

Thermal Remediation in Low-Permeability Materials

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Background/Objectives. The thermal technologies thermal conductive heating (TCH), electrical resistance heating (ERH) and Steam enhanced Extraction (SEE) are all effective source zone technologies. Specifically for low-permeability materials like silts, clays and fractured bedrock, TCH and ERH are the go-to thermal technologies.

Approach/Activities. This presentation will provide an introduction to the thermal technologies and sweet spot applications for implementing thermal remediation projects in low-permeability materials. An introduction will be provided to the removal mechanisms that govern mass removal in tight geologies.

Results/Lessons Learned. A case study for a full-scale thermal remediation of a brownfields site near San Francisco, California where TCH was used for treatment of chlorinated solvents in a tight clay below the water table will be presented. The site had contaminants in concentrations indicating that a tetrachloroethene (PCE)-rich DNAPL was present. A target volume of 5.097 m³ of subsurface material to a depth of 6.2 m was treated for a period of 110 days of heating. Energy was delivered through 126 thermal conduction heater borings, and vapors were extracted from a combination of vertical and horizontal vacuum wells. The PCE concentration in the clay was reduced from as high as 2.700 mg/kg to an average concentration of 0.012 mg/kg during thermal operations corresponding of a reduction of >99.999%.