

**Strategic Environmental Research and Development Program
(SERDP)**

FY 2020 STATEMENT OF NEED

Environmental Restoration (ER) Program Area

**DEVELOPMENT OF PASSIVE SAMPLING METHODOLOGIES FOR
PER- AND POLYFLUOROALKYL SUBSTANCES**

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop passive sampling methods to provide repeatable and environmentally relevant measures of per- and polyfluoroalkyl substances (PFAS). The focus of this work should be for at least the USEPA 24 PFAS shown in Table 1 and total PFAS in groundwater, surface water, stormwater run-off, and porewater in soils and/or sediments (collectively referred to here as “water”). Specific objectives of this SON include:

- Develop passive sampling media competent to quantitatively “concentrate” the wide range of PFAS (nonionic, anionic, and zwitterionic) of interest from water.
- Establish physical-chemical properties, including sorbent/water partition coefficients, molecular diffusivities of PFAS in water and sorbent media.
- Establish the range of PFAS that can be quantifiably sampled using the sorbent(s) (e.g., long chain vs short chain, precursors versus perfluoroalkyl acids [PFAAs]).
- Characterize the impacts of co-contaminants and various water quality and conditions (e.g., freshwater versus salt water, surface waters with biofouling versus groundwater).
- Develop a fundamental understanding of the natural solid-water sorption coefficients of PFAS as a function of sorbate properties, natural solids, and solution properties (pH, major ions, dissolved organic carbon [DOC]).
- Develop passive samplers that yield representative spatial and temporal interrogation of site contaminants when deployed.
- Develop passive sampling methods/procedures that are capable of being efficiently deployed and retrieved in widely varying field applications (e.g. groundwater, stormwater, surface waters, porewaters).

Proposers should consider means of establishing equilibria in sampling media, including suitable performance reference compounds (PRCs) across the wide range of PFAS expected, or methods for determining time weighted averages of PFAS loading into aquatic systems. Proposers should be aware of the requirements of the Department of Defense Quality Systems Manual for Environmental Laboratories ([QSM 5.1](#)) in terms of ultimate targets for quality assurance and quality control. Proposals may address one or more of the objectives listed above.

Table 1. Target PFAS Analyte List EPA SW 846 and CAS Numbers

Analyte Name	Acronym	CAS Number
Perfluorotetradecanoic acid	PFTreA	376-06-7
Perfluorotridecanoic acid	PFTriA	72629-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorobutanoic acid	PFBA	375-22-4
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorooctanesulfonamide	PFOSA	754-91-6
Fluorotelomer sulfonic acid 8:2	FtS 8:2	39108-34-4
Fluorotelomer sulfonic acid 6:2	FtS 6:2	27619-97-2
Fluorotelomer sulfonic acid 4:2	FtS 4:2	757124-72-4
2-(N-Ethylperfluorooctanesulfonamido)acetic acid	NEtFOSAA	2991-50-6
2-(N-Methylperfluorooctanesulfonamido)acetic acid	NMeFOSAA	2355-31-9

2. Expected Benefits of Proposed Work

Addressing the research needs described above will meet a critical need for better sampling and analysis of PFAS at Department of Defense (DoD) sites. This will in turn lead to improved and more cost effective management of PFAS sites by facilitating more accurate and precise assessments of the extent of PFAS contamination.

3. Background

PFAS are present in AFFF used by the DoD and other organizations to extinguish hydrocarbon fires. Different AFFF formulations have been used, but all contain a complex mixture of PFAS, including those of greatest regulatory concern - the PFAAs and potential PFAA precursors ([Field et al., 2017](#); [ITRC, 2017](#)). EPA has recommended a Health Advisory Level for perfluorooctanoic acid (PFOA) and PFOS, and several states have promulgated standards for PFOA, PFOS, and some of the related PFAAs ([ITRC, 2018a](#)).

SERDP has been funding research on AFFF contamination for several years to improve PFAS analysis, to develop tools for assessing the fate of PFAS in the subsurface, and to evaluate the potential for in situ remediation. A recent SERDP & ESTCP-sponsored workshop identified a number of research needs, and proposers should view the [Workshop Report](#) to obtain additional detail concerning these discussions. PFOS is of particular concern to DoD, as it is the predominant PFAS in some AFFF formulations, and a significant dead-end metabolite in others, and therefore it is typically the predominant PFAS in AFFF-impacted groundwaters ([Anderson et al., 2016](#)). PFOS appears to be particularly resistant to destructive technologies, and like the rest of the PFAAs it is generally considered nonbiodegradable ([ITRC, 2018b](#)).

The development of standardized procedures for field sampling of environmental waters was identified as a critical priority research need in the SERDP & ESTCP [Workshop Report](#). Currently, no single document or source exists for these procedures. The EPA's Office of Research and Development is currently leading an effort to create and validate sampling procedures for environmental water and sediment/soil media. However, the timeframe for full validation of sampling procedures is unknown and their applicability to DoD projects is yet to be determined.

4. Cost and Duration of Proposed Work

The cost and time to meet the requirements of this SON are at the discretion of the proposer. Two options are available:

Standard Proposals: These proposals describe a complete research effort. The proposer should incorporate the appropriate time, schedule, and cost requirements to accomplish the scope of work proposed. SERDP projects normally run from two to five years in length and vary considerably in cost consistent with the scope of the effort.

Limited Scope Proposals: Proposers with innovative approaches to the SON that entail high technical risk or have minimal supporting data may submit a Limited Scope Proposal for funding up to \$200,000 and approximately one year in duration. Such proposals may be eligible for follow-on funding if they result in a successful initial project. The objective of these proposals should be to acquire the data necessary to demonstrate proof-of-concept or reduction of risk that will lead to development of a future Standard Proposal. Proposers should submit Limited Scope Proposals in accordance with the SERDP Core Solicitation instructions and deadlines.

5. Point of Contact

Andrea Leeson, Ph.D.
Program Manager for Environmental Restoration
Strategic Environmental Research and Development Program (SERDP)
4800 Mark Center Drive, Suite 16F16
Alexandria, VA 22350-3605
Phone: 571-372-6398
E-Mail: Andrea.Leeson.civ@mail.mil

For Core proposal submission due dates, instructions, and additional solicitation information, visit the [SERDP website](#).

6. References

Anderson RH, GC Long, RC Porter, and JK Anderson. 2016. Occurrence of select perfluoroalkyl substances at U.S. Air Force aqueous film-forming foam release sites other than fire-training areas: Field-validation of critical fate and transport properties. *Chemosphere* 150:678-685.

Field J, C Higgins, R Deeb and J Conder. 2017. FAQs Regarding PFASs Associated with AFFF Use at U.S. Military Sites. <http://www.dtic.mil/dtic/tr/fulltext/u2/1044126.pdf>.

Interstate Technology and Regulatory Council (ITRC). 2017. History and use of per- and polyfluoroalkyl substances (PFAS). https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use_11_13_17.pdf.

ITRC. 2018a. Regulations, guidance, and advisories for per- and polyfluoroalkyl substances (PFAS). https://pfas-1.itrcweb.org/wp-content/uploads/2018/01/pfas_fact_sheet_regulations_1_4_18.pdf.

ITRC. 2018b. Environmental fate and transport for per- and polyfluoroalkyl substances. https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_fate_and_transport_3_16_18.pdf.