

Challenges in Monitoring the Short-Term and Long-Term Performance of DNAPL Remediation Technologies

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Preliminary site characterization at Launch Complex 34 (LC34), Cape Canaveral Air Station, Florida showed the presence of chlorinated volatile organic compounds (CVOCs), primarily trichloroethylene (TCE), associated with the soil and groundwater. The high CVOC concentrations indicated the presence of dense non-aqueous phase liquid (DNAPL) and detailed characterization of the DNAPL source zone was subsequently conducted. Three remedial technologies – oxidation, resistive heating, and steam injection were applied to adjacent treatment plots within the source zone. There are four challenges in monitoring the performance of remedial actions at DNAPL sites that had to be addressed at LC34:

1. Characterizing the hydrology and chemistry of the aquifer adequately to enable effective and economical application of remedial actions;
2. Monitoring the progress of the remedial technology and potential for DNAPL migration from the treatment zone;
3. Characterizing the chemistry of the aquifer following the remedial action to evaluate short-term soil and groundwater quality improvements; and
4. Monitoring the long-term effectiveness of the remedial action in terms of potential for contaminant rebound and plume generation.

At LC34, soil coring and well clusters were used to identify and define the DNAPL source zone for remediation. The number and locations of the soil cores were determined on a statistical basis using TCE concentration variances obtained from the preliminary site characterization. Soil coring was repeated following the remedial actions and the results were evaluated statistically. Groundwater and surface emissions monitoring was conducted periodically during the remedial actions to determine remediation progress and potential for contaminant migration. Additional monitoring of soil and groundwater was conducted selectively for the next one year to determine long-term effectiveness. This project was conducted as part of a demonstration of DNAPL remediation technologies organized by the Interagency DNAPL Consortium (IDC), a group consisting of the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), U.S. Department of Defense (DoD) and National Aeronautic and Space Administration (NASA).