

ERD Remediation Approach Replaces Permanganate Treatment in Low Permeability Soils

3-D Microemulsion® and BDI® Plus Treat PCE Contamination at Former Dry Cleaner

Project Highlights

- Previous remedial techniques included soil excavation and in situ chemical oxidation (ISCO)
- ISCO injection proved difficult due to low permeable soils so KERAMIDA developed an ERD/bioaugmentation injection design
- Reductions in PCE/TCE contamination observed in most wells within the injection area; monitoring is ongoing



Project Summary

The site was a former Indianapolis dry cleaner with historical releases of PCE to the subsurface. Previous remedial techniques included soil excavation in the source area, in an off-site, right-of-way area, and an in situ chemical oxidation (ISCO) injection using potassium permanganate. These approaches did reduce PCE concentrations in groundwater; however, they remained well above regulatory closure levels in multiple wells. After a almost two years of post-ISCO injection monitoring and evaluation, the consultant, KERAMIDA, recommended an alternative biological, enhanced reductive dechlorination (ERD) approach in the area of residual chlorinated impacts.



3-D Microemulsion®

Remediation Approach

KERAMIDA worked with REGENESIS to develop an ERD/bioaugmentation injection design using 3-D Microemulsion® and BDI® Plus. The final design included 20 injection points spaced 15 feet apart on a grid pattern throughout the area of residual PCE/TCE impacts. The injection included a total of 1,200 pounds of 3-D Microemulsion and 18 liters of BDI Plus, distributed evenly over the 20 injection points with an injection interval of 10-13 feet below grade (targeting the impacted sand lens). The low permeability of the impacted sand lens, which proved problematic for the high volume of fluids needed for the permanganate ISCO injection, was a challenge. Since 3-D Microemulsion can be injected with minimal water when necessary, the low fluid volumes required to effect remediation proved to be ideal for this site. In addition, the low cost of the approach compared to other potential options, combined with the long-lasting effects of the remediation products provided a significant cost-to-closure savings. One year of post-ERD implementation (post-injection) monitoring shows PCE/TCE decreases and corresponding daughter product production (cDCE and VC). The persistence of strong anaerobic conditions resulting from the use of 3-D Microemulsion is expected to keep VOC concentrations and daughter products low well into the future.

Site Type: Dry Cleaner

Contaminant of Concern: PCE, TCE

Concentration: PCE 100 - 1,500 ppb; TCE 10-100 ppb

Remediation Approach: Enhanced Aerobic Biodegradation, Bioaugmentation

Treatment Area: 4,500-Square-Feet
Soil Type: Clay with Sand Stringers

Technology Used: 3-D Microemulsion, BDI Plus

Technology Description

3-D Microemulsion is an engineered electron donor material that offers a novel 3-stage electron donor release profile, pH neutral chemistry and is delivered on-site as a factory-emulsified product.

Bio-Dechlor INOCULUM Plus is an enriched natural microbial consortium containing species of Dehalococcoides sp. (DHC). This microbial consortium has since been enriched to increase its ability to rapidly dechlorinate contaminants during in situ bioremediation processes.