Per- and Polyfluoroalkyl substances (PFAS) - Update

Targeted Sampling Done for Public Drinking Water Systems

Eric Medlock
Per- and Polyfluoroalkyl Substances (PFAS)

A class of man-made chemicals
- Chains of carbon (C) atoms surrounded by fluorine (F) atoms
  - Water-repellent (hydrophobic)
  - Stable C-F bond
- Some PFAS include oxygen, hydrogen, sulfur and/or nitrogen atoms, creating a polar end
PFAS: More Than Just PFOA and PFOS

**Non-polymers**

- Perfluoroalkyl acids (PFAAs)
  \[ C_nF_{2n+1}R \]
- Perfluoroalkane sulfonyl fluoride (PASF)
  \[ C_nF_{2n+1}SO_2F \]
- Perfluoroalkyl iodides (PFAIs)
  \[ C_nF_{2n+1}I \]

**PASF-based derivatives**

- Fluorotelomer iodides (FTIs)
  \[ C_nF_{2n+1}CH_2CH_2I \]

**FT-based derivatives**

- Polyfluoroalkyl ether carboxylic acids

**Polymers**

- Fluoropolymers
  - Polytetrafluoroethylene (PTFE)
  - Polyvinylidene fluoride (PVDF)
  - Fluorinated ethylene propylene (FEP)
  - Perfluoroalkoxy polymer (PFA)
  - Others
    - Fluorinated (meth)acrylate polymers
    - Fluorinated uredane polymers
    - Fluorinated oxetane polymers

- Side-chain fluorinated polymers

- Perfluoropolyethers
Used in Homes, Businesses & Industry

- Food contact surfaces such as cookware, pizza boxes, fast food wrappers, popcorn bags, etc.
- Polishes, waxes, and paints
- Stain repellants for carpets, clothing, upholstered furniture, etc.
- Cleaning products
- Dust suppression for chrome plating
- Electronics manufacturing
- Oil and mining for enhanced recovery
- Performance chemicals such as hydraulic fluid, fuel additives, etc.
Sources of PFAS in the Environment

- Direct release of PFAS or PFAS products into the environment
  - Use of aqueous film forming foam (AFFF) in training and emergency response
  - Release from industrial facility
- Chrome plating and etching facilities
- Landfills and leachates from disposal of consumer and industrial products containing PFAS
- Wastewater treatment effluent and land application of biosolids
Potential Reasons for Concern

- Known or suspected toxicity
- PFAS and/or breakdown products are persistent in the environment
- Persistence in biota vary greatly across PFASs and species
- Used by a variety of industries
- Found in a variety of consumer products
- Most people have been exposed to PFAS
General Flow of SDWA Regulatory Processes

Increased specificity and confidence in the type of supporting data used (e.g., health, occurrence, treatment) is needed at each stage.
PFAS Background (continued)

• In 2009, EPA established provisional health advisories (HAs) for PFOA at 400 parts per trillion (ppt) and for PFOS at 200 ppt, even though an EPA health effects review was underway.

• In May 2016, EPA released revised HAs for PFOA and PFOS set individually and combined at 70 ppt.
<table>
<thead>
<tr>
<th>State</th>
<th>Drinking Water Action</th>
<th>Compound</th>
<th>Level (ppt)</th>
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<td>Interim Response Levels</td>
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## MOS&T PFOA & PFOS Results

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</table>
Sites in Missouri Tested for PFAS

Sampled Public Water Systems
UCMR3:
44 - Groundwater
40 - Surface Water

MO & T:
13 - Groundwater
2 - Surface Water

Total Population Served:
4,093,525
(79% of 5,384,153 served)

Minimum Reporting Level (ppt)

<table>
<thead>
<tr>
<th>PFOS</th>
<th>MO &amp; T</th>
<th>UCMR3</th>
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<tr>
<td>40</td>
<td>0.2</td>
<td>0.2</td>
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</table>

Other Sites Sampled (soil, monitoring wells, surface water)

Missouri Defense Sites Restoration Unit - PFAS Report

- Lake City AAF - Independence
  - 24 PWS samples - Only PFHx detected (6.3 ppt).
- Whiteman AAF
  - 4 AFF sites tested with 0.56-4.500 ppb PFOS/PFOA, PWS not impacted.
- Richards-Gebaur AFB
  - 6 sites tested with 0.73-325 ppb PFOS/PFOA, PWS not impacted.
- Ft. Leonard Wood PWS
  - 18 samples at PWS Treatment Plant (2013) - no detects.
- Lambert ANG - St. Louis
  - 3 sites tested with 0.02-0.57 ppb PFOS/PFOA. No known wells in area.
- Rosecrans ANG - St. Joseph
  - 6 of 9 monitoring wells and 2 surface water sites with 0.01-3.46 ppb PFOA/PFOS. PWS not impacted.

Missouri Brownfields/Voluntary Cleanup (BFVC)

- Siegel Roberts Global - Farmington
  - 15 monitoring wells with PFAS detections up to 2.8 ppb. Contaminated offsite Ozark Steel Fabrikators well.
- Ozark Steel Fabricators - Farmington
  - Inactivated PWS after connection to Farmington PWS from BFVC site impacted well.

Revised 8/2019
BIDEN ADMINISTRATION PRIORITIES FOR PFAS

“... Biden will tackle PFAS pollution by designating PFAS as a hazardous substance, setting enforceable limits for PFAS in the Safe Drinking Water Act, prioritizing substitutes through procurement, and accelerating toxicity studies and research on PFAS.”
https://joebiden.com/environmental-justice-plan/

Designation of PFAS as Hazardous Substance under CERCLA
  • This was a component of the EPA’s PFAS Action Plan
  • EPA has yet to propose a rule

Establishment of drinking water standards
  • Covered by PFAS Action Plan and proposed in March.
  • EPA proposed intent to evaluate standards for PFOA and PFOS
  • Unclear on coverage for PFAS beyond PFOA and PFOS

Accelerating toxicity studies and research on PFAS
  • Ongoing efforts but major research gaps remaining
  • Prioritize substitutes through procurement
## EPA PROGRESS UPDATE

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>June 2019</td>
<td>Draft validated EPA Method 8327 for PFAS in non-drinking water matrices</td>
</tr>
<tr>
<td>November 2019</td>
<td>Draft Systematic Review Protocol for PFBA, PFHxA, PFHxS, PFNA, and PFDA IRIS Assessments (November)</td>
</tr>
<tr>
<td>December 2019</td>
<td>Published new validated EPA Method 533 for drinking water</td>
</tr>
<tr>
<td>December 2019</td>
<td>Interim Cleanup Recommendations for Groundwater Contaminated with PFOA / PFOS</td>
</tr>
<tr>
<td>March 2020</td>
<td>Published Significant New Use Rule for Long-Chain Perfluoroalkyl Carboxylates and Perfluoroalkyl Sulfonates</td>
</tr>
<tr>
<td>March 2020</td>
<td>Published preliminary Regulatory determination for PFOA, PFOS, and other PFAS</td>
</tr>
<tr>
<td>June 2020</td>
<td>Final Rulemaking for Adding PFAS to Community Right-To-Know Act Toxic Chemical Release Reporting</td>
</tr>
<tr>
<td>December 2020</td>
<td>Interim Guidance for Destruction and Disposal of PFAS Wastes</td>
</tr>
</tbody>
</table>
## DEVELOPING ANALYTICAL METHODS

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Method 537** | *Drinking water only*  
*Used for Third Unregulated Contaminant Monitoring Rule*  
*18 total PFAS focused on long-chain PFAS* |
| **Method 533** | *Drinking water only*  
*Published last year*  
*25 PFAS with more focus on short-chain PFAS* |
| **Method 8327** | *Published last year as a draft method*  
*24 total PFAS*  
*Expands analytical capacity to wastewater, surface water, and groundwater* |
| **Future Methods** | *Method 8328 will expand analytical capacity to samples with up to 2% solids*  
*Analytical method for air emissions*  
*Screening methods focused on organofluorine and perfluoroalkyl acid precursors* |

29 Total PFAS Analytes for Drinking Water Analysis
EXPANDING OCCURRENCE DATA: UCMR 5

• Proposal released for pre-publication on January 19\textsuperscript{th}
  – Biden Administration placed 60 day hold

• 29 total PFAS included (24 PFAS from Method 533, 5 from Method 537.1)

• Total Organic Fluorine considered but determined to not be feasible due to lab capacity and challenges with interpreting the results.

• Method Report Limits generally below 10 ng/L
  – As low as 2 ng/L

• Significant Expansion from UCMR 3
  – Lower Method Reporting Limits (better resolution)
  – Requires monitoring for all systems serving more than 3,300 persons and 800 smaller systems.
  – Captures 23 additional PFAS compounds
ADVANCING TOXICITY RESEARCH

**Draft** Toxicological Profile for Perfluoroalkyls (June 2018)

Ongoing biomonitoring studies

**Human Health Assessments**
- Finalized: PFOA, PFOS, PFBS
- Draft: GenX

**Integrated Risk Information System Assessments**

<table>
<thead>
<tr>
<th>PFAS Compound</th>
<th>Expected Draft</th>
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<tbody>
<tr>
<td>Perfluorobutanoic acid (PFBA)</td>
<td>Winter 2021</td>
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<tr>
<td>Perfluorohexanoic acid (PFHxA)</td>
<td>Summer 2021</td>
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<tr>
<td>Perfluorononanoic acid (PFNA)</td>
<td>Fall 2021</td>
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<tr>
<td>Perfluorohexanesulfonic acid (PFHxS)</td>
<td>Fall 2021</td>
</tr>
<tr>
<td>Perfluorodecanoic acid (PFDA)</td>
<td>Fall 2021</td>
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</table>
REGULATORY DETERMINATIONS FOR PFAS

• Final released for pre-publication on January 19th
  – Biden Administration placed 60 day hold

• Highlights
  – Decision to regulate PFOA and PFOS
  – No determinations made for PFAS beyond PFOA and PFOS.
  – EPA plans to make additional determinations, given adequate information becomes available, before Regulatory Determination 5 (2026)
ADDRESSING PFAS IN THE ENVIRONMENT

Notice: Designating PFOA and PFOS as Hazardous Substances/Wastes

- RCRA and CERCLA
- Only PFOA and PFOS included
- Initiates public comment period on action and data collection activities
- Wide ranging implications upon designation
  - Makes available federal support for clean-ups.
  - Potential impacts to disposal practices of PFAS wastes, such as treatment residuals and biosolids.

Notice: Establishing Effluent Limitations Guidelines for Certain PFAS Discharges

- Individual PFAS for consideration are not specified
- Initiates a public comment period on this effort and to collect data to support the effort.
- Provides an avenue to provide source water protection efforts
Per- and Polyfluoroalkyl substances (PFAS) - Update

Targeted Sampling Done for Public Drinking Water Systems

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Public Drinking Water Branch

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Email: eric.medlock@dnr.mo.gov