SON Number: ERSON-21-C1 **24 October 2019**

Strategic Environmental Research and Development Program (SERDP)

FY 2021 STATEMENT OF NEED

Environmental Restoration (ER) Program Area

IMPROVED UNDERSTANDING OF THERMAL DESTRUCTION TECHNOLOGIES FOR MATERIALS LADEN WITH PER- AND POLYFLUOROALKYL SUBSTANCES

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop an improved understanding of the effectiveness and sustainability of thermal destruction technologies for treatment of materials laden with per- and polyfluoroalkyl substances (PFAS). In addition, development of new technologies or modifications to existing technologies that improve the cost effectiveness and sustainability of how these PFAS-laden materials are currently processed is a critical need. The following specific areas of research are of interest.

- Development of a better understanding of incineration on materials of interest, to include a full mass balance from inlet to outlet (including but not limited to PFAS and byproducts in residuals and off-gas), as well as temperature requirements for destruction of PFAS.
- Improved understanding of PFAS fate during thermal reactivation of GAC and other carbon-based sorbents. Also of interest is how reactivation impacts the long-term effectiveness of the sorbent, and the extent to which any hazardous or toxic products are formed and subsequently released from the sorbent.
- Assessment of the fate and behavior of PFAS and co-contaminants during the production and processing of residual product streams from various technologies such as ion exchange, nanofiltration, reverse osmosis, or regeneration of spent ion exchange resins.
- Development of novel or modified sorbents that facilitate less intensive reactivation and more sustainable processes.

Materials of interest include soils, spent granular activated carbon (GAC) or other carbon-based sorbents, and spent ion exchange resins; other materials may include but are not limited to munitions, other demil materials, and concentrated solutions. Proposed efforts may address one of more of the areas of interest listed above. Research should address the wide range of PFAS that may be present in aqueous film forming form- (AFFF) impacted waters, including short-chained perfluoroalkyl acids (PFAA) and potential precursor compounds. Transformation products must be identified and defluorination should be confirmed. Other reaction byproducts not involving PFAS (e.g., perchlorate formation from chloride present in the waste stream) should be carefully identified. The overall energy requirements for treating concentrated waste streams should be included in sustainability assessments.

Proposers should be cognizant of previous SERDP-funded research that has focused on developing a better understanding of fate, transport and treatment of PFAS in soils and groundwater. Information on these projects can be found on the SERDP website (www.serdp-estcp.org).

2. Expected Benefits of Proposed Work

Developing technologies for improved management and treatment of PFAS-laden materials will help facilitate the establishment of more cost-effective and efficient remedial action plans that are protective of human health and the environment. The knowledge developed through this SON will improve the reliability of treatment processes and expedite the cleanup and closure of contaminated Department of Defense (DoD) sites.

3. Background

To date, the most widely applied approach for treatment of PFAS-contaminated sites is ex situ GAC adsorption. SERDP, the Environmental Security Technology Certification Program (ESTCP) and other DoD programs have supported research and development of innovative ex situ treatment technologies (e.g., ion exchange, nanofiltration, reverse osmosis). Although separation of PFAS from contaminated water has been demonstrated to some extent with these technologies, each process also generates one or more residual or concentrate streams that require careful management.

For example, regeneration of spent ion exchange resins produces a concentrate stream enriched in PFAS, co-contaminants, salts, and possibly co-solvents. Incineration or direct disposal of such concentrate streams in a hazardous waste landfill can be both cost-prohibitive and unsustainable. Likewise, thermal regeneration and re-use of GAC is a common practice, but concerns have been raised about residual contaminants and other potentially toxic byproducts that remain in the reactivated material and may be released into water when put back into service. These and other issues highlight the critical needs for development of cost-effective and sustainable approaches for managing residuals and concentrate streams from ex situ treatment technologies to ensure that remedial treatment objectives are met and that DoD liabilities are eliminated.

Current approaches to manage these concentrated streams are energy intensive and require high temperature (1000°C) incineration or disposal of concentrated PFAS. Likewise, thermal regeneration/reactivation and reuse of GAC is a common practice, but there is a lack of data on any residual contaminants and other potentially toxic byproducts that may remain in the reactivated material.

Off-site incineration has been used as an acceptable and proven technology for destruction of PFAS in soil, water, liquid, and remediation wastes generated from PFAS contaminated sites. However, as more studies have elucidated the extent of PFAS in the environment, it is clear our understanding of these treatment processes for PFAS-laden material can be improved.

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 $250,000 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 website.