US Army Corps
of Engineers
Omaha District

Corps Uses Permeable Barrier Wall to Destroy TCA

A permeable reactive barrier (PRB) containing zero-valent iron was installed at the former fire training area at Shaw AFB, S.C. It served to remediate groundwater contaminated with trichloroethane (TCA) and other chlorinated solvents. The PRB project, from conceptual design to construction, was completed in six months, and was installed at a cost equal to that of a pump and treat system. Lifetime operation and maintenance costs of the PRB are projected to result in a savings of nearly $2 million.

From 1941 to 1969, the Base fire department conducted fire protection training exercises within the current limits of the project site. Various types of combustible waste chemicals were burned during routine exercises, including waste oils, waste aviation fuel, jet fuel and solvents. Unburned liquids quickly infiltrated into the sandy site soils and into the underlying groundwater. Remedial investigations showed the principal contaminants of concern included TCA, dichloroethene (DCE), dichloroethane (DCA) and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) compounds. Contaminants were distributed in elongate plumes parallel to groundwater flow.

The South Carolina Department of Health and Environmental Control (SCDHEC) ordered the Base to implement an interim measure at the site to prevent further contamination. The conceptual design was for a pump and treat system to recover groundwater, treat via air-stripping and discharge as surface water. However, through bench-scale testing during pre-design activities, it was determined that air-stripping alone did not provide sufficient treatment to meet National Pollution Discharge Elimination System toxicity requirements. Ultimately, the protective barrier wall option was selected.

PRB's are being used at an increasing number of sites to remediate groundwater contaminated with halogenated volatile organic compounds. The technology consists of installing zero-valent iron into a cross section of contaminated groundwater. The zero-valent iron breaks and destroys the chemical bonds of various chlorinated volatile compound molecules, converting them to water, carbon dioxide and chloride.

A faster implementation, greater rate of mass reduction/removal, and lower lifetime costs were primary advantages of PRB over a traditional pump and treat system. Although a final analysis cannot be completed until steady-state conditions are achieved, performance of the PRB, based on three quarters of data, shows that the majority of contaminants are being degraded within the PRB treatment zone as expected.

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Respected ● Responsive ● Reliable