Demonstrating Successful Performance of ERD Treatment at Multiple Sites at Hill Air Force Base, Utah

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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. Since 1984, the Air Force has committed significant resources to assess and remediate environmental contamination. Today, restoration work at Hill AFB is organized into 15 operable units (OUs), based on geography, hydrogeology, and contaminated media.

Ten of the 15 OUs involve chlorinated solvents plumes, some extending up to several miles off base. To contain these plumes, hydraulic or physical containment systems have been installed at many OUs and extensive groundwater monitoring networks are in place. This paper discusses part of the remedy optimization program to accelerate progress toward site closeout; including enhanced reductive dechlorination (ERD) treatment at 11 plumes.

Approach/Activities. As part of an 8-year, performance-based remediation contract, 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 treating source areas and plume hotspots by in situ bioremediation, to eliminate dependence on pump and treat remedies and reduce plume restoration time frames by several decades. At most sites, emulsified vegetable oil substrate has been injected at low pressures into 2-inch injection wells (almost 200 total). Between sites, hydrogeologic conditions vary from predominantly fine-grain (mostly silty clay with fine sand layers and laminae) to more heterogenous conditions (clay, silt, and medium and coarse sands).

Results/Lessons Learned. This presentation describes the performance of these efforts in terms of approach to measuring performance, variations in site conditions, substrate delivery methods and challenges, and geochemical conditions created. Performance has been monitored using injection row/biobarrier performance monitoring wells, with mean percent reductions of primary contaminants (perchloroethene [PCE] and/or trichloroethene [TCE]) reported in performance models. Aerobic baseline conditions with minimal total organic carbon concentrations have been flipped to anaerobic conditions conducive to ERD. Generally, sites with PCE or TCE concentrations greater than 100 micrograms per liter have been bioaugmented. Overall, in 2 to 3 years, an order of magnitude reduction in primary contaminants has been achieved in a variety of hydrogeologic conditions across the portfolio. Little rebound has been observed where conditions conducive for ERD have been maintained for an extended time.