A pilot scale field demonstration of dense non-aqueous phase liquids (DNAPL) treatment using emulsified zero-valent iron (EZVI) was conducted at Parris Island Marine Corps Recruit Depot (MCRD), Parris Island, SC. The EZVI technology was developed at the University of Central Florida and the National Aeronautics and Space Administration (NASA) as a treatment technology for DNAPLs in the subsurface. EZVI consists of a surfactant-stabilized, biodegradable emulsion that forms emulsion droplets composed of an oil-liquid membrane surrounding micro- or nano-scale zero-valent iron (ZVI) particles in water. The emulsion droplets enhance contact between the ZVI and the DNAPL. The ZVI provides rapid abiotic degradation of the DNAPL constituents and the oil provides an immediate sequestration of the DNAPL constituents as well as a long-term electron donor source to enhance further biodegradation.

The location of the field demonstration at Parris Island MCRD is a former dry cleaning facility. The demonstration consisted of two side-by-side treatment areas to evaluate the performance of nano-scale EZVI to remediate a shallow (<20 ft) tetrachloroethene (PCE) DNAPL source area and to evaluate two injection technologies for EZVI, pneumatic injection and direct injection using a direct push rig. Soil and groundwater samples were collected from the site in June 2005 to assess contaminant distribution within the treatment areas, and a network of performance monitoring wells was installed at the site in June 2006. Groundwater samples were collected prior to EZVI injection to establish baseline conditions for the demonstration. EZVI was injected into the treatment areas in October 2006, after which point performance monitoring was initiated and conducted periodically until March 2009 when a final set of groundwater and soil samples were collected to establish post-demonstration conditions. Results showed a significant decrease in PCE and trichloroethene (TCE) downgradient of the treatment areas following EZVI injection, with an increase in degradation products including significant increases in ethene indicating complete degradation. A description of the pilot test set up and EZVI injection will be presented. Information on the evaluation of the injection technologies and the results of performance monitoring will also be presented.

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