



Lead at Outdoor Small Arms Firing Ranges

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Generally, the Indiana Department of Environmental Management (IDEM) does not have regulatory authority over indoor air quality as U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) regulates indoor air quality in the workplace. Here is a fact sheet from OSHA: [Protecting Workers from Lead Hazards](#).

Additionally, Indiana Code states that indoor firing ranges are under local units of government. Additionally, Indiana Code § [14-22-31.5-5](#) states a local unit of government may regulate the location, use, operation, safety, and construction of a shooting range.

Background

This guidance offers a general overview of lead issues at small arms firing ranges and points to resources for more detailed technical support. Ammunition used at small arms firing ranges may contain lead. However, small arms firing ranges do not generally present extreme environmental hazards, nor are extensive remediation efforts usually required. Depending upon the site conditions, localized small-scale cleanups or cover, usually a clay or rich soil cap, may be adequate. It is recommended that active ranges have an environmental management plan to control lead contamination and recycle spent materials.

Regulatory Issues

The United States Environmental Protection Agency (U.S. EPA) does not consider the use of munitions a waste management activity because the munitions are not "discarded." Rather, the firing of munitions is within the normal and expected use of the product ([62 FR 6630, Feb. 12, 1997](#)). Waste sent offsite for disposal may be considered hazardous if toxicity characteristic leaching procedure (TCLP) testing shows lead levels above regulatory limits. In that case, the waste must be managed and disposed of under hazardous waste rules. ([US EPA, 2005](#)). Extracting the lead and sending the material to a recycler, or managing the waste on site, is usually a more efficient practice. Hazardous waste (HW) is regulated under the Resource Conservation and Recovery Act (RCRA). Information on HW regulations including a link to guidance on how to do a waste determination can be found at: idem.IN.gov/waste/hazardous-waste. Solid Waste is regulated under 329 IAC 10 and information can be found on our website at: idem.IN.gov/waste/solid-waste. Hazardous waste regulations can be found at [329 IAC 3.1](#). Solid waste regulations can be found at [329 IAC 10](#).

Remediation requirements should be determined on a case-by-case basis, considering site-specific risks and the planned reuse of the property.

The movement of lead in soil depends on the physical and chemical transformations it undergoes. A detailed investigation of the different forms of lead in shooting range soils helps assess contamination risks to plants, water, and soil, as well as the associated health hazards. Instead of total lead concentration determination, the lead associated with the water soluble or bound residual fractions help determine the mobility of lead in the ecosystem ([Kelebemang R. 2017](#)). The synthetic precipitation leaching procedure (SPLP) method is an appropriate test for determining the mobility of lead in the soils of shooting ranges ([Hardison D.W., 2004](#)).

Health and Toxicity

For lead to be toxic to animals or humans, it must enter the body. Dermal contact and ingestion are not a common potential exposure pathway given the fundamental nature and practices at an active small arms firing range. A well-maintained layer of vegetation helps prevent direct skin contact with contaminated soil. ([ITRC, 2005](#)). Drinking water is seldom affected by firing ranges because of the low solubility and restricted migration of metallic lead. Excavation of the impacted areas at outdoor ranges could possibly generate lead dust, so dust control measures should be used.

Ecological Risks

Smaller lead particles (shot or fragments) can be ingested by wildlife and precautions should be taken to make open range areas uninviting to wildlife ([ITRC, 2005](#)). Nearly all confirmed examples of harm to terrestrial species are with lead shot from shotgun ranges, not from small arms firing ranges ([Clausen et. al., 2011](#)).

An outdoor range that plans to stay open and prevent negative environmental impacts can set up an environmental management program, with a plan for lead recovery and recycling, range management, erosion prevention, etc. “Environmental Management at Operating Outdoor Small Arms Firing Ranges,” ([ITRC, 2005](#)) and “Best Management Practices for Lead at Outdoor Shooting Ranges” ([US EPA, 2005](#)) are documents that detail the best environmental operating practices for the management of an open small arms firing range.

Reclamation

Future land use is the most important factor in determining if remediation is necessary. The goal of remediation is to prevent lead from harming humans or ecology. Since ingestion is the exposure pathway of concern, the remediation method must prevent dermal contact and possible ingestion of the lead. If the property will be slated for residential use, soil from shooting ranges merits special concern and remedial action. A parking lot or industrial use will not present many opportunities for dermal contact or ingestion.

The most effective remedy is to remove the impacted soil. Soil removal is most feasible if the lead is concentrated in small areas such as the backstop or berm behind the targets. Shotgun ranges (trap and skeet) are difficult because the lead pellets are more widespread, but do not penetrate far beneath the surface. There are machines that remove the top few inches of soil, extract the lead, and replace the soil. These are often used at large ranges to recover and recycle lead shot. There are firms which specialize in lead cleaning at firing ranges.

If it is impractical to remove the lead, it may be successfully managed on-site. Covering, or “capping”, with clay soil is quite beneficial ([ITRC, 2005](#)). A sufficiently thick soil cover, if seeded and maintained so there are no erosion problems, will also help prevent dermal contact with lead.

Further Information

If you have additional questions regarding lead concerns at small arms firing ranges, there are numerous online local, State, and Federal resources available to the public. If you have questions regarding this guidance, please contact the Office of Land Quality (OLQ), Science Services Branch (SSB) at 317-233-6593.

References

J. L. Clausen, B. Bostick & N. Korte. 2011. "[Migration of Lead in Surface Water, Pore Water, and Groundwater With a Focus on Firing Ranges](#)", Critical Reviews in Environmental Science and Technology, 41:15, 1397-1448.

[Federal Register / Vol. 62, No. 29 / Wed., Feb. 12, 1997 / Rules and Regulations](#)

Hardison D.W. Jr., et. al. December 2004. "[Lead contamination in shooting range soils from abrasion of lead bullets and subsequent weathering](#)". Science of the Total Environment 328 (2004) 175-183, Soil and Water Science Department, University of Florida.

Kelenbemang R., et. Al. 2017. "[Speciation and mobility of lead in shooting range soils, Chemical Speciation and Bioavailability](#)", 29:1, 143-152.

ITRC (Interstate Technology & Regulatory Council). Feb. 2005. "[Environmental Management at Operating Outdoor Small Arms Firing Ranges](#)".

U. S. Environmental Protection Agency. Updated June 2005. "[Best Management Practices for Lead at Outdoor Shooting Ranges](#)". EPA-902-B-01-001.