



MercLok™

MERCURY REMEDIATION
TECHNOLOGY

SUCCESS STORY: MINING SITE
APPLICATION

MercLok™ SUCCESS STORY

At Last, We Can Lock Mercury Down

California has a rich history of supplying society with important products, from the Gold Rush to the tech industry revolution. Other products the region supplied were less celebrated. Quicksilver (*aka elemental mercury*) was mined out of these hills from the 1950s through the 1970s for use in thermometers, fluorescent lights, thermostats, chlorine production, lye, and the goldmining process. Miners dug, crushed, and roasted the ore, releasing toxic ash into the air and discarding toxic residue in large mounds.

Vapors from elemental mercury produced in mining processes can constitute a neurotoxin with the potential to damage human organs. Furthermore, mercury becomes much deadlier when it leaches into soil and sediments where microorganisms transform it into an organic form. This methylated form of mercury is a powerful neurotoxin even in very low dosages and accumulates in seafood, insects, and all the birds and mammals that consume these creatures. When consumed by humans, methylmercury can damage vision, speech, walking, muscle strength, fetal development, and lead to death.

The mining has ended but the threat remains. By one estimate, at least 550¹ mercury mines have been abandoned across California, leaving the sites exposed to rainwater that can carry mercury residue to nearby soil and streams. Seventy-four² reservoirs are contaminated, according to the California Water Board.



Albemarle Invents a New Solution

A few years ago, the owners of a ranch containing an old, abandoned mercury mine in the hills of California were faced with the prospect of containing the site's mercury-contaminated mine waste. The conventional options included frequent surface grading, concrete capping, and amendments designed for other heavy metals, but these measures have generally failed to contain mercury beyond a few years. Building a landfill on the site or trucking away contaminated soil to a landfill were other mitigation options, but these were very expensive, and could further damage the ecosystem.

In 2020, Albemarle Corporation secured access to the site for a study of its promising new solution for mercury stabilization. Albemarle has a long history with mercury emissions capture from industrial plants, and because of the company's expertise, customers asked for help with mercury contamination in soil, waste, and groundwater.

Over five years of research and development (R&D), the company created a bromine-based amendment specifically for contaminated soil called MercLok™. A black powder that can be blended into soil or waste, or injected as a slurry, MercLok "locks" the mercury in a stable, nontoxic particle that prevents the element from leaching into water.

Sources:

1. <https://www.dailybreeze.com/2009/09/17/abandoned-central-california-mercury-mines-continue-to-pollute/>
2. https://www.waterboards.ca.gov/water_issues/programs/mercury/reservoirs/docs/factsheet.pdf

Remarkable Results, All Documented

In exhaustively documented lab and field testing at this California site, MercLok delivered astonishing results, reducing leachable mercury by as much as 99% in multiple types of mining waste while being exposed to rain and typical environmental conditions. Through multiple industry-standard leachability tests, it has been demonstrated at this site and others that using MercLok reduces leachable mercury concentrations in a wide range of soil types to the equivalent of a teaspoon of sugar in a standard sized swimming pool full of salt.

Total Mercury Concentration Found in Leachates

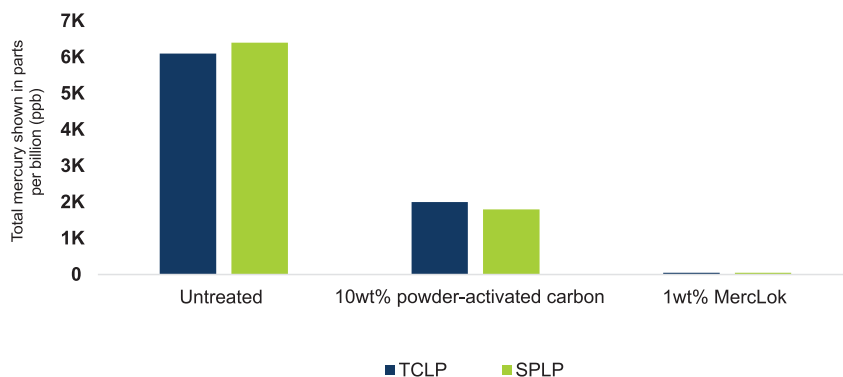


Figure 1: TCLP and SPLP results of mercury contaminated soil taken from a field site

Cumulative Total Mercury from the Effluent

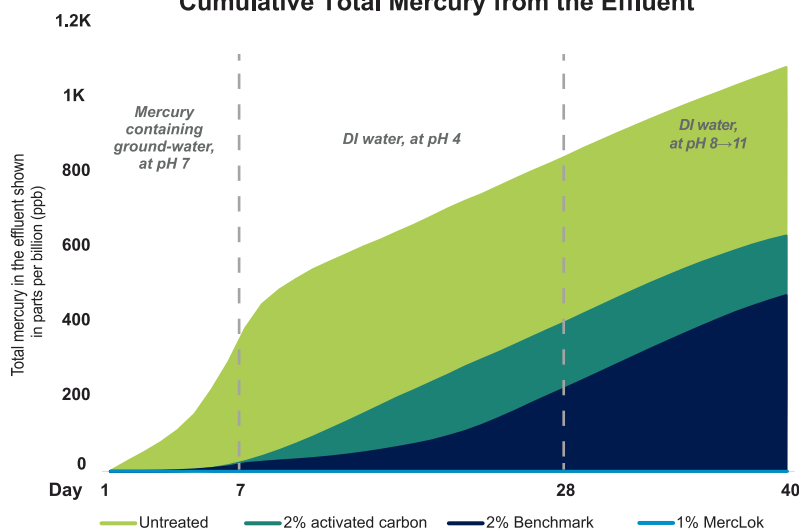


Figure 3: Forty-day column studies of contaminated soils comparing MercLok to other amendments under aggressive conditions to demonstrate decades of stability.

MercLok also demonstrated through EPA Method 1314 LEAF testing that it locks the mercury into its particles over long periods of time. Other amendments for heavy metals and activated carbon begin releasing mercury in just three or four days.

This research, reviewed by numerous industry experts, confirms MercLok’s groundbreaking advancement in the remediation of mercury. In addition to being nontoxic at the prescribed dosage and conditions, MercLok can help the environmental cleanup of sites such as this mine, by reducing the toxicity of contaminated waste to below the 0.2 mg/kg threshold, which in many cases will eliminate any need to transport waste offsite, saving landowners and taxpayers millions of dollars.

Brighter Future

Stabilizing mercury this way in sites in California and around the world can protect waterways that flow into critical estuaries and bays where seafood is harvested. The use of MercLok will make seafood safer, expand the uses of contaminated land, and improve the health of many organisms in the ecosystem. Where once there was gold and, later, quicksilver, there will be clean soil, fresh water, and a second chance for a delicate ecosystem.

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