SON Number: ERSON-23-C4 **28 October 2021**

Strategic Environmental Research and Development Program (SERDP)

FY 2023 STATEMENT OF NEED

Environmental Restoration (ER) Program Area

ATTENUATION MECHANISMS AND DEGRADATION KINETICS OF MINOR COMPONENTS OF COMMON GROUNDWATER CONTAMINANT MIXTURES

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop a better understanding of relatively minor components of common groundwater contaminant mixtures in terms of their degradation kinetics and attenuation in the environment. Of particular interest is their behavior at environmentally relevant concentrations (often <100 ppb) in both natural systems and in engineered systems designed for treatment of the more common groundwater contaminants found at Department of Defense (DoD) sites. The following research objectives are of interest:

- Assess the natural attenuation mechanisms and degradation kinetics of chemicals of interest in groundwater at environmentally relevant concentrations.
- Determine the fate and transport of chemicals of interest during implementation of common groundwater treatment scenarios for primary contaminants such as chlorinated solvents or petroleum hydrocarbons.
- Evaluate whether minor modifications can be made to common groundwater treatment scenarios for improved treatment of low concentrations of chemicals of interest.

Proposals may address one or more of the objectives listed. The chemical of greatest interest is 1,4-dioxane as it frequently co-occurs at low concentrations with chlorinated solvents. Other chemicals of interest include 1,1-dichloroethane (1,1-DCA) and 1,2-dichloroethane (1,2-DCA). Other chemicals will be considered but must meet the criteria of co-occurrence with common groundwater contaminants within chlorinated solvent or petroleum hydrocarbon plumes at DoD sites; the rationale for inclusion of other chemicals must be clearly defined. Proposed efforts must be conducted at environmentally relevant concentrations to be considered.

Research and development activities at laboratory-, bench-, and field-scale will be considered, but work does not necessarily have to culminate in a field-scale effort. Technologies and approaches should be applicable to a variety of hydrogeologic settings.

2. Expected Benefits of Proposed Work

An improved understanding of the attenuation and degradation kinetics of co-occurring chemicals in groundwater will ultimately enable optimization of treatment systems and improve our ability to manage such sites in a cost-effective manner. In addition, the resulting technologies should

improve DoD's ability to mitigate the risks associated with these groundwater components.

3. Background

Most contaminated groundwater at DoD sites contains multiple chemicals of concern. Chlorinated volatile organic compounds (CVOCs) frequently occur in groundwater with a variety of different co-contaminants, including but certainly not limited to 1,4-dioxane or 1,2-DCA. Additional chemicals of concern, such as 1,1-DCA, may be formed from the breakdown of other, more common contaminants.

In situ groundwater treatment technologies are well developed for both petroleum hydrocarbon and CVOC contamination, but the overall effectiveness of these technologies can be complicated by the presence of relatively minor co-contaminants due to their occurrence at very low concentrations (often <100 ppb). Much of the research on these co-contaminants to date has been conducted at much higher concentrations or the detailed information on degradation kinetics has not been determined, resulting in treatment systems that cannot be optimized for their removal. Field studies have shown that in situ treatment systems designed for the more common groundwater contaminants have had little impact on these low-level components, leading to the need for costly advanced oxidation treatment combined with pump-and-treat. Developing a better understanding of the natural attenuation and degradation kinetics of these co-contaminants when present at low concentrations could lead to more efficient remedial design.

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.