U.S. ARMY

US Army Corps of Engineers®

ERDC

Building Strong®

DISCOVER | DEVELOP | DELIVER

Aqueous Film Forming Foam Blend

Mission:

ERDC is compiling a large, well-characterized **4,500-gallon batch of AFFF concentrate** to support Army and ESTCP-funded PFAS destruction demonstrations. By blending **legacy and modern AFFF formulations** from multiple sources into a single, homogenized matrix, ERDC ensures consistent testing conditions across technologies. This approach **enables objective, apples-to-apples evaluation of treatment** performance and supports broader transition of validated solutions to the field.

The Contaminant Treatment Technology Test Bed:

Providing a dedicated environment for evaluating and demonstrating treatment technologies targeting emerging contaminants will simplify and expedite implementation of testing. Located on the ERDC campus inside a spacious hangar, the test bed supports systems from **pilot to field scale**, offering a realistic but controlled setting for performance validation. By enabling testing outside of active installations, the test bed helps identify and resolve potential technical or logistical issues as well as provides independent validation/verification of technology, reducing the risk of and establishing security prior to deployment and implementation of technologies on installations. This approach **accelerates technology readiness** while safeguarding mission-critical operations.

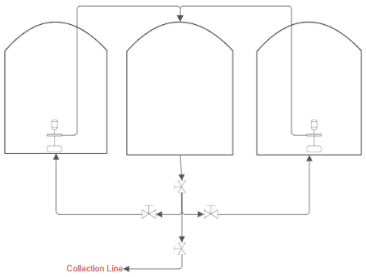
Contaminant Test Bed Facility

Test Bed Features:

- Metered Power
- Emissions monitoring and Exhaust systems
- Climate Controlled communication project trailer
- Electronic systems monitoring
- Closed circuit camera monitoring
- Secondary containment

AFFF Mixing Process:

For demonstration/validation of AFFF destructive technologies, the test bed includes a robust AFFF mixing system. Three 2,100-gallon tanks are used to blend the AFFF concentrate. Two outer tanks are equipped with submersible pumps that continuously circulate the AFFF into the central tank. At the bottom of the central tank, a manifold evenly redistributes the mixture back to the outer tanks. This closed loop mixing **design ensures a consistent homogenized matrix** suitable for fair and repeatable evaluation across multiple treatment technologies.



AFFF Mixing Process

AFFF Sources and Composition:

≈ 4,500 gallons of AFFF was collected to be blended. The final mixture consists of 35.7% C8-based and 64.3% C6-based products by volume, reflecting the range of formulations historically used at DoD sites.

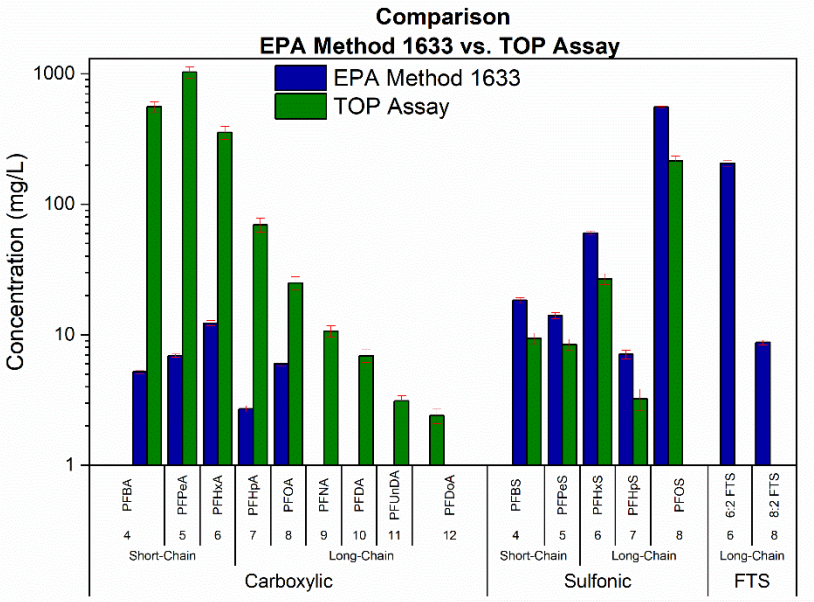
Source Breakdown:

- **Jackson, MS:** 450 gallons of PHOS-CHEK 3% AFFF
- **Meridian, MS:** 1,925 gallons of PHOS-CHEK 3% AFFF
- **Harrison Township, MI:** 550 gallons of PHOS-CHEK 6% AFFF and 550 gallons of Ansulite 6% AFFF, both from steel tanks
- **Brunswick, ME:** 1,075 gallons of Ansulite 3% AFFF

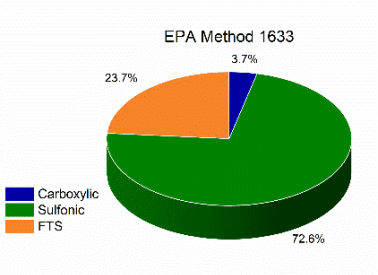
For the 550 gallons of Ansulite 6% obtained from the steel tanks, microbial growth appeared to cause tank degradation and corrosion from presumed iron/sulfate-reducing bacteria (RB) in the AFFF. It is recommended that all aliquots be homogenized prior to analysis and bench top evaluations to resuspend settled solids.

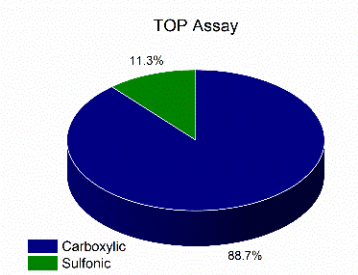
PFAS Results:

The AFFF blend contains a diverse mixture of PFAS compounds, characterized using both **EPA Method 1633 and the Total Oxidizable Precursors (TOP) Assay**. The TOP Assay was performed on the AFFF concentrate to convert all precursors into measurable PFAS, providing a more comprehensive understanding of the total PFAS burden. Results from the TOP Assay indicate a PFAS profile dominated by carboxylic acids (88.70%), with sulfonic acids comprising the remaining 11.30%. Within these groups, short-chain species account for 94.29% of carboxylic acids and 6.79% of sulfonic acids. Notably, no fluorotelomer sulfonates (FTS) were detected following oxidation, suggesting that many FTS precursors were transformed into carboxylic acids during the assay.

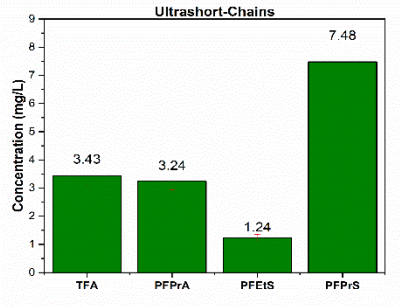


Several PFAS compounds were measured at particularly high concentrations following oxidation. These include **PFPeA (1028 mg/L), PFBA (559 mg/L), PFHxA (355 mg/L), PFHpA (69.53 mg/L), PFOA (24.92 mg/L), and PFOS (215 mg/L).** The total PFAS concentration was 2,322.72 mg/L by the TOP Assay, compared to 906.06 mg/L measured by EPA Method 1633.





Additional PFAS Analytical Results:



- **Ultrashort-Chain PFAS:**

Ultrashort-chain PFAS (e.g., TFA, PFPrA, PFEtS, PFPrS) were detected in the AFFF blend matrix using specialized analytical techniques. These compounds, shown in the adjacent chart, are highly water-soluble and may result from degradation of longer-chain PFAS or be present as formulation ingredients.

- **Suspect PFAS Screening** - A total of **28 suspect PFAS compounds were identified**, including:
  - Fluorotelomer thioether amido acids (e.g., 6:2 FTAA, 8:2 FTAA)
  - Perfluoroalkyl sulfonamido amines (e.g., PFHxSAm, PFPeSAm)
  - Fluorinated betaines and acrylates

Non PFAS Analytical Results:

In addition to PFAS characterization, non-target water quality parameters were assessed to better understand the overall chemical profile of the AFFF blend matrix. **Total Organic Carbon (TOC)** was measured at an average concentration of **27.46 g/L**, indicating a substantial presence of organic constituents beyond PFAS. Analyses for **Chemical Oxygen Demand (COD)** and **Extractable Organofluorine (EOF)** are currently underway, with results pending.

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