



# Aerobic Bioremediation Case Study:

## Bioremediation of TCE and 1,1,1-TCA at Central Indiana Industrial Site

### Location

Manufacturing facility  
Central Indiana

### Site Conditions

Ground water plume in confined silty sand beneath an active facility. Aerobic aquifer conditions.

### Target Chemicals

The target chemicals were a mix of solvents released from a drum storage area including 1,1,1-TCA, TCE, 1,1-DCE, and 1,1-DCA.

### Application

385 gallons of hydrated CL-Out microbes were injected into 22 injection points covering 3,500 square feet.

### Results

The concentrations of the four main contaminants decreased by 62% to 99% of the pre-bioremediation concentrations.

	1,1,1-TCA	TCE	1,1-DCE	1,1-DCA
Before	45.0	16.0	1.4	40
After	0.53	2.3	0.018	0.18

*Pre- and post-bioremediation maximum concentrations in mg/L (ppm)*

### Background

Chlorinated solvents were found in soil and ground water beneath a drum storage area at a manufacturing facility in central Indiana. The contamination was mainly found in the uppermost occurrence of ground water in an intratill silty sand formation. Within this zone the contamination had spread to cover an area of approximately 3,500 square feet.

### Geology and Hydrogeology

The geology of the property was underlain by typical till plain deposits. The impacted silty sand formation was sandwiched between dense tills with limited permeability. The impacted silty zone had irregular upper and lower contact surfaces with a thickness varying from less than six inches to as much as six feet. The overlying till was six to nine feet thick.

The ground water within the silty sand was confined. The hydraulic conductivity was not known, but was expected to be relatively low. Ground water velocity was also not known.

The contaminants found at the site were mainly 1,1,1-trichloroethane (1,1,1 TCA) and trichloroethene (TCE). The pretreatment TCE concentration was up to 16mg/L and the highest pretreatment 1,1,1 TCA concentration was 45 mg/L. Trace levels of other chlorinated solvents were detected in lower concentrations. Vinyl chloride was not detected.

### Remediation Design

CL-Out was introduced through one-inch diameter pvc injection points that were installed using direct push. Twenty two injection points were installed on a grid covering the impacted area.

Petrox was injected into the ground water in monthly applications of seven drums each. Depending on the formation thickness the injection volume ranged from 5 to 65 gallons per injection point.

### Results

After three CL-Out injections, ground water samples taken for laboratory analysis showed a significant reduction in the contaminant concentrations and no generation of vinyl chloride. The maximum concentrations of the four main contaminants were all reduced by 62% to over 99%.

### Conclusions

This project demonstrates several of the benefits of aerobic bioaugmentation. The CL-Out microbes produce enzymes to break down chloroethenes and chloroethanes simultaneously.

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