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**Guaranteed Remediation Certainty
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Project Example

Full Scale Remediation of Volatile and Semi-Volatile Organic Compounds using Electrical Resistance Heating, Washington, NC

Contracting: Fixed Fee Per Task

Contaminants Treated: Total VOCs including Benzene, Carbon Tetrachloride, Chloroform, 1,2 Dichloroethane (DCA), 1,1 Dichloroethene (DCE), cis-1,2-DCE, Ethylbenzene Tetrachloroethene (PCE), 1,1,1-Trichloroethane (TCA), 1,1,2-TCA, Trichloroethene (TCE), Vinyl chloride

Technology Applied: Electrical Resistance Heating (ERH)

Geology: Silts and clays.

Hydrology: Groundwater at 4 feet bgs.

Treatment Interval: 2 to 14 feet bgs.

Beginning Contaminant Levels: Total VOCs 56,437 µg/kg; Average VOCs 4,031 µg/kg

Average % Reduction Achieved: 80% and 95% reductions in average total VOCs in soil and groundwater, respectively.

Remediation Time Period: December 2003 – July 2004

Project Reference: Mr. Brett Berra, URS Corporation (919) 461-1290

Background

TRS used ERH to accomplish the *in situ* thermal remediation of VOC's at the Hamilton Beach Proctor Silex (HBPS) Facility, Washington, North Carolina. TRS performed this remediation project as a subcontractor to URS Corporation (URS) under a fixed price contract. The ERH technology was utilized as the first phase of a correction action to reduce the contaminant concentrations in the source area and to preclude further migration of contaminants from the source area soils to the surrounding groundwater.

Located near the southeast corner of the plant building, the ERH system was installed to treat the subsurface interval from 2 to 14 feet below ground surface (bgs). The selected treatment area measured 90 feet wide by 155 feet long. At a target treatment interval covering 12 feet, the projected treatment volume was 154,000 cubic feet or 5,600 cubic yards. Figure 1 is a picture of the site.

Initial maximum and average concentrations for total VOCs in soil were 20,915 ug/kg and 4,031 ug/kg, respectively. The goal of the remediation was to remove the source of the contaminant and eventually achieve MCLs after polishing agents were implemented. Soil samples were taken from 7 locations using direct push technology. Soil sampling was performed within an hour of stopping subsurface heating and samples were removed from two subsurface intervals (3-4, and 8-9 feet below original grade surface) at each TMP to monitor unsaturated and saturated soil concentrations.



Figure 1. Site Picture

Operations

TRS was responsible for the design, construction and operation of the full-scale ERH remediation system. The ERH system included a total of 62 electrodes, 22 vapor recovery points from 1-3 feet bgs co-located with each electrode inside the building. In addition, two ground rod clusters were installed in the boiler room in the building. The 38 electrodes outside the building did not have co-located vapor recovery points; instead, 250 feet of horizontal vapor recovery screens were installed through out the electrode field. The site plot plan is presented as Figure 2.

Uniform increases in subsurface temperatures in the remediation area are illustrated in Figure 3. The subsurface design temperature was achieved rapidly. Within a couple of weeks from the beginning of ERH operations the depressed boiling point of VOCs was achieved (87°C).

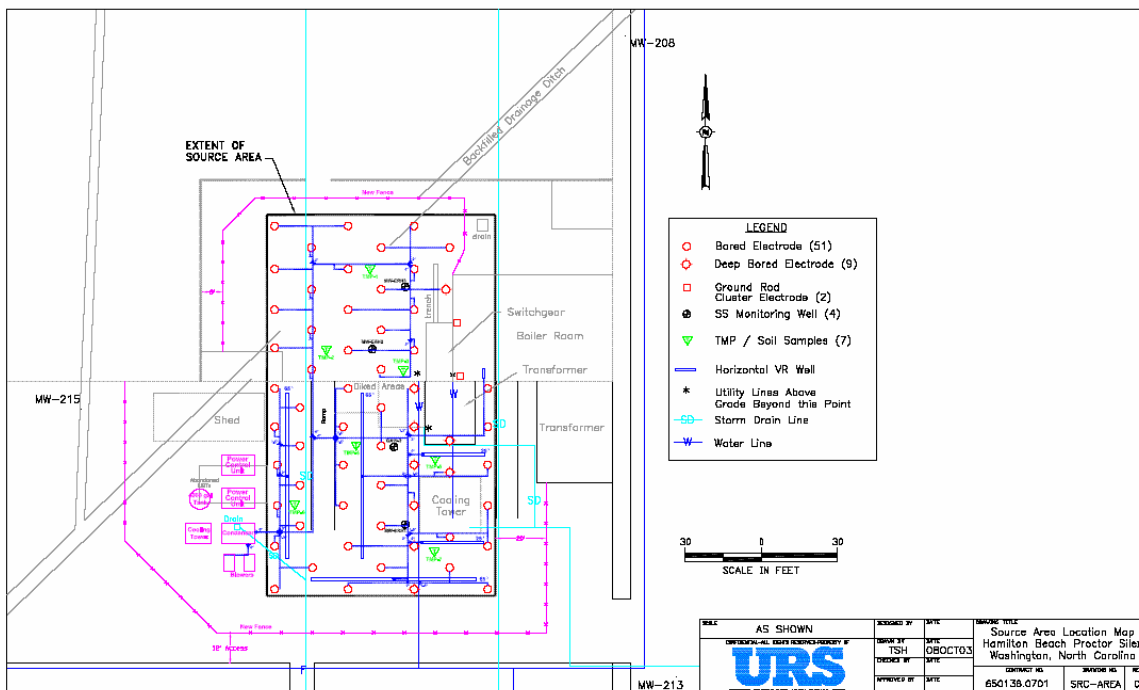


Figure 2. Electrode and Conveyance Piping Locations Installed Below the Alley

Results

Following 238 days of ERH operations, confirmatory soil samples were taken and 12 of the 14 sample intervals had achieved a reduction of 97% or better. The estimated contaminant mass removed via vapor recovery totaled 5,249 lbs compared to a pre-remediation estimate of 762 lbs. The decision to stop the ERH system was based on reaching the point of diminished return of contaminant mass removal.

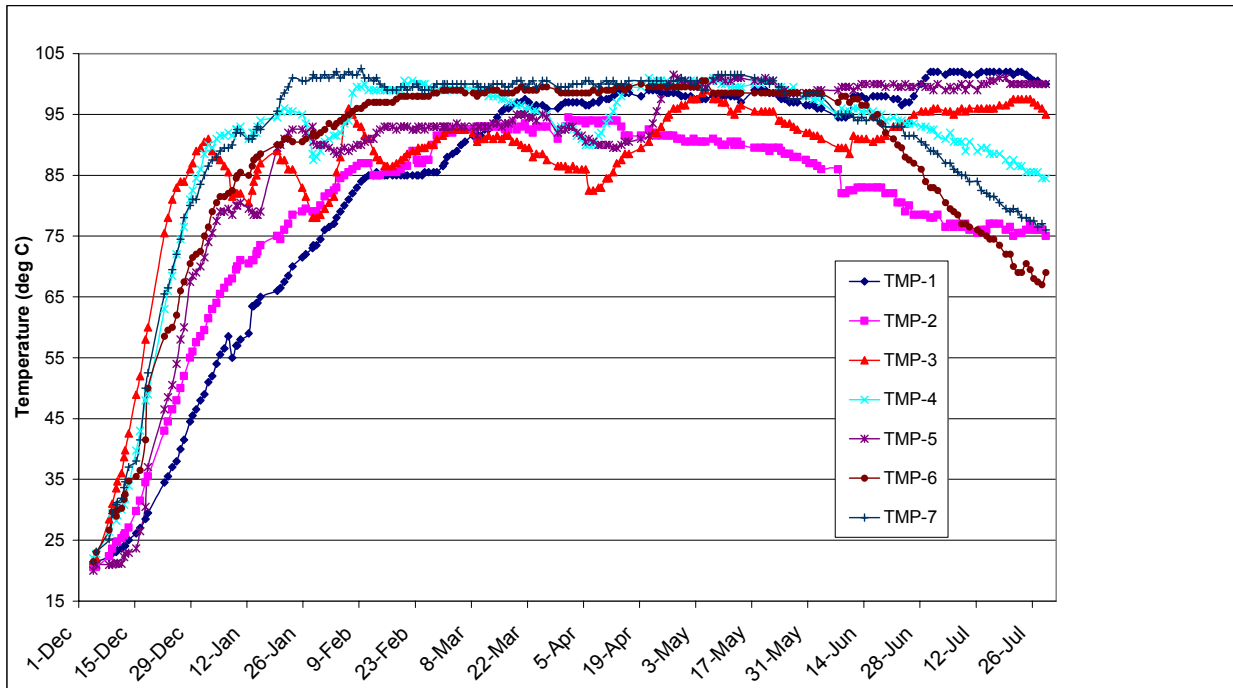


Figure 3. Subsurface Temperature at Depth Over Time

Figures 4 and 5 illustrate the concentrations of total VOCs (ppb) in groundwater and soil before and after the ERH remediation. The average reductions in total VOCs in groundwater and soil was 95% and 80%, respectively. The soil average for total VOCs was distorted by the elevated concentration in sample location TMP 5-3-4 following ERH.

Following the ERH remediation, URS implemented a polishing regimen to enhance the continued reduction in total VOCs to reach the federal MCLs.

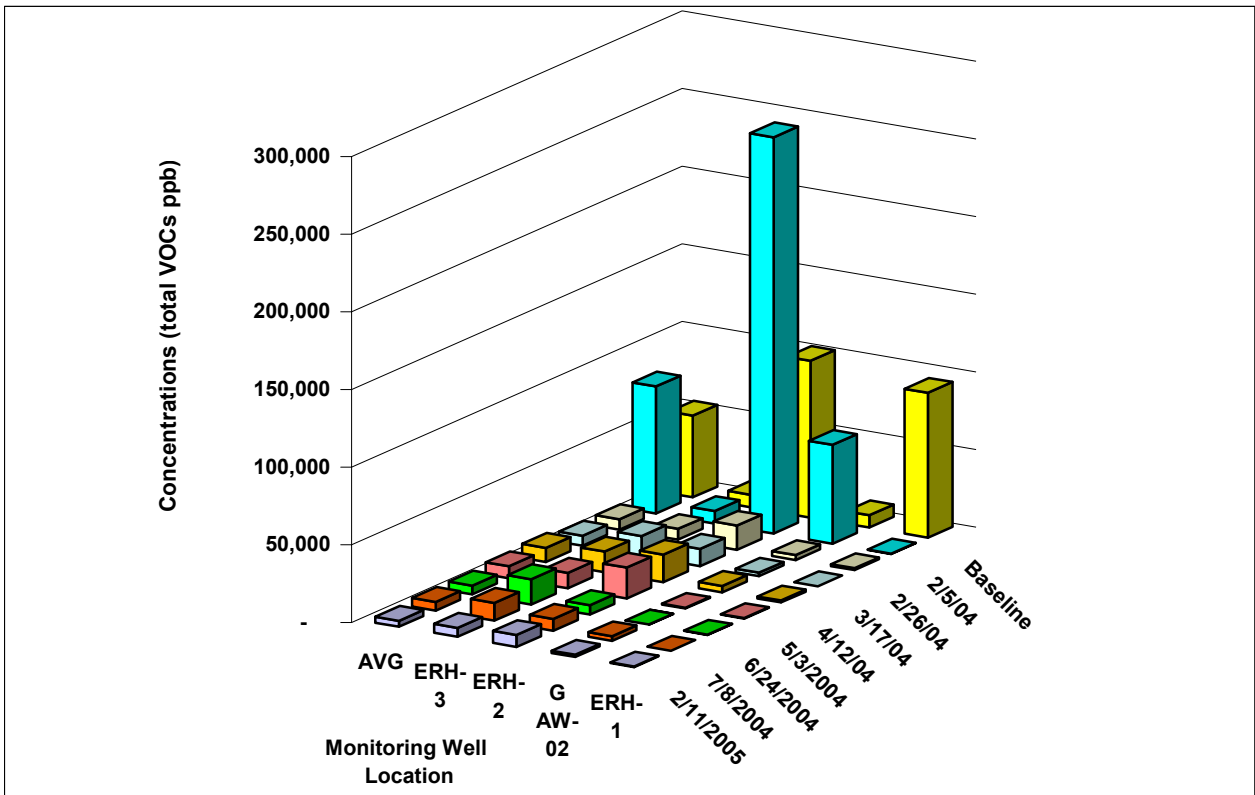


Figure 4. Total VOCs in Groundwater Before and After ERH

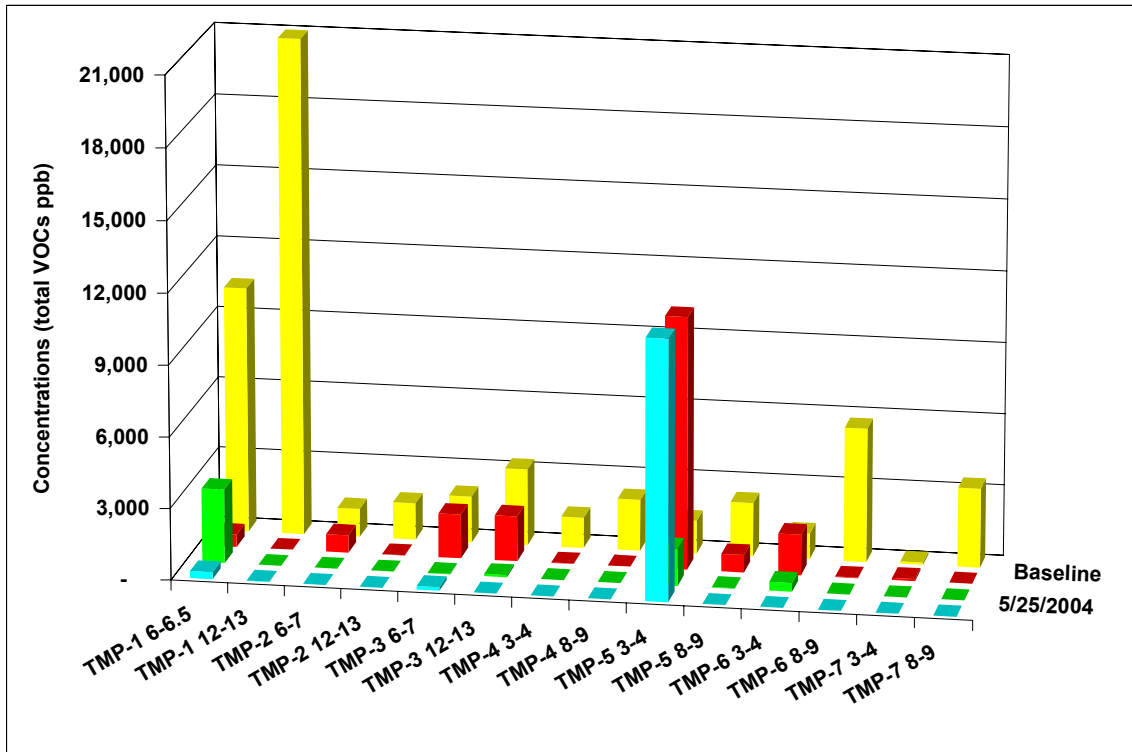


Figure 5. Total VOCs in Soil Before and After ERH