

## LEAD AND COPPER CONTAMINATION IN SMALL ARMS FIRING RANGES

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### EXTENDED ABSTRACT

Firing range activities have been proven to adversely impact the environment. The main concern in small arms firing ranges (SAFRs) is the fate and transport of heavy metals from bullets and bullet fragments accumulating in soil with lead (Pb) being the primary contaminant. Frequently however, bullets are jacketed with copper (Cu). The presence of Cu results in an increased galvanic corrosion potential. This in turn may lead to elevated levels of Pb release and subsequent lead mobility. In this paper we investigate the presence of Pb and Cu in an attempt to identify any synergistic effects between Pb and Cu and to accurately establish the extent of contamination. Soil samples from an active 20-position zeroing range and from a former range located at Fort Irwin in the Mojave Desert were analyzed for total concentrations of the respective metals. Overall, the Pb and Cu concentration levels and their spatial distribution correlated well with the associated range activities. Most Cu and Pb contamination appeared to concentrate at the berm surface with contamination levels rapidly decreasing with depth. Metal concentrations were elevated in the immediate vicinity of the target area, but were somewhat lower in areas between target positions. The presence of Cu increases the solubility of Pb by increasing its corrosion potential. Pb corrosion results in the formation of hydrocerussite, a Pb carbonate.

**Key words:** lead, Pb, copper, Cu, galvanic corrosion, bullets, firing ranges, hydrocerussite