

Remediation under Buildings – Electrical Resistance Heating Provides the Solution

Project Summary

Thermal Remediation Services, Inc. (TRS) provided Electrical Resistance Heating (ERH) to remediate five chlorinated volatile organic contaminant (CVOC) source areas in the soil under a manufacturing building. To accomplish the remediation, it was necessary to place over 70 electrodes and vapor recovery wells through the main floor of the facility and to use angled electrodes to access soil under an inaccessible compressor room.

The contaminants of concern included Tetrachloroethene (PCE), Trichloroethene (TCE), 1,2-Dichloroethene (DCE), and Methylene Chloride (MeCl). An extensive confirmatory soil sampling program showed that the ERH system accomplished every project goal and average Total CVOC concentrations in soil were reduced by 99.98%.

Upon sale of the property in the Fall of 2008, the client will realize a **\$10 million dollar increase** to their property value with the ERH remediation removing environmental restrictions on the property.

Background

The five separate source areas were underneath a former manufacturing facility located in a suburb of Atlanta, Georgia. Well before ERH remediation, operations in the building had ceased and most facility equipment had been removed. While not necessary for ERH, working in an empty facility did make system installation easier.

Site Characteristics & Design Parameters

The treatment regions, with areas, depth intervals and remediation volumes, are described in the table below.

Region	Treatment Area (Square Feet)	Depth Interval (Feet Below Ground Surface)	Volume (Cubic Yards)
Area 1	2,107	0 - 20	1,561
Area 2	1,722	0 - 10	638
Area 3	2,772	10 - 20	1,027
Area 4	9,756	0 - 20	7,227
Totals	16,357		10,453

Site lithology in the remediation area consists of silty-clay saprolite (weathered bedrock) over partially weathered rock and then bedrock. Groundwater across the site averaged 20-feet below ground surface (bgs), and active ERH heating stopped just above the top of the groundwater table.

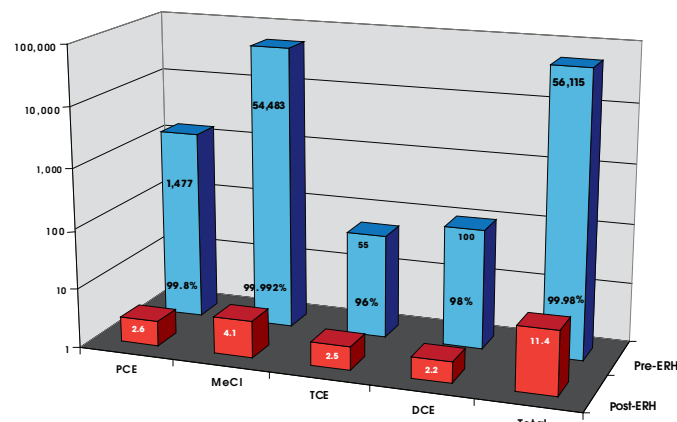
System Construction & Operations

The ERH system incorporated 73 electrodes, each with a co-located vapor recovery (VR) well. Subsurface temperatures were measured using 60 thermocouples placed at 2, 6, 10, 14, and 18 feet bgs within 15 temperature monitoring points (TMPs). Temperature data was automatically uploaded to the ERH control computer.

Recovered soil vapors were treated using vapor phase granular acti-

vated carbon (GAC), while recovered steam was condensed, and either evaporated in the condenser-cooling tower or treated with liquid phase GAC before being returned to the subsurface at each electrode.

ERH operations lasted 148 days and a total of 1,820,712 kilowatt hours (kW-hrs) of energy were applied to the subsurface. The maximum subsurface temperature achieved was 103 °C, and the maximum average temperature within the treatment volume was 92°C. The total amount of energy input into the subsurface and the number of days necessary to apply that energy were both lower than original design estimates and represented direct savings for the property owner.



Concentrations of Total CVOCs in Soil Pre- and Post-ERH

Project Results

The estimated pre-ERH mass of CVOCs in the treatment volume was 20 pounds. Weekly vapor sampling indicated that at least 175.6 pounds of CVOCs were removed by the ERH operations. A total of 61 confirmatory soil samples were collected at 40 locations within the treatment area. Sampling indicated that the concentration of each CVOC had been reduced to below its clean-up criteria. Additionally, concentrations of the CVOCs in all but 11 of the 61 soil samples were below analytical detection limits.

During post-ERH sampling, soil samples from outside the northern perimeter of the ERH treatment area were analyzed for CVOCs. Results indicated that a small area to the north of the original treatment volume contained PCE concentrations in excess of the site cleanup goal. As a result, TRS installed four electrodes in this area and reduced PCE concentrations by at least 98.5%.

The cleanup goals for both areas were met on time and on budget.



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