Warning! This document has not been amended since publication. Some content may be out of date and may no longer apply.

Characterization and Remediation of Soils at Closed Small Arms Firing Ranges (SMART-1)

EXECUTIVE SUMMARY

Small arms firing ranges (SAFRs) include government, commercial, and recreational rifle, pistol, trap, skeet, and sporting clay ranges. Small arms firing ranges are those ranges accepting 50 caliber or smaller ammunition. This definition is meant to include shotgun ammunition used on trap- and skeet-type ranges. SAFRs may contain lead, antimony, copper, zinc, arsenic, and polycyclic aromatic hydrocarbons (PAHs) from nonexploding (nonenergetic) bullets and fragments, bullet jackets, and related sporting material (e.g., clay targets); however, lead is the primary risk driver and is thereby the focus of this guidance.

Lead has documented impacts on human health, particularly for children. There are many mechanisms for exposure to lead, including drinking lead-contaminated groundwater, ingesting lead-contaminated soil or sediment, or inhaling airborne particles of lead. Lead dissolution and migration to groundwater or through aerially (windblown) or hydraulically (erosion and deposition) dispersed particles can cause exposure and result in elevated levels of lead in the blood of humans and wildlife and may ultimately impact beneficial future land use.

The U.S. Department of Defense (DoD) oversees more than 3,000 active SAFRs as well as the closure, or pending closure, of 200 more. In all, DoD expends more than 2 million pounds of lead annually. In addition to DoD facilities, there are an estimated 9,000 nonmilitary outdoor ranges in the United States (USEPA, January 2001). USEPA also estimates that 4% of the 80,000 tons of lead produced in the United States during the late 1990s was made into bullets and shot.

This guidance is designed to display a logical and easy-to-follow decision diagram for determining how best to remediate lead and lead-contaminated soils at closed small arms firing ranges. A decision diagram is included to assist the practitioner in formulating a proper strategy for removing the threat that metal, particularly lead, presents at small arms firing ranges. This decision diagram and accompanying documentation is valuable for planning, evaluating, and approving lead soil remediation systems. It defines site parameters and appropriate ranges of criteria necessary for characterizing, testing, designing, and monitoring lead soil remediation technologies. Contaminants, associated chemicals of concern, and contaminant distribution may differ among small arms firing ranges; however, many characteristics of a site, necessary to determine the efficacy of lead remediation technologies, are similar. Once a site has been characterized and the postremediation land use of the site established, engineered approaches can be designed, tested, and deployed. The decision diagram defines the primary decision points and provides characteristics used to evaluate various lead soil remediation strategies. The flow diagram references the sections where each element is more thoroughly discussed in the body of the document. When viewing the flow diagram electronically, simply click on the box in the flow diagram to proceed directly to that section for additional information. This approach is useful to state and federal regulators, environmental consultants, responsible parties/owners, and community stakeholders.

Site owners and operators have only recently become familiar with the environmental consequences of their practice. Their industry has since developed Best Management Practices (BMPs) for environmental management and maintenance of their range and, consequently,

operators are incorporating these into their operating procedures. Federal agencies, specifically DoD, and commercial sporting range operators are proactively developing a greater understanding of lead management and remediation. There are a number of remediation technologies as well as sampling and analysis techniques that, if appropriately applied, can adequately characterize and remediate lead contamination at any SAFR.

Because of the increased scrutiny being paid to SAFRs, the U.S. Department of Navy, USEPA Region 2, and the state of Florida have developed BMP documents to provide guidance on the operation of active SAFRs. These documents closely follow the guidance provided by the National Shooting Sports Foundation (www.rangeinfo.org).

While researching and compiling information for this guidance, the team identified a number of regulatory and technical issues encountered while remediating a SAFR. Through this guidance, the team seeks to clarify these issues and make recommendations, which in the team's view enhance the use of the techniques discussed in the guidance. Following are some of the more significant issues identified by the team. See Section 6.0 of this guidance for further discussion:

- At some ranges, it may be possible and desirable to reuse the soil from the backstop of a range that is being closed to construct a new berm or rebuild an existing berm located in another area of the same property or facility. It is USEPA's position that ranges that reclaim and recycle lead bullets or lead shot may place the soil that is generated during the reclamation process back onto an active range on the same property or facility or a property adjacent to and under the same ownership as the property where the soils originated without testing the soil for hazardous waste characteristics.

- It has been suggested that range soil from a former backstop may also be reused, following lead reclamation, for constructing or rebuilding a backstop at a location that is not on the range property. The same environmental benefits from berm reuse as described later in this document could be realized, but extra oversight may be needed. Since individual states may not permit this action, or may impose additional requirements for transportation, documentation, and approvals, state regulations and regulatory agencies should be consulted prior to transporting range soils to a property that is not the same as or adjacent to and under the same ownership as the property where the soils originated.

- While many current analytical methods rely on using only soil that has been passed uncrushed through a 30-mesh sieve as the source for analytical tests, some controversy exists in the field as to the best method(s). Other sample preparation protocols have been proposed and approved by governing regulatory bodies. Differences in sample preparation protocols include the designation of the size of sieve or whether to use a sieve at all and on the degree of disaggregation prior to sieving. Therefore, to recommend a specific sample preparation method may be misleading. No matter which method is selected, however, it should result in a sample that is representative of the site and its environment and is agreeable to the regulatory community and the other parties involved in the evaluation.

Other recommendations on relevant issues can be found throughout this document. Please refer to Section 6.0 for a comprehensive listing of all issues contained in this document.