COST EFFECTIVE OPTIONS FOR TREATMENT OF WASTES FROM MUNITIONS CONSTITUENTS MANUFACTURING

1. Objective of Proposed Work
The objective of this Statement of Need (SON) is to develop cost effective options for treatment of wastes generated from munitions constituents manufacturing. Wastes that are mixed with legacy munitions constituents and insensitive high explosives (IHE) are of particular concern. Specific research areas of interest include:

- Develop treatment technologies that are able to satisfactorily treat both IHE and legacy munitions constituents in wastewater. Treatment train approaches may be necessary and are of interest.
- Determine the impact of IHE wastes when present during the treatment of legacy munitions constituent wastewaters.
- Develop alternatives or improvements to open burn (OB) disposal for aged, off-spec, and excess propellants and energetics, including both legacy munitions constituents and IHE.

Proposers are not required to address all of the needs listed in any individual proposal. Research and development activities at laboratory-, bench-, and field-scale will be considered as well as computer modeling to support such efforts. Information on a variety of classes of munitions is of interest. The contaminants of primary concern are RDX and perchlorate due to low federal health advisory levels, but HMX, TNT, DNT and their breakdown products also are of interest, as are the new IHE.

To provide strategic guidance for future research and demonstrations on management of munitions constituents, SERDP and ESTCP conducted a workshop on July 28-29, 2015 in Washington, D.C. Reviewing the Workshop Report for additional detail on these research needs is essential prior to submitting a proposal.

2. Expected Benefits of Proposed Work
Results from this research will lead to improved technologies for treating wastes generated from the manufacturing of legacy munitions constituents and IHE. Such treatment technologies will help reduce the costs associated with disposal of these wastes and minimize management concerns.
3. Background

Munitions constituents manufacturing and load/assemble/pack (LAP) operations generate liquid waste streams from various plant activities. Manufacturing generates wastewater containing both organics (munitions constituents) and inorganics (nitrate). The waste stream volume is lower and more easily handled during the initial munitions constituents development and test stage than during the acquisition stage, where flows as high as five million gallons a day may be generated. For LAP operations, the volumes also tend to be smaller, and the main constituents are munitions constituents, with traces of processing agents. While efforts are made to keep solid munitions constituents out of the liquid waste stream using crystallization, settling, and filtration, the presence of micron-sized munitions constituents is still probable.

The established treatment trains at specific manufacturing and LAP facilities vary, but some generalizations can be made. Manufacturing facilities tend to use sequential anaerobic/aerobic biological treatment to remove both the inorganic nitrate and the organic munitions constituents using traditional wastewater treatment plant processes, with discharge to surrounding surface water. While these processes have been reasonably effective for treating manufacturing wastewaters containing legacy munitions constituents (e.g., TNT, RDX, HMX, DNT, nitrocellulose), a stricter regulatory environment and the need to produce a range of new munitions constituents, including IHE like NTO, DNAN, and NQ, is putting demands on existing systems. For instance, while the legacy munitions constituents are considered to be not very soluble (e.g., 10’s to 100’s mg/L), newer IHE constituents like NTO have a solubility of 20,000 mg/L, leading to both high concentration wastewater and a much larger loss of the end product to the waste stream. Additionally, while legacy munitions constituents are amenable to the current biological treatment approaches, not enough is known about the degradative pathways of IHE to assure the existing wastewater treatment trains will be sufficient to meet release criteria.

LAP facilities tend to use diatomaceous earth filters combined with granular activated carbon (GAC), and run their processing water in closed loops through the plant (e.g., zero discharge), with spent GAC removal and disposal as a hazardous waste. It is likely that the more highly soluble IHE (like NTO and NQ) will sorb less to GAC than the legacy munitions constituents, thereby reducing the effectiveness of the existing LAP wastewater treatment process, and requiring new technologies to ensure effective IHE treatment.

The co-manufacturing of both legacy munitions constituents (e.g., RDX) and newer IHE (e.g., NTO) is expected to continue for several decades. Additionally, new IHE are continually being developed. Therefore, technologies capable of handling mixed waste streams are a critical need. Workshop participants identified a number of research needs associated with improved treatment of wastes from manufacturing of munitions constituents. It is essential that proposers view the Workshop Report to obtain additional detail concerning these discussions.

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 $200,000 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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