

PROJECT HIGHLIGHT

CLIENT: Manufacturing Facility

LOCATION: Newington, CT

TECHNOLOGY: ZVI and Pneumatic Fracturing

LITHOLOGY: Slightly fractured siltstone and silt

CONTAMINANTS:
Chlorinated Solvents

ZERO-VALENT IRON INJECTIONS INTO SILTSTONE

Site Information

At a large manufacturing facility, chlorinated volatile organic compounds (VOCs) including PCE and TCE, and their associated daughter products, were detected in groundwater. The concentrations of chlorinated VOCs in groundwater ranged between 100 and 500 ppb, exceeding applicable remediation criteria.

The site geology is dominated by slightly fractured siltstone at depths, but silt deposits were detected in a lower-lying area of the site. Due to

the tight nature of the formations, enhanced emplacement was required in some areas to distribute the reagent to treat groundwater. Cascade executed pneumatic and hydraulic emplacement injections with direct push technology to inject zero-valent iron (ZVI) powder to achieve remediation objectives.

Approach

In the first phase, Cascade constructed permeable reactive barriers (PRB) within the fractured bedrock to eliminate offsite migration of chlorinated VOCs. The PRBs were constructed by pneumatically emplacing micro-scale ZVI into 15 injection boreholes. Moderately soft siltstone bedrock was typically encountered between 5 to 20 ft bgs. The siltstone was intensely fractured near the surface of competent rock with fracture intensity decreasing with depth. Cascade injected a total of 104,000 lbs of ZVI powder into the bedrock with a loading rate of approximately 0.5% w/w (ZVI to soil) to establish three separate reactive zones. Injection zones ranged from 20 to 35 ft bgs and 7 to 35 ft bgs. Radius of influence for each injection location was estimated at 30 to 40 ft.

In the second phase, Cascade treated the dissolved plume located off-site in a swampy area. Cascade injected 64,000 lbs of ZVI powder into two distinct regions (Low Lying Silty Area and Fringe Area) and two distinct vertical treatment zones (deep and shallow). Cascade used 150 injection points to treat a 2-ft interval from 3 to 15 ft bgs. A combination of hydraulic injection and pneumatic emplacement were used to install the treatment material. Daylighting of ZVI to surface during injections was minimal, but where it occurred, it indicated a radius of influence at or beyond 10 ft.

RESULTS

Performance monitoring results indicated significant decreases in PCE, TCE, and other daughter products within the injection zones following the treatment. Additional data were collected from offsite downgradient wells, including groundwater quality parameters, CVOCs, and breakdown products. Our client achieved the design outcomes and the site progressed towards meeting remediation goals.

