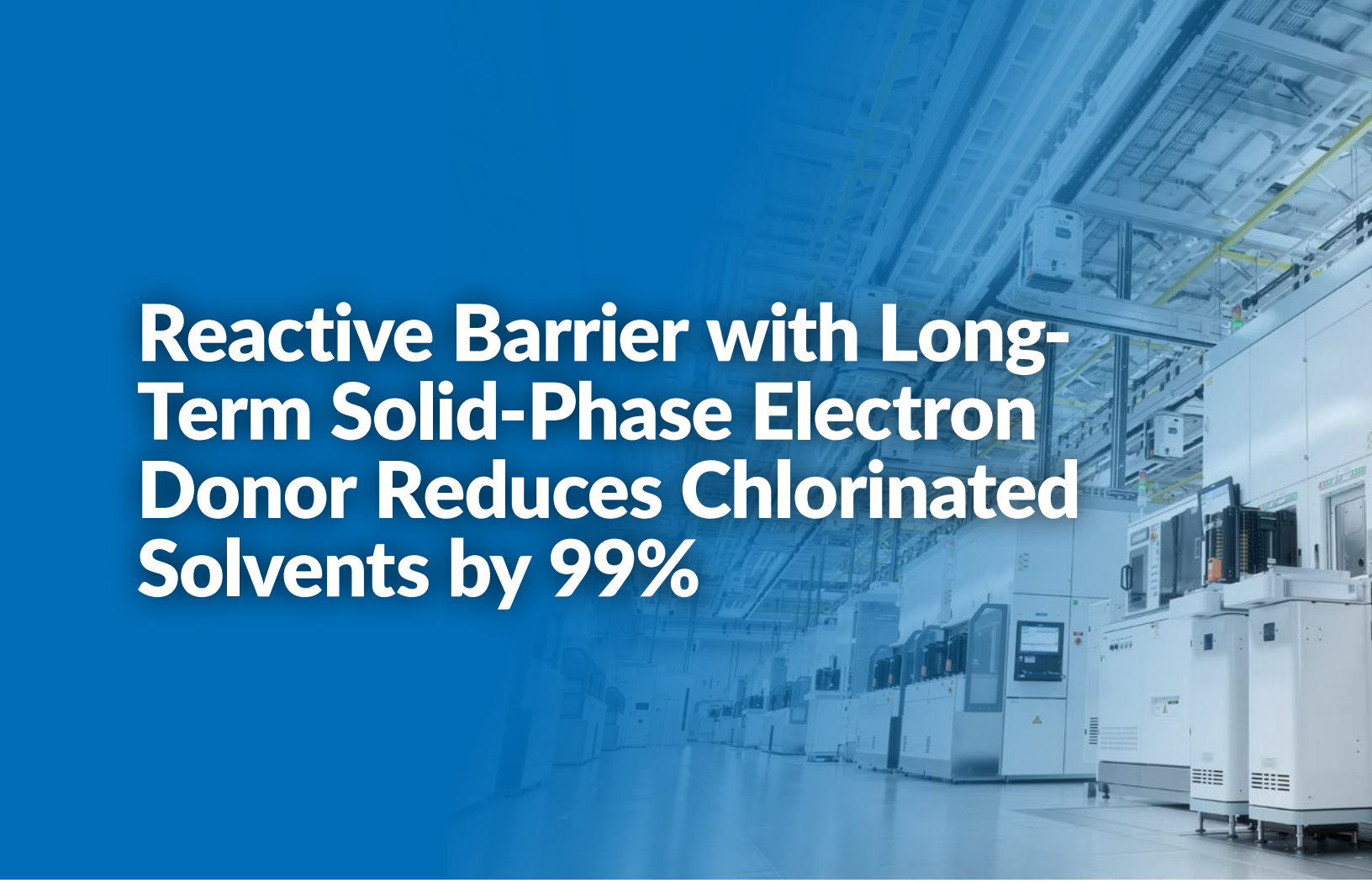


Reactive Barrier with Long-Term Solid-Phase Electron Donor Reduces Chlorinated Solvents by 99%

AquiFIX®
Long-Lasting Colloidal Electron Donor

Summary

An injectable permeable reactive barrier (PRB) was installed as an interim remedy to control migration of chlorinated ethenes (CEs) and chlorinated benzenes (CBs) at a former semiconductor facility. The PRB incorporated AquiFix®, a long-term solid-phase electron donor, along with PlumeStop®, sulfidated micron-scale ZVI (S-MicroZVI®), and a bioaugmentation culture. Within 12 months, downgradient contaminant concentrations were reduced by approximately 99%, with all but one monitoring location achieving cleanup goals.

Background

Historic solvent releases created a mixed plume of CEs and CBs migrating beneath the site. Treatability studies indicated limited CB degradation with ZVI and Dehalococcoides (DHC) alone. To address this, the PRB design included colloidal activated carbon (CAC) for adsorption, AquiFix for sustained donor release, S-MicroZVI for abiotic degradation, and a microbial blend of DHC and Dehalobacter (DHB) to enhance biotic dechlorination. AquiFix was selected to extend donor longevity, with the barrier designed for a 10-year lifespan.

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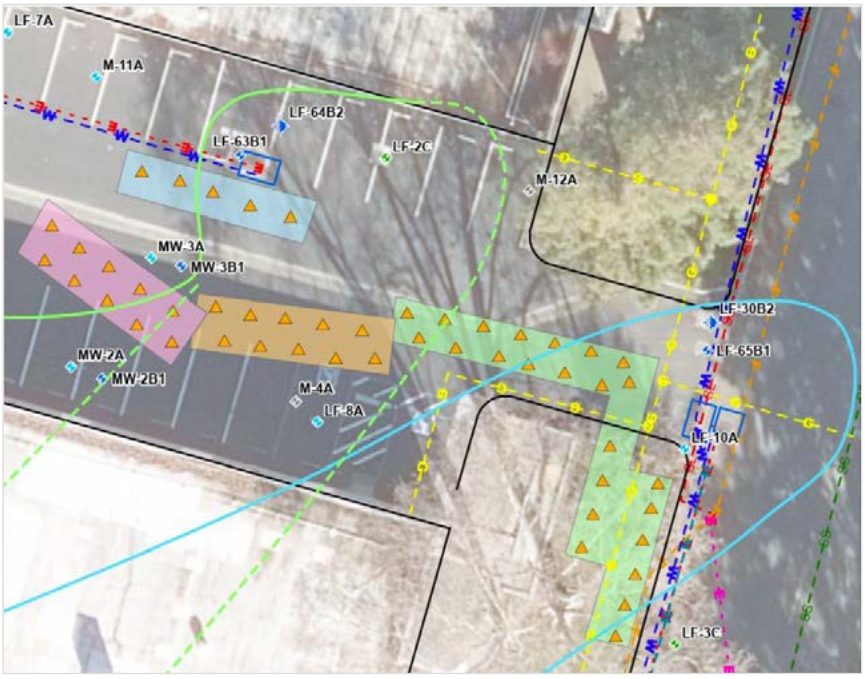
Application

The PRB was installed along a 200-foot alignment with 51 injection points spaced 6 feet apart and depths of 9–44 feet. Amendments were co-applied at each point, and placement validation monitoring confirmed effective lateral and vertical distribution across a 12-foot treatment zone.

Figure 1

PRB Application Map

PRB application map, showing injection points as orange triangles transecting the commingled CE and CB plumes.



Results

Performance monitoring showed strong amendment distribution, with total organic carbon levels increasing by two orders of magnitude from baseline. After 12 months, downgradient contaminant concentrations declined by ~99%. Only a single vinyl chloride detection was observed, while upgradient concentrations were two orders of magnitude higher, demonstrating the barrier's effectiveness. Geochemical indicators—low sulfate, elevated TOC and ethene, and negative oxidation-reduction potential—confirmed persistent reductive dechlorination, with no daughter product accumulation observed.

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