

ITRC PROJECT PROPOSAL: A Guide to Munitions Constituents Regulatory Status, Sampling, and Treatment

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Problem Statement (why is this project necessary?)

Thousands of current and former DoD sites, comprising tens of millions of acres, are suspected of containing munitions with an estimated cleanup cost of \$35 billion. The DoD is currently assessing its sites in the Military Munitions Response Program (MMRP). The Army Corps of Engineers MMRP Formerly Used Defense Sites Program has over 1600 sites, the Navy and Marine Corps have over 230 sites, and the Air Force has over 240 sites. These sites are distributed throughout the fifty states. The primary focus to date has been to determine the explosive hazards related to these sites. Munitions constituents from low order detonations at former testing and training ranges, as well as from production facilities, can impact groundwater and soil. The release of munitions constituents below an explosive hazard level must be addressed under the MMRP as well. A significant number of the MMRP sites are just beginning the site inspection phase. As the MMRP sites progress through the regulatory cleanup process, the munitions constituents risk to human health and the environment will need to be evaluated in order to determine the extent of this impact and ways to mitigate or minimize it.

Organizations such as the SERDP and ESTCP of the DoD as well as the Army have funded innovative sampling and treatment technologies for munitions constituents in the last few years. The sampling efforts have included using the multi-increment sampling approach, as well as traditional sampling approaches such as judgmental. Studies have also been conducted on dissolution rates, and modeling of mass transfer rates of energetic compounds (such as TNT and RDX). Treatment technologies have been developed using biological and physical processes for both in-situ and ex-situ treatment. Examples include in-situ bioremediation, soil washing, and low temperature thermal desorption. Currently, there are no summary written documents that discuss the regulatory status, innovative sampling techniques and treatment options for the munitions constituents.

Solution / Impact (how will the project impact the environmental marketplace?)

The proposed project will develop a technology overview document of the common energetic compounds contained in munitions, their current regulatory status, sampling, analysis and treatment. An initial technology overview is appropriate rather than a formal tech-reg document for two reasons. The first is that the scope of this problem needs to be defined because many states are in different phases of regulatory consideration for these energetic compounds. For instance, in New Jersey, TNT, RDX, and HMX have only been proposed as interim standards for consideration due to lack of occurrence data. Secondly, the forensic evidence and remediation technology efficiency has to be evaluated and documented prior to Tech-Reg recommendation document preparation. The area of explosives research in the last two centuries has yielded a vast quantity of chemicals that could potentially be used in a munition. This effort will focus only on the more common explosives (TNT, RDX, HMX, ammonium picrate), propellants (nitrocellulose, nitroglycerin, nitroguanidine, 2,4-dinitrotoluene), and pyrotechnics (white phosphorus) used in last half century. The proposed outline for the document is as follows:

- Explosives Safety Considerations
- Physical and Chemical Properties
- Sources, Use, and Occurrence
- Fate and Transport and Potential Impacts
- Regulatory Status
- Sampling and Analysis
- Remediation Technologies

It is anticipated that the final document will be approximately 150 pages plus appendices. The explosives safety and physical properties sections will be shorter than the other sections in the document. By developing this document, for MMRP sites, the team will utilize increased regulator and stakeholder input to address and elaborate on the factors that influence the assessment and potential cleanup of a MMRP site. This will accelerate the site assessment and evaluation of remedial alternatives of an MMRP project, which in turn would reduce overall costs for a site. This document could also in some instances help show that there is no risk to human health and the environment at some sites, thereby reducing the expenditure of funds for unnecessary further characterization and/or remediation.

Success Measures (how you determine the project impact to the market place)

This effort would benefit a significant number of the over 2000 sites in the DoD's MMRP where a human health or ecological risk may exist. Regulators and Remedial Project Managers will need a reference to describe sampling options, regulatory status, and treatment options as they proceed through the regulatory process for their sites. The production of this document by ITRC will be very timely because a large portion of the MMRP sites will be entering the remedial investigation/feasibility study at the time this document is finalized.

The development of this document will also help with the implementation of innovative technologies developed by the Services, ESTCP and SERDP programs.

Summary of Deliverables (primary project outputs)

The expected project outputs will be a technology overview, and an Internet-based training curriculum. The title for the document will be "Common Munitions Energetic Constituents, Sources, Regulatory Status, Analysis, and Treatment".

Project Schedule

The proposed project schedule is as follows:

- 1.) Overview Document – 2009 through June 2010, published Fall of 2010
- 2.) Tech/Reg Document – June 2010 through June 2012, published Fall of 2012
- 3.) Internet training – Public offerings commencing late 2012

Target Audience

The primary target audience for this project are the federal and state regulators who will oversee the cleanup of MMRP sites. The secondary target audience for the team deliverables are the DoD remedial project managers and their contractors. Community stakeholders may also use this information for education purposes.

Resources Required

Personnel:

- Lee Lippincott, New Jersey, is interested in being the Team Leader and would consider a co-leader
- States that have already expressed interest in participating as team members include NJ, AL, CA, MA, and CO. Many others are expected to participate since the problem is widespread.
- The new team will have a skill mix of scientists and engineers that will benefit the project. This will include chemists, microbiologists, and engineers. In addition to the interested personnel previously listed in this proposal, additional membership/review from other government agencies will be necessary. This includes representation from explosives safety personnel and relevant research organizations such as the Cold Regions Research and Engineering Laboratory
- Regulatory personnel have a background in the regulation of RCRA and CERCLA sites.
- Industry participation from prominent engineering firms is expected to include Shaw, Tetra Tech, Battelle, and others.
- Educational Institutions/Researchers will be contacted and invited to participate with the advice of SERDP/ESTCP.

Related Work:

The current ITRC UXO Team is focused on addressing the explosive hazard associated with MMRP sites. This proposed team would complement that team by addressing the other part of the MMRP that needs to be addressed, the munitions constituents below an explosive hazard that have a human health or ecological risk. This team would involve several members from the sunseting perchlorate team and some members from the UXO team. These individuals have experience in writing ITRC documents and the perchlorate team members have already written extensively on one munitions constituent, perchlorate.

Coordination between the proposed multi increment sampling team will be necessary in order to avoid duplication of efforts if both teams are funded. It is proposed to have a couple of team members serve on both teams in order to avoid duplication. The sampling section of this overview document will discuss the multi-increment sampling only in summary. The munitions constituents team document will not discuss all the issues with the multi increment sampling to the same level of detail as the multi-increment sampling team document. Additional sampling techniques will also be discussed in the munitions constituents team document where the site type warrants a different sampling approach.

EPA is revising its Handbook on the Management of Munitions Response Actions. The primary focus of the Handbook has been on the explosive hazard associated with MEC, with sections addressing munitions constituents below an explosive hazard level. Part of the planned revision is to revise the section on munitions

constituents. The effort by this ITRC team will be more involved than the roughly 20 pages in the EPA document that discuss munitions constituents.

The Navy and EPA have training classes on munition response where the powerpoint and reference materials are provided to the students. This includes summary information on munitions constituents below an explosive hazard. The technology overview document developed by this team will summarize the regulatory status, sampling and analysis, and treatment of munitions constituents, which to date has only been done with powerpoint presentations. These presentations will help with the outlining and development of the written document.

SERDP/ESTCP have funded a number of munitions constituents sampling and treatment technology research and demonstration projects. This effort by ITRC would build upon that effort by summarizing the relevant research and demonstrations that regulators and project managers need to be aware of to assess their sites. Currently, this type of summary does not exist.