Strategic Environmental Research and Development Program (SERDP)
SERDP Exploratory Development (SEED)

FY 2015 SEED STATEMENT OF NEED

Environmental Restoration (ER) Program Area

DEVELOPMENT OF PASSIVE SAMPLING METHODOLOGIES TO MEASURE CONTAMINANT BIOAVAILABILITY IN AQUATIC SEDIMENTS

The SEED Solicitation is a means for researchers to test a proof of concept during an effort of approximately one year.

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop passive sampling methods to provide repeatable and biologically relevant measures of contaminant bioavailability in sediment. Proposed efforts should focus on one or both of the following objectives:

- Develop passive sampling methodologies for one of the following groups of contaminants: dioxin/furans, metals (including arsenic, lead and mercury and zinc), and munitions constituents of concern. The munitions constituents of particular interest are RDX and TNT. Passive samplers that only address polycyclic aromatic hydrocarbons (PAHs) or polychlorinated biphenyls (PCBs) will not be considered.
- Develop a multi-purpose passive sampling device capable of collecting data on several contaminants of interest. A multi-purpose sampling device could include measurement of multiple hydrophobic organic compounds, metals, or munitions compounds in sediment and the immediate overlying surface water.

Proposed research should focus on developing methodologies that have the potential to meet the following requirements:

- Passive sampler measurements that can be used as surrogates for tissue contaminant measures in benthic and pelagic organisms.
- Passive sampler measurements that can be correlated with sediment toxicity measures, and whether those measures can be used to calibrate and validate trophic transfer models.
- Passive samplers that yield representative spatial and temporal interrogation of site contaminants when deployed.
- Field-deployable passive samplers for deeper waters that do not require diver-assisted deployments.

The focus of this SON is contaminated aquatic sediments, either marine, estuarine, brackish, or freshwater. Proposals may address multiple objectives listed above.
In August 2012, SERDP and the Environmental Security Technology Certification Program (ESTCP) co-sponsored a Workshop on Research and Development Needs for Long-Term Management of Contaminated Sediments. This workshop identified high priority research topics involving improved understanding of potential recontamination sources for contaminated sediments. A more detailed description of these issues can be found in the report from the workshop. Proposers are strongly encouraged to review the workshop report for additional detail. (http://www.serdp-estcp.org/content/download/16022/182923/version/2/file/Sediment+Workshop+Report_October+2012.pdf).

2. Background

The Department of Defense (DoD) is responsible for the management of thousands of contaminated sediment sites. The current regulatory paradigm for characterizing risks associated with the level of contamination in soils and sediments generally does not include measures of the actual bioavailability of these contaminants to human or ecological receptors. Historically the assumption was that the presence of contamination is equivalent to actual exposure. As a result, risk values are overestimated and subsequently incorporated into the remedial decisions. Often, mass removal (e.g., dredging) is selected due to the uncertainty of reliably managing exposure through the reduction of bioavailability. However, there is clear and growing evidence that some of these contaminants are less available to potentially harm humans or ecological receptors than is suggested by simply extrapolating results of bulk chemical analysis. Explicitly assessing contaminant bioavailability can result in setting more technically defensible cleanup goals and establishing more realistic cleanup priorities, while still ensuring protection of human health and the environment.

Potentially the best measures of bioavailability and risks that truly reflect site conditions are in situ measurements, such as passive sampling methods (PSMs). PSMs predict the fraction of total contaminant in bulk sediment that is available to be taken up by organisms. These techniques rely on the partitioning of contaminants to a sampling media that is placed in contact with the sediment. Passive sampling devices have recently been developed and applied for both organics (polyethylene samplers, solid phase microextraction, semipermeable membrane devices) and metals (Acid Volatile Sulfides and Simultaneously Extractable Metals Diffusive Gradient in Thin-film devices). Additional tools and links to biological resources are needed for other DoD chemicals of concern including dioxins/furans, additional metals, munitions-related compounds, and other emerging compounds.

Complementary SERDP/ESTCP-Funded Projects: SERDP and ESTCP have supported several projects relating to the remediation and management of contaminated sediments. A brief description of these completed and ongoing projects can be found at the SERDP and ESTCP website (http://serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Sediments).

3. Cost and Duration of Proposed Work

To meet the objectives of this SEED SON, proposals should not exceed $150,000 in total cost and approximately one year in duration. Work performed under the SEED SON should investigate innovative approaches that entail high technical risk and/or have minimal supporting
data. At the conclusion of the project, sufficient data and analysis should be available to provide risk reduction and/or a proof-of-concept. SEED projects are eligible for follow-on funding if they result in a successful initial project.

4. Point of Contact

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