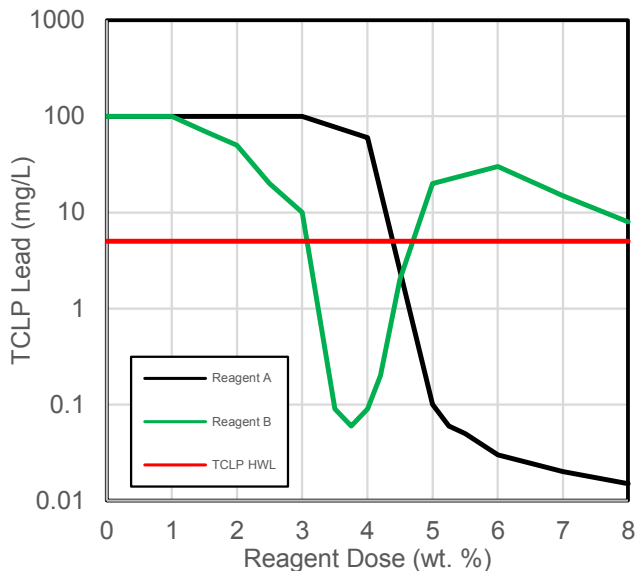


**Site Background:**

RMC Consultants Inc. was contracted by the USDA FS to remediate a unregulated shooting range in the mountains west of Boulder CO. The project required excavation and treatment of 1,800 tons of soil contaminated with lead. The untreated soil had a lead concentration between 400 to 48,000 mg/kg. Treatment goals were to reduce lead (Pb) to <1 mg/L by the TCLP test verification. CERES was requested to provide MTS<sup>®</sup> remediation chemistries to achieve the site goals. ReSolution Partners (RP) was retained by the consultant to verify reagent(s) that would remediate lead at the site.

**Solution:**

The initial phase of treatability studies used competing vendor-recommended dosage rates. Batch treatment trials found that only 1 of the 3 reagents appeared to have the potential to keep TCLP lead concentrations below 1 mg/L. RP added a 4th reagent, MTS<sup>®</sup> from CERES, to the trials which also appeared to potentially meet the project goals. Subsequent trials found that the results of the treatments were very sensitive to soil pH and reagent dose, in both the untreated and the treated samples. Composite soil samples collected by the consultant were tested at dosage rates of 1, 2, and 4.5 wt. % of MTS<sup>®</sup> with a maximum lead concentration of 38,800 mg/kg and the 1 wt. % dosage resulted in a TCLP-lead concentration of 0.47 mg/L when extracted using TCLP Solution 1. The soil samples tended to be driven to the TCLP Solution 2 extraction fluid in the TCLP pre-test with the addition of reagents. To ensure reliable, consistent results, the final selected chemistry was developed to ensure consistently passing results in TCLP Solution 2..



**Comparison of Reagents (MTS<sup>®</sup> vs Competitor):**

Reagent A (black line) shown is MTS<sup>®</sup> and it brought the TCLP lead concentration below the goal at a slightly higher dosage, but once the dose was sufficient to meet the TCLP goal the reagent was more “forgiving” of uncertainty in dose or soil pH. This makes onsite management and implementation more predicatable. A conservative 5 or 6 wt.% dose could be applied with a high degree of confidence that the treatment goal would be met, without the need for in-field process control.

An alternative competitor reagent B (green line) would lower the TCLP below the hazardous waste limit at a dose of approximately 4 wt. % but a slight



*Firing Range Site  
Lead  
Reduction/Stabilization*



increase or decrease in dose or in soil pH would cause the soil to fail the TCLP goal. This response suggested that there would be a need for in-field chemistry process control to ensure that enough, but not too much, of Reagent B was applied. If slightly too much was applied, it would then be necessary to add much more of Reagent B to meet the TCLP goal.

The contractor chose to proceed with MTS® and not be concerned that in-field process control would be required. The results highlight the value of site-specific treatability studies in reagent selection to meet concentration and implementation goals and the peace of mind provided by MTS®.

### **Full Scale Results:**

All lead contaminated soil identified above action levels was treated by MTS®. The MTS® reagent was thoroughly mixed with contaminated soil using the bucket on the excavator while spraying water to increase moisture levels to activate the chemical reactions. This mechanical mixing approach was suitable for this site due to the shallow depth of soil contaminations 12 feet. A total of 1,800 tons of lead impacted soil was treated with MTS®.

A total of 25 confirmation samples were collected from the treated soil and the results confirmed reductions in lead by 95% to 100%. All field soil confirmation samples collected were either below the detection limit or less than the site-specific treatment goal of 1 mg/L lead by TCLP.

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### **Client Feedback**

The project is going fabulous! Willow stakes were planted at the base of the treatment area along a natural creek. The MTS® reagent did not cause any issues with plant life.

Contact C.E.R.E.S. Remediation Products for information about lead remediation at your site.



C.E.R.E.S. Corporation is a remediation products manufacturer focusing on innovative and economical solutions for the sustainable remediation of heavy metals, chlorinated solvents, and petroleum hydrocarbons.