Using a Treatment Train to Optimize DNAPL Source Zone Remediation

Paul J. Favara (pfavara@ch2m.com)(CH2M HILL), Gainesville, Florida, U.S.A., Michael A. Singletary (Naval Facilities Engineering Command) Charleston, South Carolina, U.S.A., and Steve Tsangaris (CH2M HILL), Tampa, Florida, U.S.A.

Many DNAPL sites have been treated using innovative source reduction technologies, such as in situ chemical oxidation (ISCO). Although individual technologies can be successful in removing significant mass from a DNAPL source, rarely, if ever, will implementation of a single technology allow a site manager to achieve site closeout. More often, a combination of technologies sequenced throughout the life cycle of a project is used to meet remedial action objectives. An example of the need for a treatment train approach is when ISCO is used for source treatment purposes. When ISCO was an emerging technology in the mid to late 1990's, it was considered feasible to remediate DNAPL sites successfully and achieve a high level of source area reduction. However, post-remediation monitoring of these sites often shows a rebound of contaminant concentrations over time. As a result, many of these sites often have to be re-engineered or optimized to define the next course of action.

The subject site of this paper is the former Naval Training Center (NTC) Orlando, Study Area 17 (SA-17). The 25 acre-site was a former motor pool storage area. DNAPL migrated into the saturated zone throughout the surficial aquifer to depths up to 40-feet below ground surface. Trichloroethene (TCE) was the predominant compound detected in groundwater, with a maximum concentration of 65,000 µg/L.

ISCO, using Fenton's Reagent, was selected as an interim remedial action to reduce TCE concentrations. While the ISCO application proved to be effective in reducing TCE and total CVOC concentrations in overall groundwater, contaminant rebound was observed in the source area.

This paper describes the remedial process optimization (RPO) approach used to assess the effectiveness of ISCO and describes the development of a treatment train approach designed to meet remedial action objectives (RAOs) and to protect human health and the environment. The RPO process follows recent Navy policy, which requires optimization studies during the design, construction, operation, and long-term monitoring of environmental restoration sites. The optimization process included: 1) refinement of the conceptual site model based on data collected during additional source area investigations, 2) re-evaluation of remedial action objectives with the regulatory agencies, 3) definition of the target treatment zones, 4) evaluation of technologies capable of meeting RAO's in the target treatment zones including the downgradient portion of the contaminant plume, 5) development of performance objectives to be achieved by the selected remedy, and 6) development of a strategy for achieving site closeout.