

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

FY 2014 STATEMENT OF NEED

Environmental Restoration (ER) Program Area

**IN SITU REMEDIATION OF PERFLUOROALKYL CONTAMINATED
GROUNDWATER**

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to seek applied research to develop cost effective in situ remedial alternatives for perfluoroalkyl contaminated groundwater. Proposed efforts should focus on the following objectives:

- Develop cost effective, in situ remedial approaches for treating perfluoroalkyl contaminated groundwater.
- Assess the impact of common co-contaminants on the remedial process given that these compounds were commonly utilized at sites contaminated with petroleum hydrocarbons and possibly chlorinated solvents (e.g., historical fire training sites).
- Determine the necessity for treatment train approaches to facilitate treatment of co-contaminants.

Contaminants of interest include perfluoroalkyl sulfonates and perfluoroalkyl carboxylates, such as perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), contained in historical aqueous film forming foam (AFFF) formulations. Research and development activities at laboratory-, bench-, and field-scale will be considered, although work does not necessarily have to culminate in a field-scale effort. Technologies and approaches should be applicable to a variety of hydrogeologic settings. Ex situ technologies will not be considered. Proposers should be cognizant of previous SERDP-funded research that focused on developing a better understanding of fate and transport properties of perfluoroalkyl contaminants in groundwater, and of the mechanisms involved in contaminant destruction (projects [ER-2126](#), [ER-2127](#), [ER-2128](#)). Summaries for these projects can be found on the SERDP website (www.serdp-estcp.org).

2. Expected Benefits of Proposed Work

Developing technologies for treatment of perfluoroalkyl sulfonates and perfluoroalkyl carboxylates in groundwater will help facilitate the establishment of more cost-effective and efficient remedial action plans that are protective of human health and the environment. The remediation approaches that will be developed through this SON will improve the reliability of contaminant treatment processes and expedite the cleanup/closure of contaminated Department of Defense (DoD) sites.

3. Background

Perfluoroalkyl compounds (PFCs), such as PFOA and PFOS have been used to manufacture a variety of industrial and military products, including (through 2001) PFOS-based fluorochemical surfactants (FCSs) used in AFFF. AFFF is used to extinguish flammable liquid (e.g., hydrocarbon) fires. Military Specification MIL-F-24385F mandates the use of FCSs in AFFF to meet performance requirements. Additional ingredients include organic solvents (i.e., glycol ether), foam stabilizers, and corrosion inhibitors. Over the past several years, manufacturers of FCSs have shifted to a telomerization process to produce FCSs for use in AFFF. While telomer-based FCSs do not contain or break down into PFOS, they may contain trace levels of perfluorocarboxylic acids (e.g., PFOA) as an impurity.

Environmental releases of AFFF have likely occurred from tank and supply line leaks, use of aircraft hanger fire suppression systems, and from fire fighting training activities. Site investigations under the Defense Environmental Restoration Program (DERP) have not typically included analysis for PFCs given their emerging status. However, approximately 600 DERP sites are categorized as Fire/Crash/Training areas and thus have the potential for PFC contamination due to historical use of AFFF.

PFOA and PFOS have attracted increased regulatory scrutiny because of their resistance to degradation, ability to bioaccumulate, and growing evidence of toxicity in animal studies. The U.S. Environmental Protection Agency published Provisional Health Advisory values of 0.4 µg/L for PFOA and 0.2 µg/L for PFOS in drinking water. Additionally, the Agency for Toxic Substances and Disease Registry released a draft toxicological profile on perfluoroalkyls for public comment. Several state regulatory agencies have moved forward to establish action levels and guidelines for PFOA and PFOS. Minnesota established a health risk level of 0.3 µg/L in drinking water for PFOA and PFOS. New Jersey established a drinking water guidance value of 0.04 µg/L for PFOA. These levels are several orders of magnitude lower than concentrations of PFOA and PFOS observed in groundwater at historical fire training areas.

Due to their chemical structure, PFCs are very stable in the environment and are resistant to biodegradation, photo-oxidation, direct photolysis, and hydrolysis. The perfluoroalkyl carboxylic acids and sulfonic acids have very low volatility due to their ionic nature. Perfluoroalkyl compounds are mobile in soil and leach into groundwater. Liquid phase granular activated carbon has been proposed for use or is being used at several sites to remove PFCs from contaminated water; however, a cost-effective treatment approach for these contaminants has not been established.

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. It is expected that most proposals will fall into this category.

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 \$150,000 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

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For Core proposal submission due dates, instructions, and additional solicitation information, visit the SERDP web site at www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations.