

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

FY 2013 STATEMENT OF NEED

Munitions Response (MR) Program Area

**ADVANCED TECHNOLOGIES FOR DETECTION, CLASSIFICATION,
AND REMEDIATION OF MILITARY MUNITIONS ON LAND**

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop signal processing methods, supporting technologies, or remediation technologies to address the diverse challenges associated with the cleanup of Department of Defense (DoD) munitions-contaminated terrestrial sites (sites contaminated with unexploded ordnance [UXO], discarded military munitions [DMM] and related items). Many sites or sections of sites have sparsely distributed subsurface munitions and clutter items that can clearly be distinguished, while other areas have almost continuously overlapping suspected items, which need to be assessed and removed. Munitions as small as 20-mm and 37-mm projectiles must be reliably detected and discriminated from other non-hazardous items in the subsurface over a wide range of conditions; particularly those with difficult geology, terrain and vegetation, and complex munitions and clutter distributions.

Proposals addressing any aspects of munitions response will be considered although those addressing the following topics are of particular interest.

Signal Processing

Significant progress has been made in the technologies required to classify buried objects as either hazardous or not. Analysis of geophysics data using simple dipole models to estimate object parameters is routine in research and development and becoming accepted in practice. Previously, testing of these approaches was primarily limited to test sites with only limited application at live sites. Over the last five years, the Environmental Security Technology Certification Program (ESTCP) has demonstrated the application of classification technologies at real UXO sites under real world conditions. The remaining research challenges for classification include:

- Complex mix of munitions types, especially small munitions.
- High clutter environment.
- Conditions that make collection of high quality data problematic.
- Noise sources in data collection, such as platform motion and geolocation error.
- Insufficient signal to noise to discriminate small and deep targets.
- Significant operator input required for effective classification.
- Use of cued data from a stationary sensor rather than a continuously moving survey sensor.

Typically, the result of classification is expected to be a list of geophysical anomalies prioritized by the likelihood that they correspond to munitions that will be used to guide digging. Although

for most anomalies, this prioritization is straightforward using currently available inversion and classification methods, there is a subset for which it is more challenging and sometimes fails. These difficult cases result from causes such as apparently successful inversions that result in incorrect target parameters, local minima in the objective function that are not recognized as such, and distributions of parameters that do not match the assumptions made while developing the classifier. Principled approaches to address these “outlier” anomalies are required.

ESTCP has conducted large-scale demonstrations of emerging classification technologies at sites ranging from former Camp Sibert, AL, to Mare Island Naval Shipyard, CA (serdp-estcp.org/Featured-Initiatives/Munitions-Response-Initiatives/Classification-Applied-to-Munitions-Response). These demonstrations involved the collection of high-density, well-located survey data from a variety of standard and developmental systems and cued interrogation with the developmental systems. Comprehensive ground truth data were collected for 1500 to 2500 geophysical anomalies at each location. Data from these demonstrations will be available for use to support proposed work in response to this SON.

Tools to Support Informed Decisions on Munitions Response Sites

There is a need for procedures and tools that will allow site managers to make decisions at munitions response sites based on quantitative and transparent criteria. The focus is on the needs of individual site managers and teams to answer questions such as what is the likelihood that UXO will be encountered at the site before and after remediation, how to prioritize anomalies for digging in a principled way, how to assess residual uncertainties, and when to stop digging.

Proposals need not address all aspects of this SON. Proposals addressing contamination of soils and groundwater by munitions constituents are not within the scope of this SON. Proposals addressing underwater munitions topics should be submitted under MMSON-13-02: “Improvements in the Detection, Classification, and Remediation of Military Munitions Underwater”.

2. Expected Benefits of Proposed Work

Results from this work will provide expanded capability to cost-effectively characterize and remediate munitions response sites, resulting in improved site coverage, significant cost savings, and increased capabilities to deploy advanced technologies for a wide diversity of site conditions.

3. Background

As a result of past military training and weapons testing activities, military munitions are present at sites designated for Base Realignment and Closure (BRAC), at Formerly Used Defense Sites (FUDS) and other closed ranges, as well as on active installations. The detection and remediation of munitions on ranges, munitions burning and open detonation areas, and burial pits is one of the DoD's most pressing environmental problems. The characterization and remediation activities conducted at DoD sites using currently available technology often yield unsatisfactory results and are extremely expensive, due mainly to the inability of current technology to detect all munitions that may be present at a site and the inability to discriminate between hazardous munitions and non-hazardous items. Field experience indicates that often in excess of 90% of objects excavated during the course of a munitions response are found to be

non-hazardous items (false alarms). As a result, most of the costs to remediate a munitions contaminated site are currently spent on excavating targets that pose no threat.

The military munitions technology program seeks to both maximize the probability of detection of munitions and minimize the false alarm rate. Our goal is to meet the highest probability of detection desired (near 100%) at each site while reducing the false alarm rate by a factor of up to 100 for highly cluttered sites. These two metrics are closely coupled and must be tackled jointly. In all of DoD's technology objectives, the DoD Munitions and Explosives of Concern (MEC) Research, Development, Test and Evaluation (RDT&E) program is striving to provide tools and full visibility to site managers, regulators and communities concerning the expected performance and associated cost and impact for any cleanup decision.

Complementary SERDP/ESTCP-Funded Projects: Currently, SERDP and ESTCP are supporting a wide array of efforts addressing the munitions response problem. These efforts are primarily directed at the validation of previously-developed geophysical instruments through the collection and analysis of geophysical data at live munitions sites and the underwater munitions response problem. A brief description of these completed and ongoing projects can be found at the SERDP and ESTCP web site (www.serdp-estcp.org/Program-Areas/Munitions-Response).

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

Dr. Herb Nelson
Program Manager for Munitions Response
Strategic Environmental Research and Development Program (SERDP)
901 North Stuart Street, Suite 303
Arlington, VA 22203
Phone: 703-696-8726
E-Mail: Herbert.Nelson@osd.mil

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.