Optimization of a Source Area Remedy Using SVE and ERD

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Background/Objectives. Hill Air Force Base (AFB) in northern Utah has been the site of military activities since 1920, including distribution of military equipment, aircraft rehabilitation and maintenance, and missile assembly. Industrial operations have generated spent chemicals and wastes, including chlorinated and non-chlorinated solvents and degreasers, petroleum hydrocarbons, acids, bases, metals, and other chemicals. As part of an 8-year performance-based remediation (PBR) contract at Hill AFB, Jacobs is helping the Air Force systematically accelerate progress toward site closeout, while moving toward a greener and more sustainable remediation approach that reduces remediation life-cycle costs. This approach includes optimized treatment within source areas and plume hotspots, which will eliminate dependence on pump-and-treat remedies and reduce projected plume restoration time frames by several decades.

This work includes Operable Unit 12 (OU 12), which consists of an on-base trichloroethene (TCE) source area and a TCE groundwater plume that extends several miles off-base. Contaminated groundwater is hydraulically contained at the base boundary by an extraction system installed in April 2003 and expanded in 2009. The system has successfully contained groundwater contamination at the base boundary; however, it has consumed approximately half a million kilowatt-hours of electricity and produced 130 million gallons of groundwater for treatment at the local publicly owned treatment works. As part of the PBR contract, Jacobs is implementing aggressive source area treatment to eventually eliminate the need for hydraulic containment.

Approach/Activities. Jacobs is treating both the vadose zone and saturated zone in two portions of the on-base source area at OU 12. In October 2015, Jacobs implemented a soil vapor extraction (SVE) and enhanced reduction dechlorination (ERD) treatability study. The SVE systems operated for five months, followed by periodic rebound testing over eight months. The ERD treatments consisted of organic carbon substrate injections into series of injection wells, with repeated injections as needed over the two-year duration of the study. These treatability studies have supplemented a concurrent optimization of the groundwater extraction system, in which extraction wells that are no longer needed have been deactivated.

Results/Lessons Learned. Although mass removal was not a goal of the hydraulic containment system, approximately 50 pounds of TCE were extracted by the hydraulic containment system over 14 years. Five months of SVE operation is estimated to have removed almost 400 pounds of TCE; an order of magnitude more than that removed during 14 years of groundwater extraction operations. The removal of TCE mass from the vadose zone, in conjunction with previous source removal efforts, is expected to significantly reduce contaminant loading into the saturated zone in the source area. The ERD treatment reduced TCE concentrations in groundwater within the source area treatment zone by approximately 90 percent. TCE concentrations upgradient of the system are now less than TCE concentrations in the downgradient plume. The accelerated source area treatment will significantly reduce cleanup time-frames and reduce life-cycle costs at OU 12, meeting the goals of this work.