

Accelerated Anaerobic Bioremediation of a PCE Source Area Two Years Later at Site SS07, Dover AFB, DE

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A solvent source area (called SS07) consisting of primarily PCE and minor amounts of TCE was situated near the hazardous waste storage building at Dover AFB, Delaware. High PCE concentrations in shallow groundwater indicated a source area, although no soil contamination was ever found. The resulting downgradient solvent plume migrates off Base, a distance of 2,600 feet from the source area, with little indication of parent material degradation. The selected remedy for the site was two-pronged, focusing on the source area using accelerated anaerobic biodegradation (AAB) by direct-push injection methods to distribute substrate and nutrients and relying on natural attenuation for the downgradient dissolved plume.

A mixture of potable water, sodium lactate, emulsified vegetable oil (EVO), and diabasic ammonium phosphate (DAP) was injected into 53 locations at multiple depths in March 2006. The substrate portion of the mixture was 50 percent (by volume) of sodium lactate and 50 percent EVO. The sodium lactate is an easily degradable food source that quickly stimulates microbe growth and drives the aquifer into from aerobic to anaerobic conditions. The vegetable oil is a slower-release carbon source used to maintain the organic carbon levels in the aquifer and sustain the anaerobic environment for a longer period of time after injection. DAP provides metabolic nutrients. In total, nearly 102,000 gallons of amended water were injected into the shallow aquifer at the site.

Groundwater monitoring data have demonstrated the effectiveness of the lactate/EVO combination at Site SS07. Analytical results showed that aquifer conditions rapidly became more reducing and favorable for anaerobic biodegradation within the first month after injection. Over the longer term, favorable aquifer conditions persisted and spread. One year after injection, PCE and TCE fell below their MCLs in all site monitoring wells. Well into the second year of monitoring, organic carbon concentrations are still elevated and degradation continues. Increases in cis-1,2-dichloroethene and vinyl chloride concentrations are observed and ethene is found in all site wells providing evidence that complete anaerobic degradation is occurring.