



# Bioremediation Following Dual Phase Vacuum Extraction

## Case Study:

### Dry Cleaners Site, Houston, Texas

#### Site Summary:

BioLogix CL<sup>®</sup> bioremediation was implemented at a dry cleaners site in Houston, Texas to reduce residual PCE and other chlorinated solvent concentrations in groundwater following dual phase vacuum extraction. After application of BioLogix CL<sup>®</sup> bioremediation the chlorinated solvent concentrations were reduced by 98% to 99% in less than 90 days. In Control Technologies, of Houston, Texas, was the project consulting and engineering firm for the investigation and remediation of the site.

#### Project Design and Implementation

Subsequent to the discovery of contamination of soil and ground water contamination by PCE and associated daughter products, a dual phase extraction system was implemented for 9 years. While the dual phase extraction system had removed 1.2 million gallons of water and reduced the total CVOCs from 115,000 µg/L to 36,000 µg/L, the removal rate had reached an asymptote with PCE higher than 4,000 µg/L. BioLogix CL<sup>®</sup> bioaugmentation was selected to treat the residual contamination.

The soil and sediments beneath the site are part of the Chicot aquifer, which consists of discontinuous layers of sand and clay. The aquifer has a relatively moderate hydraulic conductivity estimated at 10<sup>-4</sup> cm/sec. The area of ground water impact and treatment was approximately 20,000 square feet.

BioLogix CL<sup>®</sup> microbes were injected into the ground water on three occasions between July 2005 and February 2006. Based on the volumes of impacted ground water, three drums of hydrated BioLogix CL<sup>®</sup> were injected into the ground water. The total injection volume was less than .1% of the pore volume of the treated aquifer.

#### Results

The following table summarizes the results of application of bioremediation in the ground water.

Contaminant	Source Area (µg/L)		Down Gradient Results (µg/L)	
	Before	After	Before	After
PCE	4,100	1.9	430	<5
TCE	2,500	1.5	360	<5
Cis 1,2-DCE	34,000	65	590	8.9
Vinyl Chloride	<50	47	6.6	<5

BioLogix CL bioremediation reduced the contaminant concentrations by 98% to 99% in less than 90 days.

The treatment cost for three rounds of bioaugmentation, including drilling and field services was less than \$20,000. For comparison the annual cost for operation and maintenance of the dual phase extraction system was \$75,000 per year. Bioaugmentation reduced the overall project cost by eliminating years of on-going costs, saving possibly hundreds of thousands of dollars.

