Making the Case for Monitored Natural Attenuation at a High Profile VOC CERCLA Site in California

Anja Verce (av@weiss.com) and Mary L. Stallard
(Weiss Associates, Emeryville, California, USA)

Background/Objectives. Soil and groundwater at an industrial site in California have been affected by unintended releases of chlorinated and aromatic volatile organic compounds (VOCs) since 1965.
Contaminants consist primarily of trichloroethene (TCE) and its degradation products, cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride, as well as ethylbenzene, xylenes and toluene. Aggressive source removal was conducted in the early 1980s with the excavation of over 4,000 cubic yards of impacted soil and the installation of a groundwater extraction and treatment system (GWETS). Between 1982 and 2005, approximately 79 million gallons of groundwater and 2,000 pounds of VOCs were removed by the GWETS. In 2005, the GWETS was suspended and an enhanced reductive dechlorination (ERD) pilot test was initiated. Between 2005 and today, the VOC mass removal and mass flux reductions achieved by ERD are greater than those achieved by GWETS, suggesting that the site may be ready to transition to monitored natural attenuation (MNA). However, the feasibility and regulatory acceptance of MNA as a remediation strategy ultimately rests upon demonstrating contaminant degradation under "non-enhanced" site conditions. These evaluations are being challenged because key wells at the downgradient portion, and near the center of the plume, are still being affected by ERD.
Therefore, this paper presents the specific analyses conducted to support MNA as an effective remedial strategy and follow up to decades of active remediation.

Approach/Activities. The critical factors that are being evaluated to support MNA include:

(1) Whether the contaminants are likely to be effectively removed by natural attenuation processes; (2) the ground water plume's potential for migration; and (3) the potential for unacceptable risks to human health or the environment. Over 40 monitoring wells are being included in the MNA evaluation with over 20 years of collected groundwater data. Specific data evaluations being conducted include:
(1) concentration trend analysis for total VOCs, TCE, cis-1,2-DCE and vinyl chloride over time and over distance; (2) area and mass comparisons based on current and historical isoconcentration contours for TCE, cis-1,2-DCE and vinyl chloride; and, (3) mass flux and mass discharge calculations over time for the site boundary. In addition, indoor air samples have been collected at the site that show VOC concentrations are below their respective USEPA action levels, indicating that vapor intrusion is not a health risk.

Results/Lessons Learned. Since the shutdown of the GWETS and implementation of ERD, the groundwater plume has receded, as indicated by decreased total VOC concentrations in all downgradient site boundary wells, and concentrations in most plume wells have declined. Concentration trends in wells not affected by ERD indicate that MNA may be an effective remedial strategy for the site. However, because key wells in the downgradient and central portions of the plume have been and are still affected by ERD, future behavior under MNA cannot be reliably predicted in those wells at this time and therefore, a five-year trail MNA period is being proposed during which the efficacy of MNA in these areas will be evaluated.