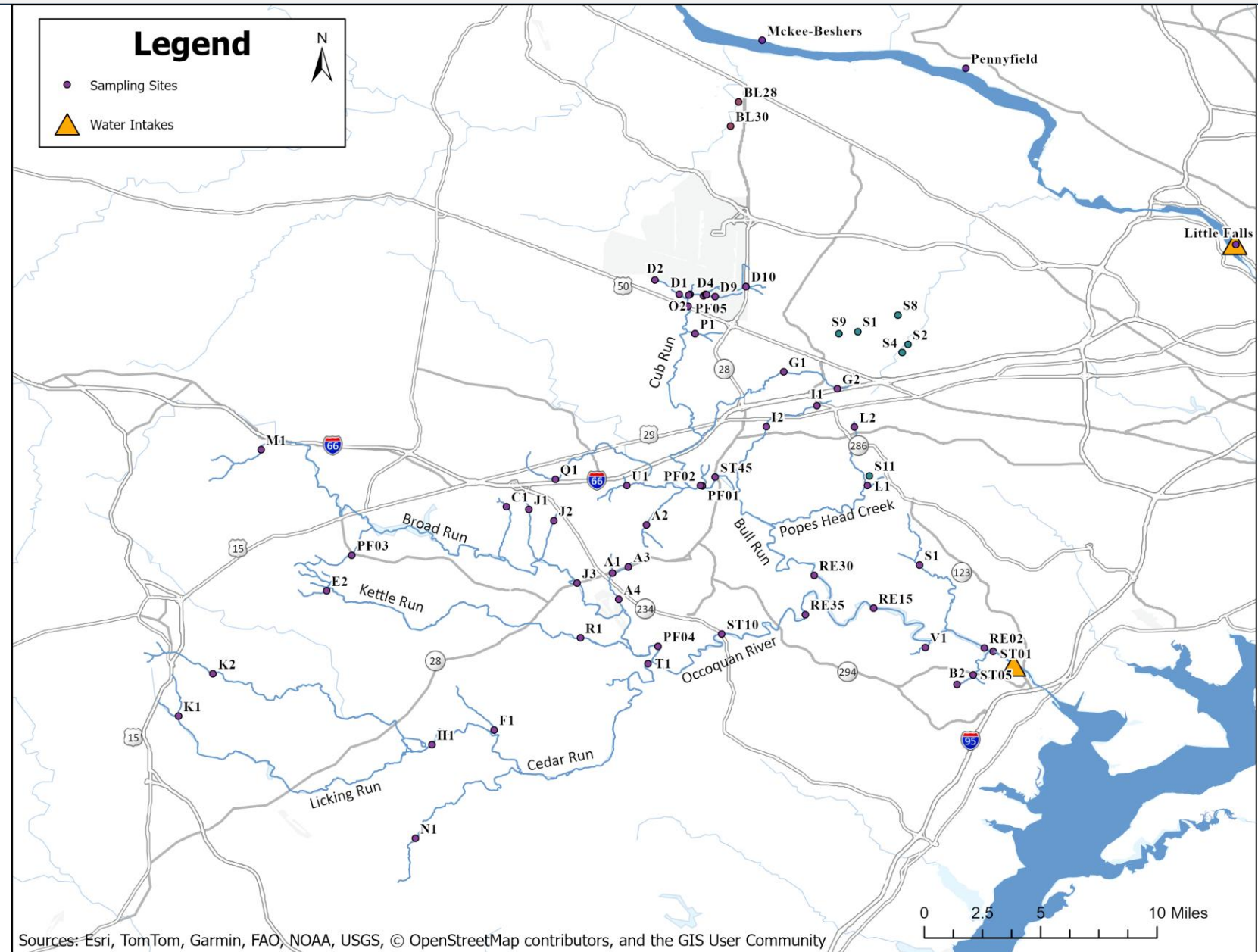


Interstate Commission for the Potomac River Basin

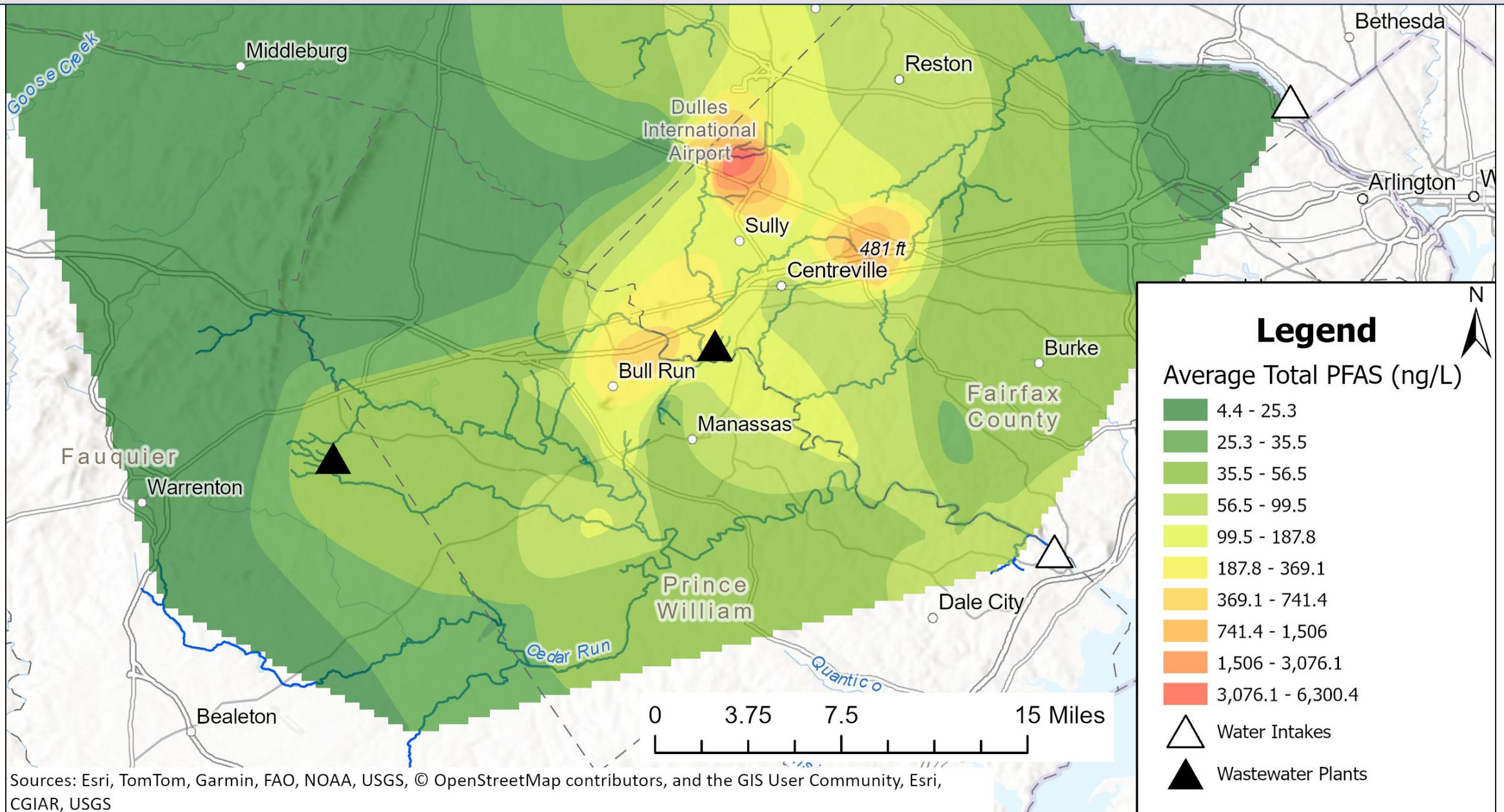
PFAS surface water sampling locations in VA-DC

>700 samples from
~70 sites for three
projects:

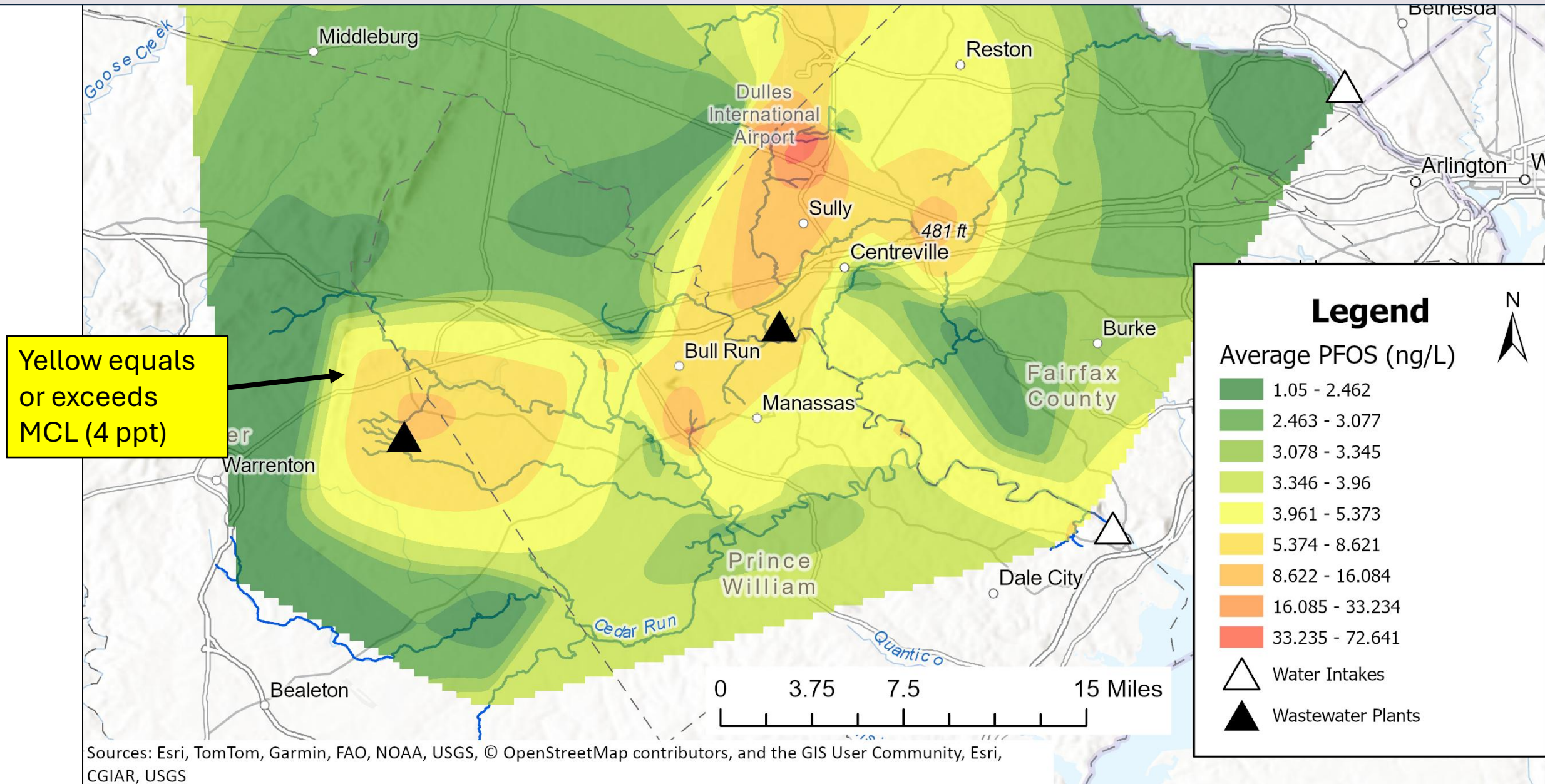
1. Occoquan Watershed Monitoring Program
2. Fairfax Water forensics study
3. USGS septic system study



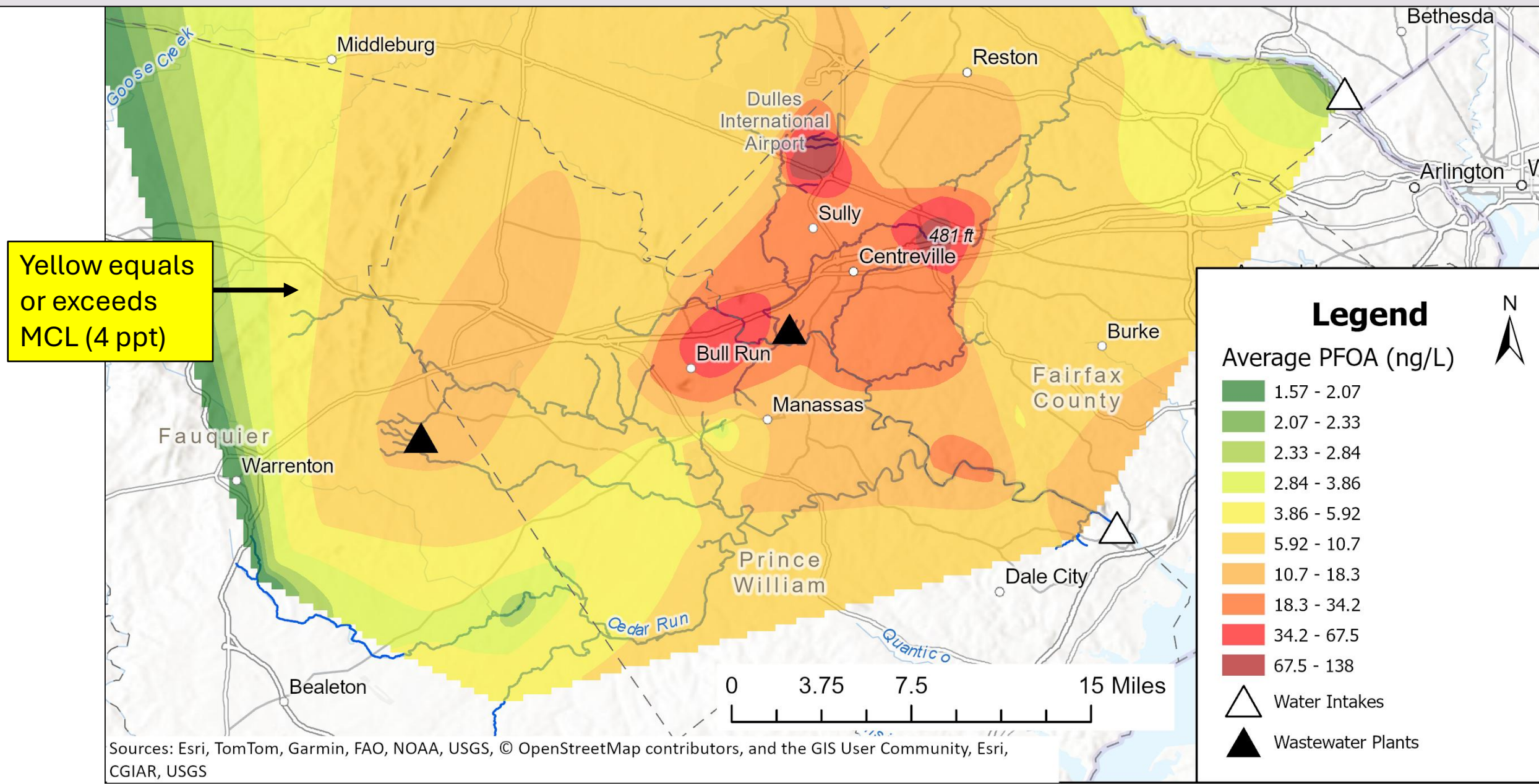
Average Σ PFAS₄₀ in surface water (ppt)



Average PFOS in surface water (ppt)

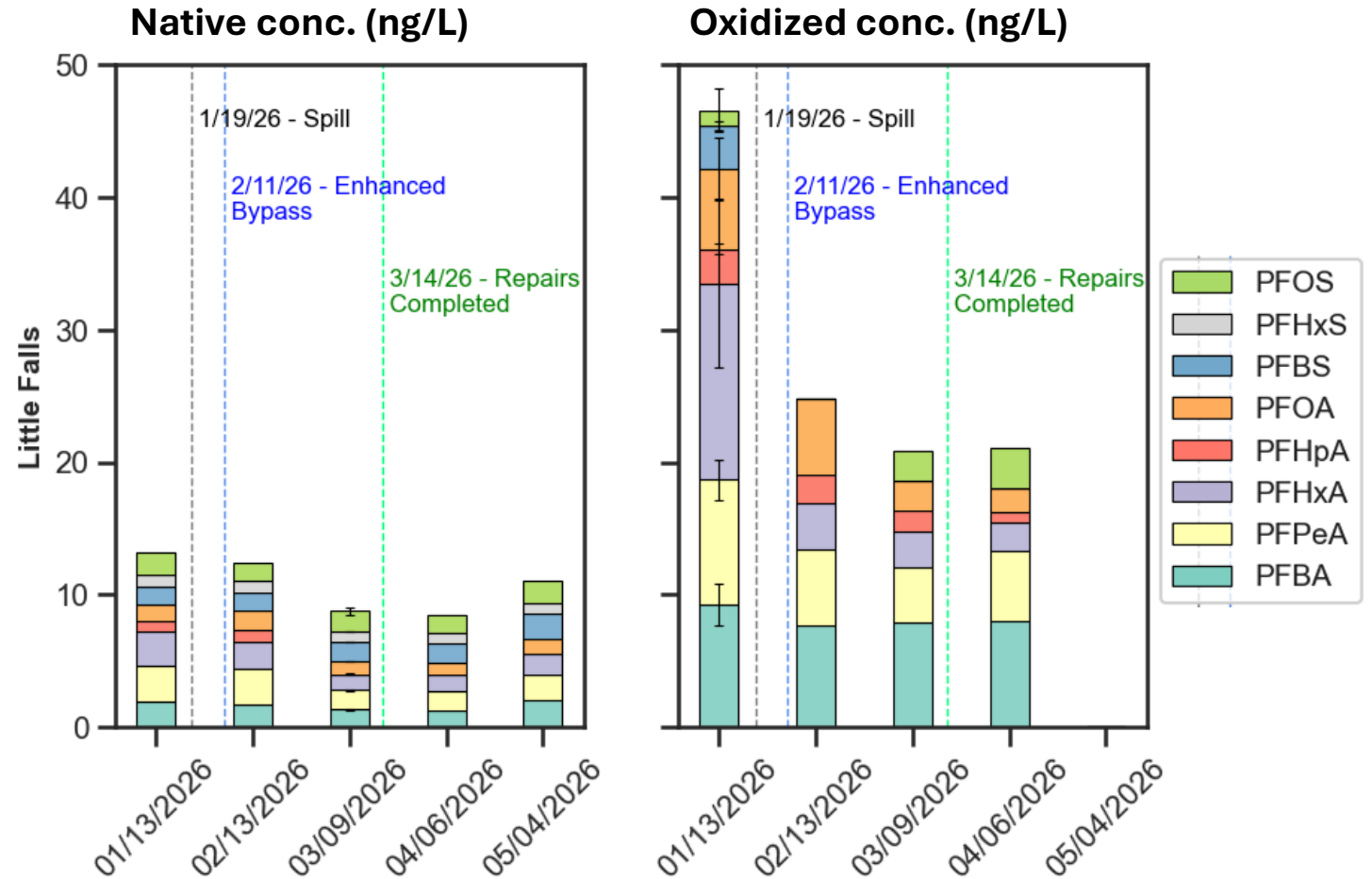


Average PFOA in surface water (ppt)



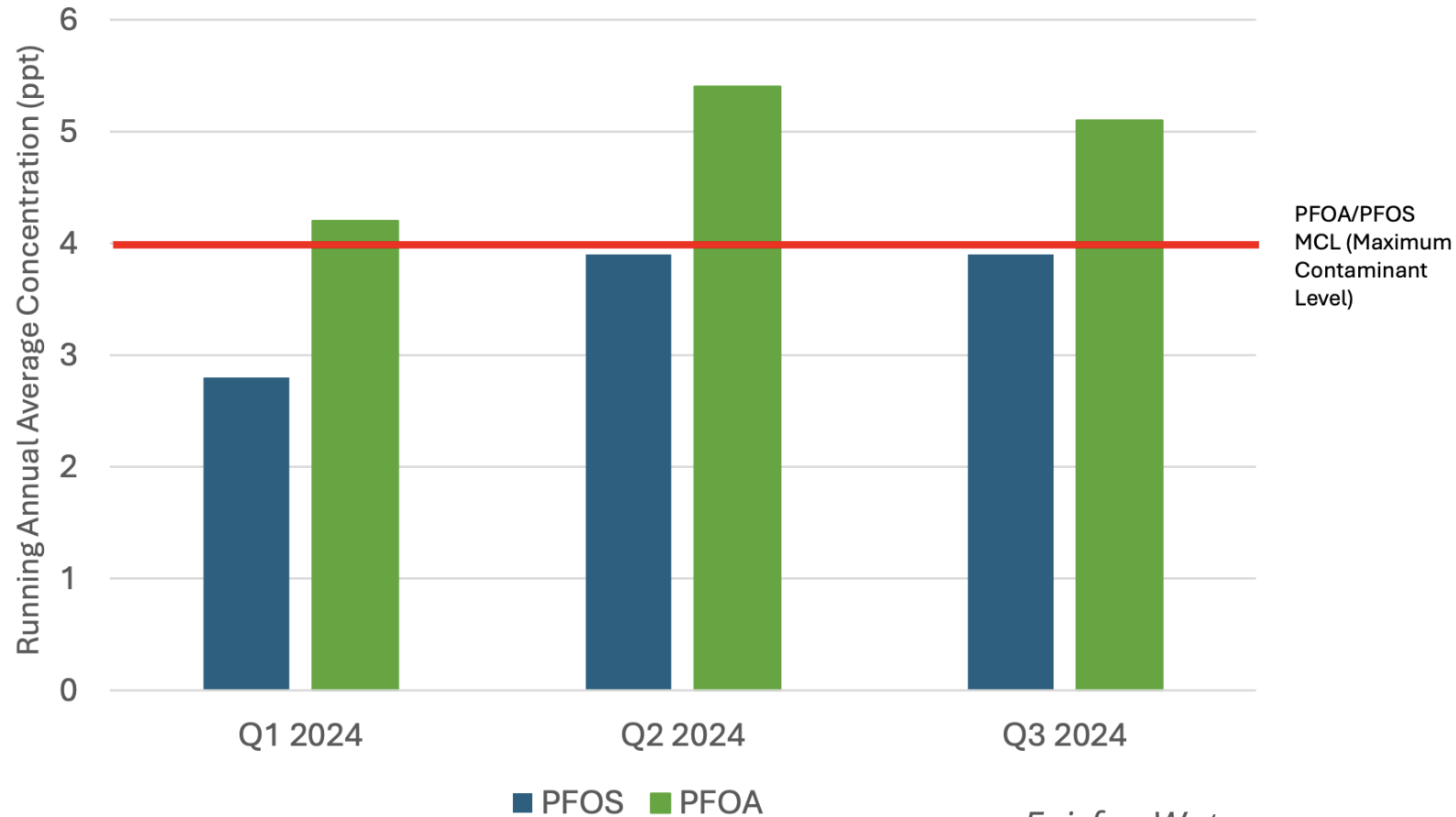
2026 Potomac River monitoring (COG) data snapshot

- Monthly monitoring at sites throughout Potomac River basin, including **Little Falls, DC**
- Figure illustrates what we see across the larger dataset*:
 - At each site, native PFAS levels are relatively stable while oxidizable precursor levels are highly variable over time
 - PFOA precursors exceed 4 ppt MCL in some months



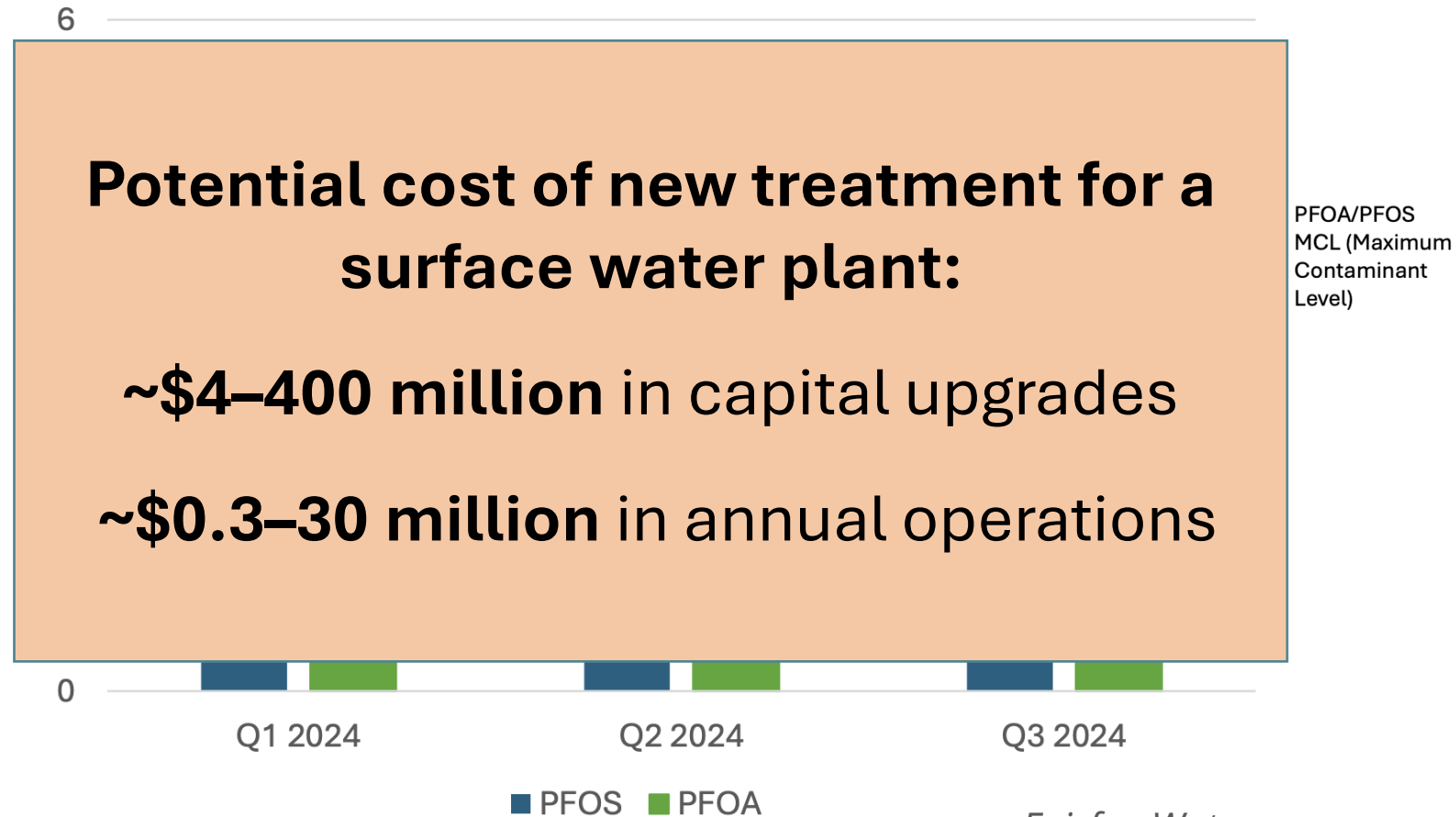
*Includes WRF 5269. *Manuscript in prep*: Rashid, Gasper, Furst, et al. The mystery of temporally variable, spatially uniform PFAS precursors in the water supply of the U.S. National Capital Region.

Cost of PFOA and PFOS removal to <4 ppt in finished drinking water



Fairfax Water

Cost of PFOA and PFOS removal to <4 ppt in finished drinking water



Fairfax Water

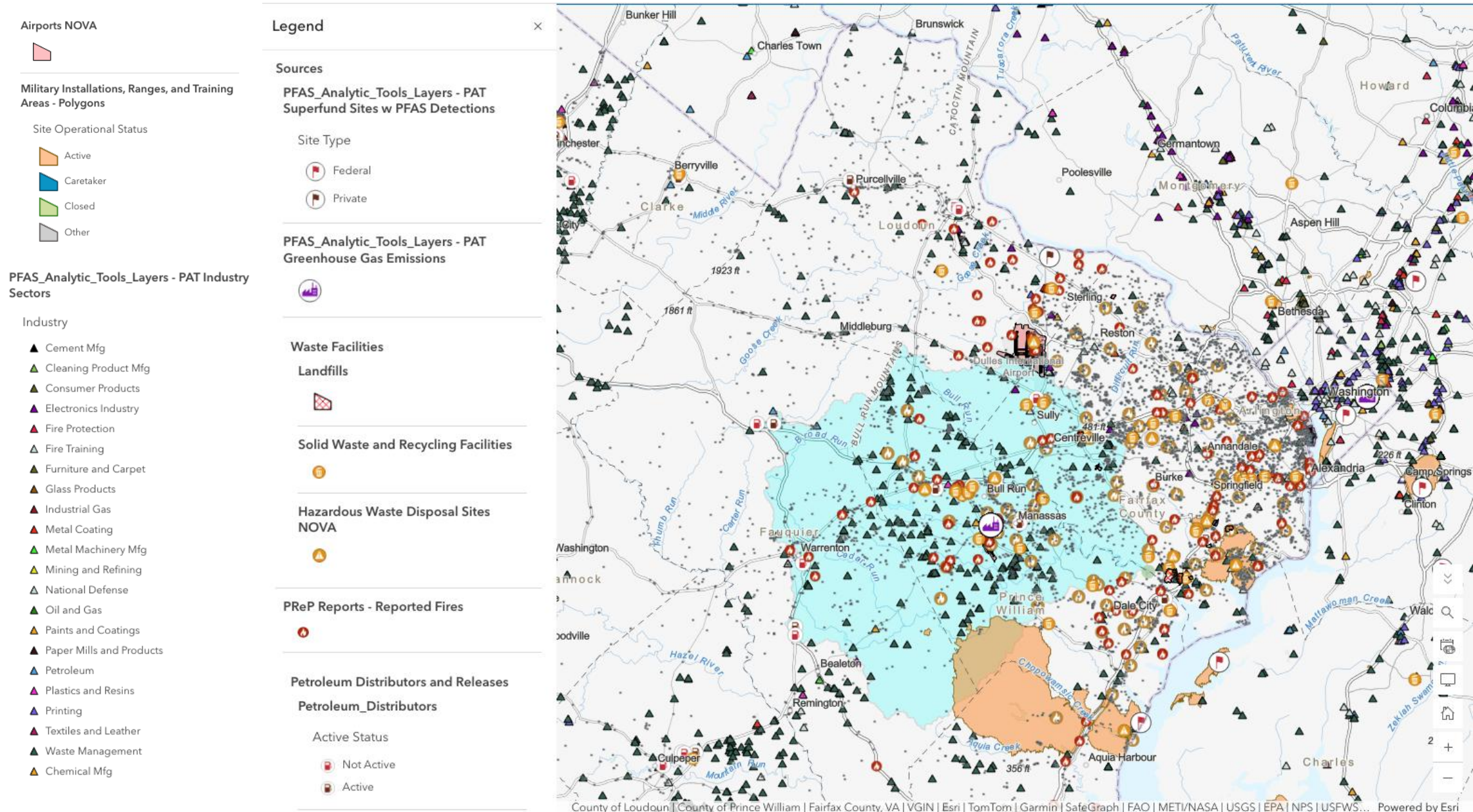
How can we remove PFAS from drinking water
and minimize water rate hikes?



**Identify opportunities for source control
and remediation**

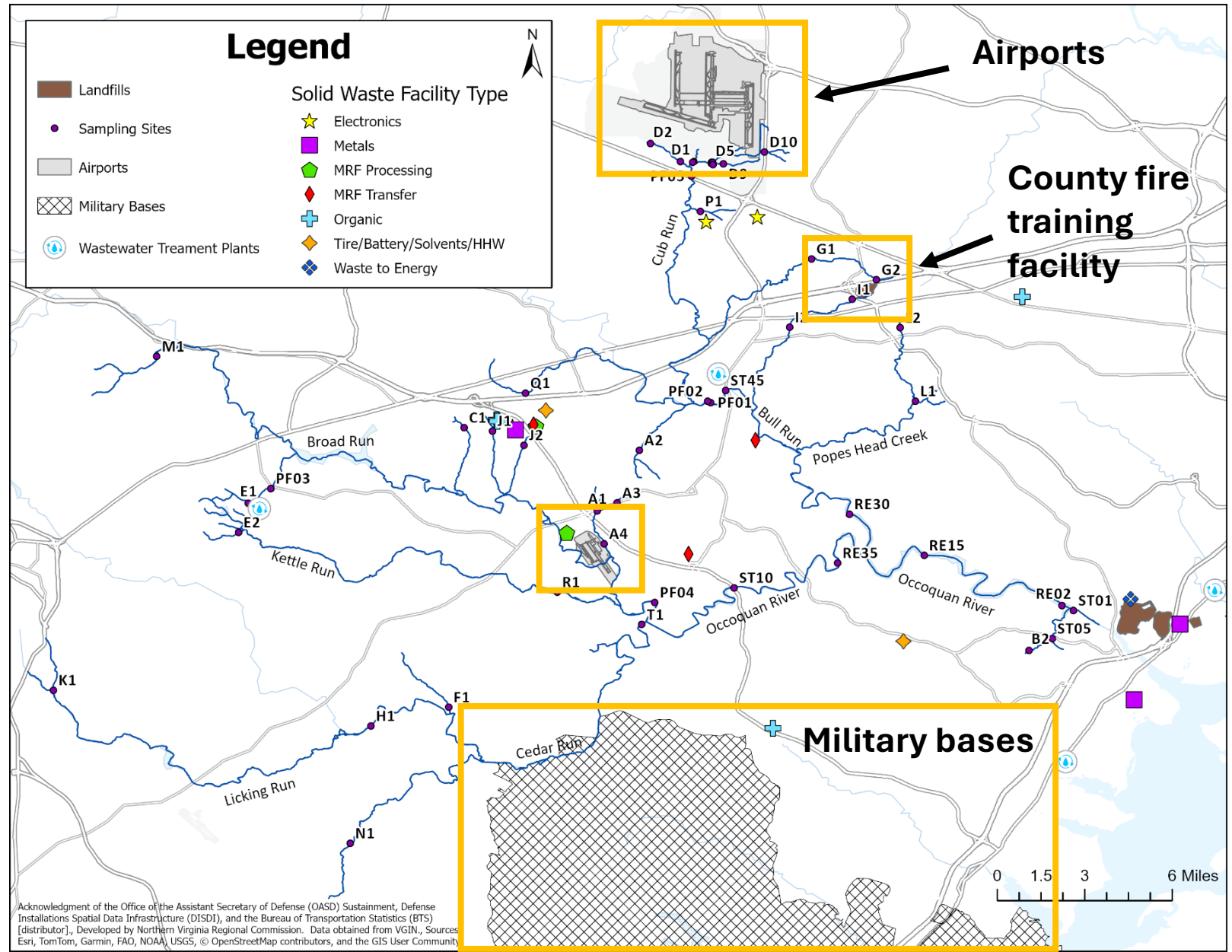


Potential PFAS sources in the National Capital Region



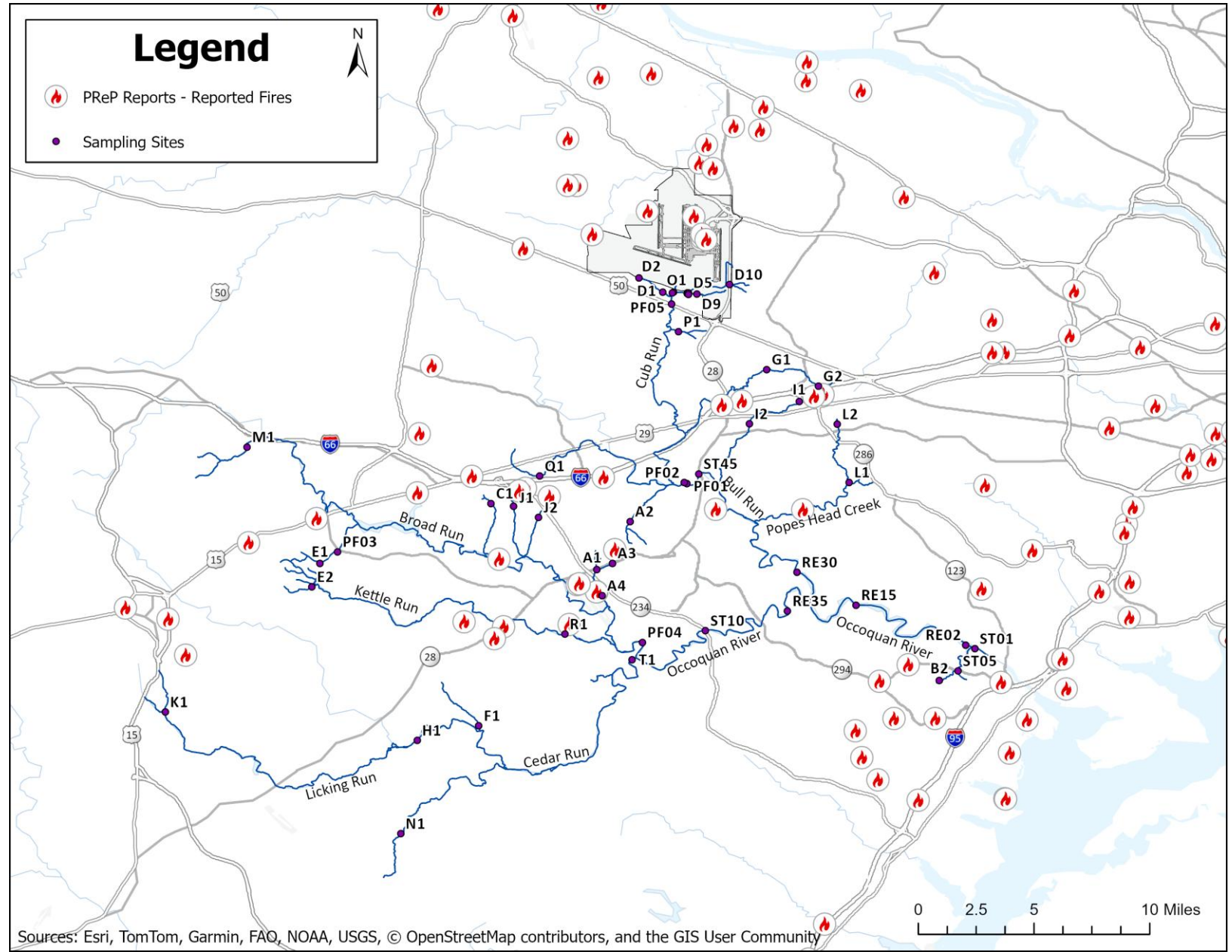
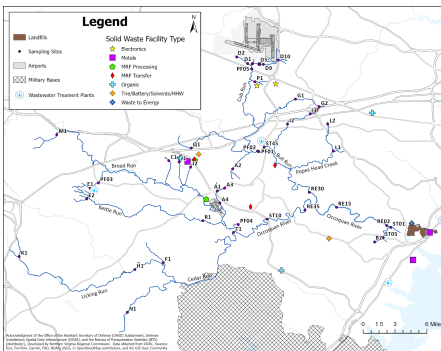
Sources of PFAS: Fluorinated AFFF use

Use of fluorinated Aqueous Film-Forming Foams (AFFF) for suppression of flammable liquid fires

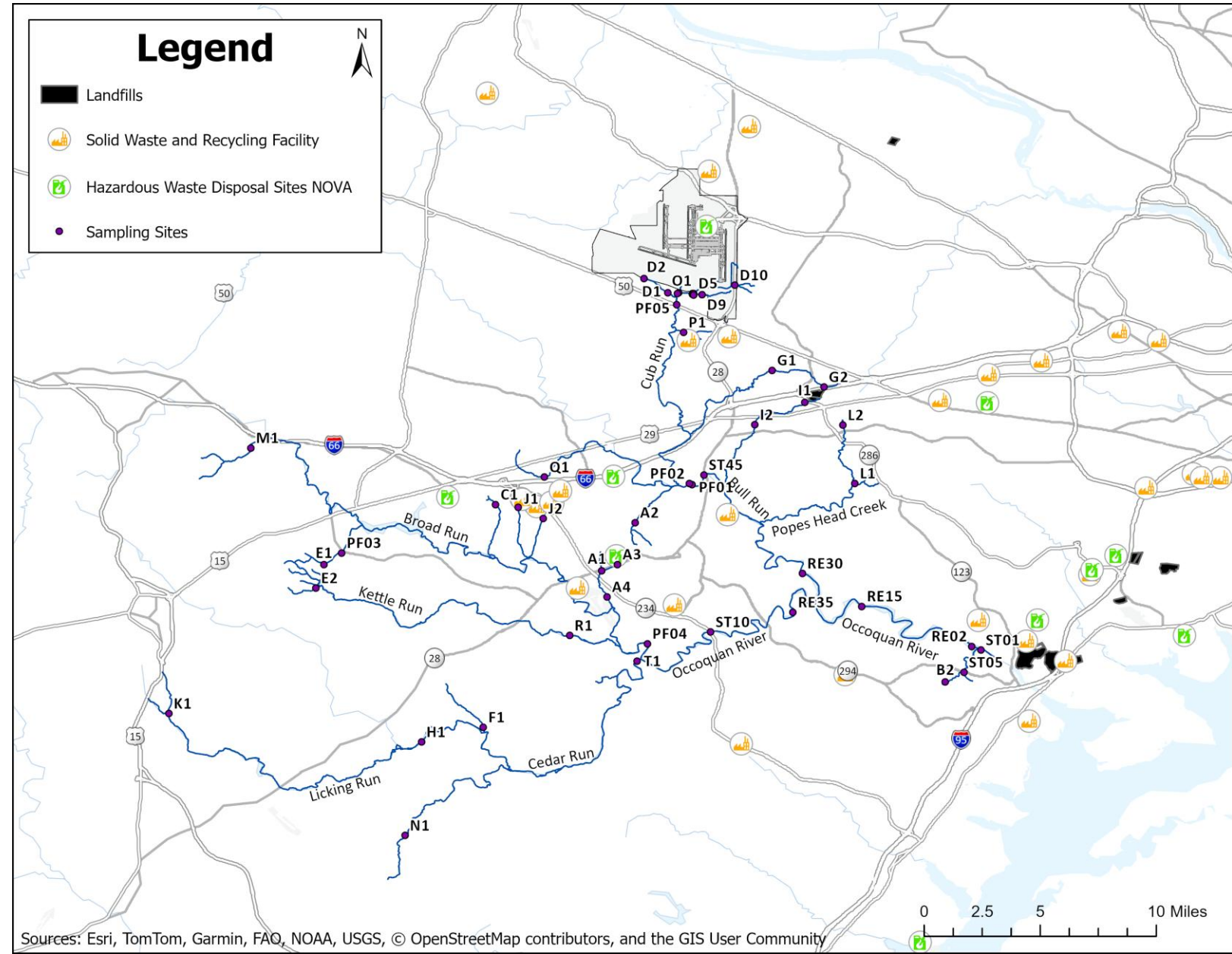
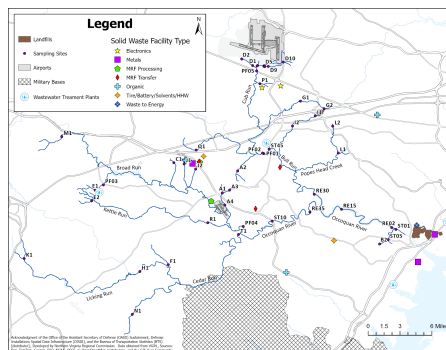
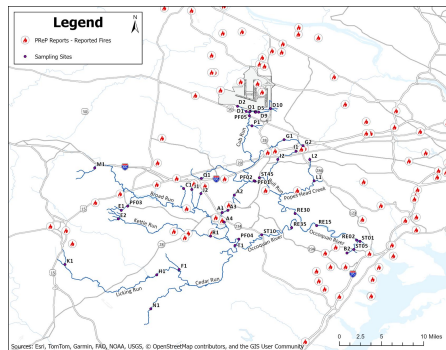


Sources of PFAS: Fluorinated AFFF use

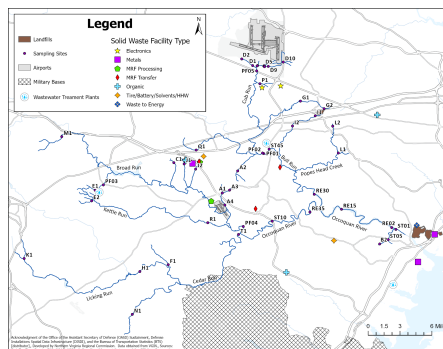
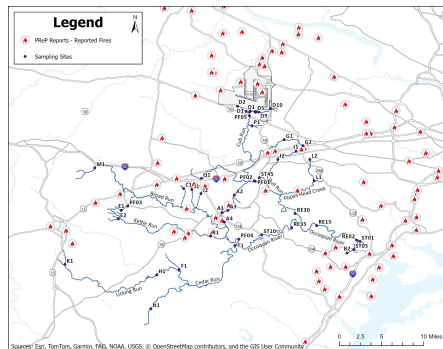
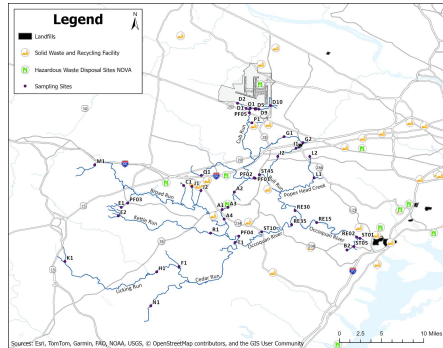
Use of fluorinated Aqueous Film-Forming Foams (AFFF) for suppression of flammable liquid fires



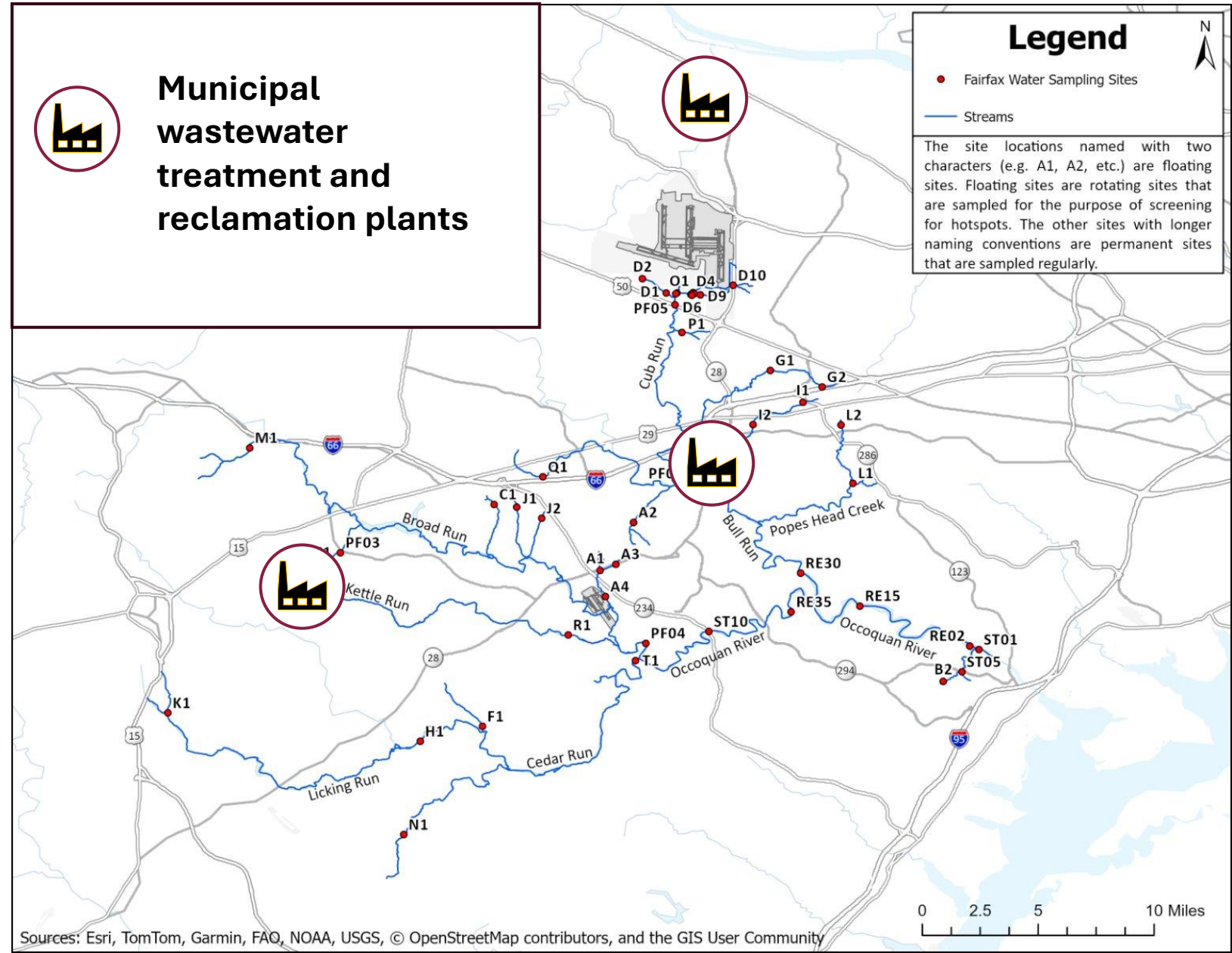
Sources of PFAS: Solid and hazardous waste



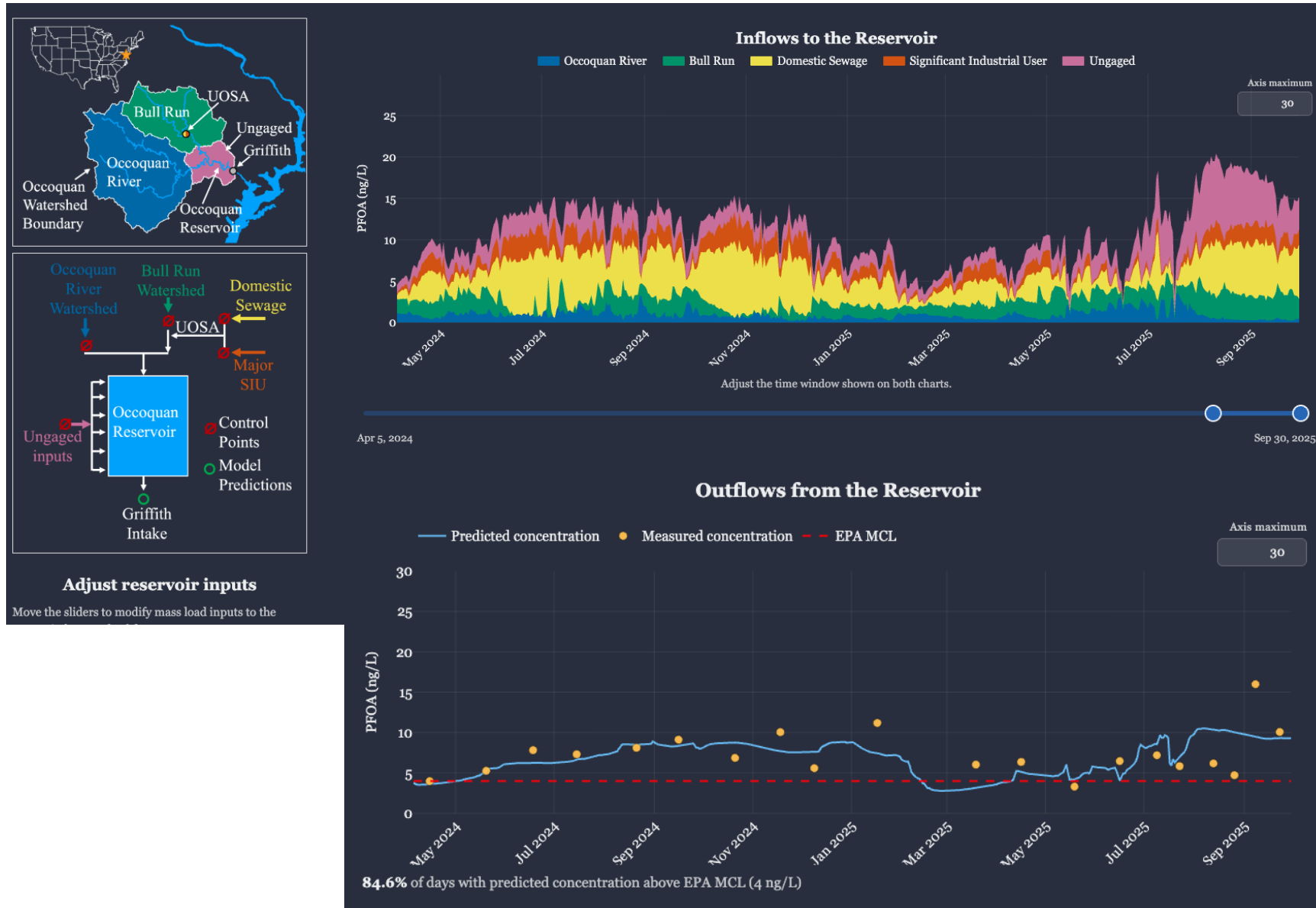
Sources of PFAS: Wastewater



Municipal wastewater treatment and reclamation plants



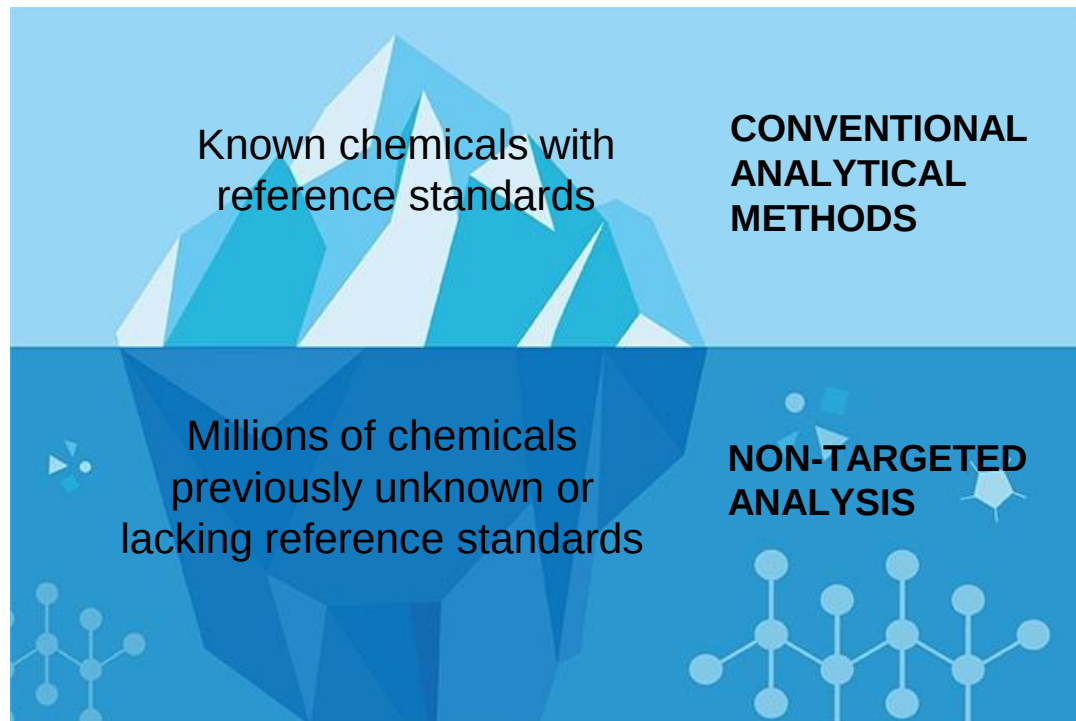
“One PFAS” approach to source apportionment (WRF 5345, Grant)



WRF 5355: Developing a Robust Framework for PFAS Source Identification and Characterization (Furst)

Central question: How can we distinguish between multiple overlapping sources in large, multi-source watersheds?

Probable answer: Broaden your analytical horizons (non-targeted analysis, non-fluorinated tracers)



Dr. Andrew Maizel
OWML Research
Scientist



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Johns Hopkins
University

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GMU PhD '25



Redowan Rashid
VT PhD student



Ethan Gasper
GMU BS '26



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Supervisor



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Supervisor



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PFAS Research Scientist

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Christy Davis,
Lauren O'Donnell,
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ICPRB: Mike
Selckmann



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Glover, Joe Jacangelo, Carsten Prasse,
Kellogg Schwab, Matthew Newmeyer



Greg Prelewicz, Anne Speisman

COG: Steve Bieber, Lisa Ragain

