Challenges of Thermal Remediation at Two Waste Oil Superfund Sites

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Thermal remediation was the chosen remedy for light nonaqueous phase liquids L(NAPLs) at two waste oil Superfund Sites in Region 1. Although there were some similarities in the wastes that were to be recovered at the two sites, differences in the site characteristics lead to different thermal approaches. Some challenges, such has how to determine the area to be treated, are common to both sites, however, other unique challenges were encountered at the two sites which had to be overcome to meet the remedial goals. The thermal treatment at both sites has been completed and successfully met the remedial goals.

The NAPL contamination at the SRSNE site was contained in low permeability soils and estimates of the contaminant mass were as high as one million pounds. Due to the low permeability soils, thermal conductive heating (TCH) was the chosen thermal technology. This technology results in the contaminants being volatilized for recovery in the vapor phase, with subsequent destruction in a thermal oxidizer. This thermal technology had the advantage that destruction of the contaminants in the thermal oxidizer significantly reduced the amount of NAPL that had to be sent off site for disposal. However, challenges that had to be overcome by the design and operation of the system included destroying the very large amount of contaminants present within the limitations of the thermal oxidizer, and condensation of contaminant vapors under the vapor barrier during winter operation. The remedial goal of removal of both mobile and residual NAPL was exceeded, as demonstrated by the fact that many of the confirmation soil samples contained significantly lower concentrations than would indicate the presence of NAPL.

At the second site, the LNAPL was contained in permeable soils over the smear zone of the fluctuating water table. One of the two LNAPL areas was partially within a landfill, with a steep slope at the northern side that lead down to a brook. Due to the permeable soils, steam enhanced extraction (SEE) was chosen as the thermal technology. This technology has an advantage with the LNAPL contaminant that the LNAPL could be displaced towards the extraction wells and recovered as a liquid, allowing more of the higher boiling point hydrocarbons to be recovered. However, separating the LNAPL from the groundwater presented a challenge, and the LNAPL then had to be sent off site for disposal. The hot groundwater that was recovered during the operations contained high amounts of naturally occurring arsenic and bromide, which then had to be treated to meet maximum contaminant levels (MCLs) before the groundwater could be reinjected.

This presentation will describe the salient features of each of the sites and the chosen remedial technologies, the challenges encountered at each site, and how these challenges were successfully overcome.