TechData Sheet

Naval Facilities Engineering Service Center
Port Hueneme, California 93043-4370

TDS-2052-ENV **April 1998**

Assessment and Remediation Technologies for Environmental Cleanup

High Resolution, Electromagnetic Resistivity Surveys for 3-D Imaging of DNAPL Contamination

The Naval Facilities Engineering Service Center (NFESC) and the Environmental Security Technology Certification Program (ESTCP) are testing three-dimensional (3-D) electromagnetic resistivity (EMR) methodology to determine whether it can detect dense non-aqueous phase liquid (DNAPL) contamination. This demonstration project is being performed under the Broad Agency Announcement (BAA) Program for innovative remediation and assessment technologies.

DNAPL is a common contaminant found during environmental clean up operations. Since DNAPL will sink below the groundwater table, these sites are difficult to clean up.

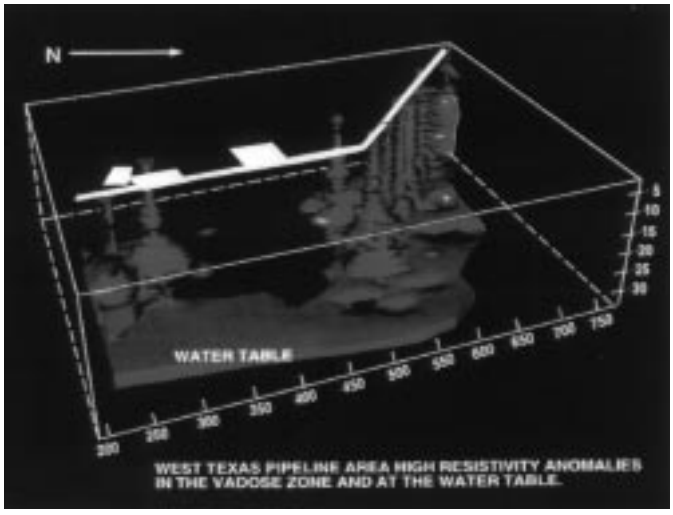

Figure 1. DNAPL areas (in red) detected by an EMR survey.

While traditional drilling methods have been prone to spread DNAPL contaminants and cannot provide a detailed image of the plume, EMR surveys can generate a 3-D image of subsurface contaminants using existing monitoring wells and will not create any additional waste (see Figure 1).

EMR Surveys

EMR technology has been used successfully for exploring natural resources since the 1960s. Recent advances in instrumentation have allowed this technology to be used for environmental sites.

The EMR survey uses an above-surface source coil to induce a low frequency magnetic field below the source coil location (see Figure 2). The field is detected by the

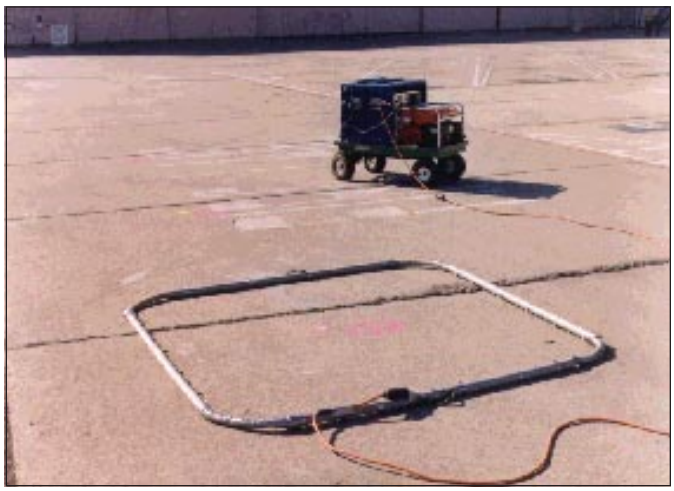

Figure 2. EMR source coil and frequency generator.

EMR receiver, which is located in a well hole. The receiver is moved vertically up the well as it measures the field strength at 0.1 foot intervals. This provides a large number of data points that can be compiled to create an image of high resistivity anomalies. Since DNAPL has a much higher resistivity that the surrounding soil, it can be identified (see Figure 3).

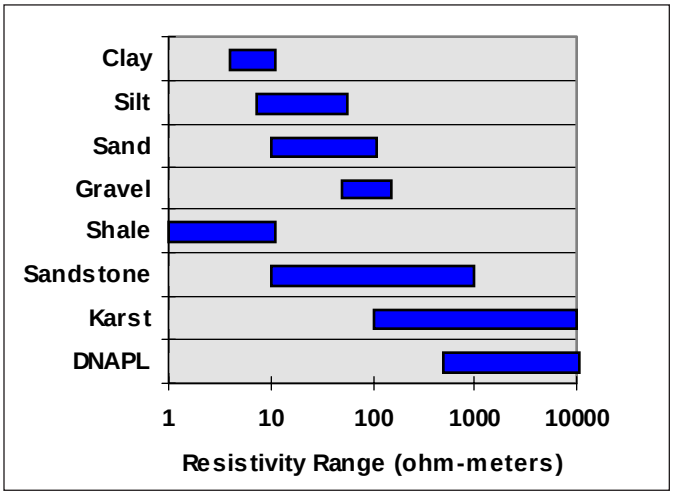

Figure 3. Saturated subsurface resistivity values.

This process is repeated with the source coil situated at other grid points. Data can be collected with the receiver lowered into a monitoring well up to 300 feet. The source coil can be located up to 300 feet away from the well (see Figure 4).

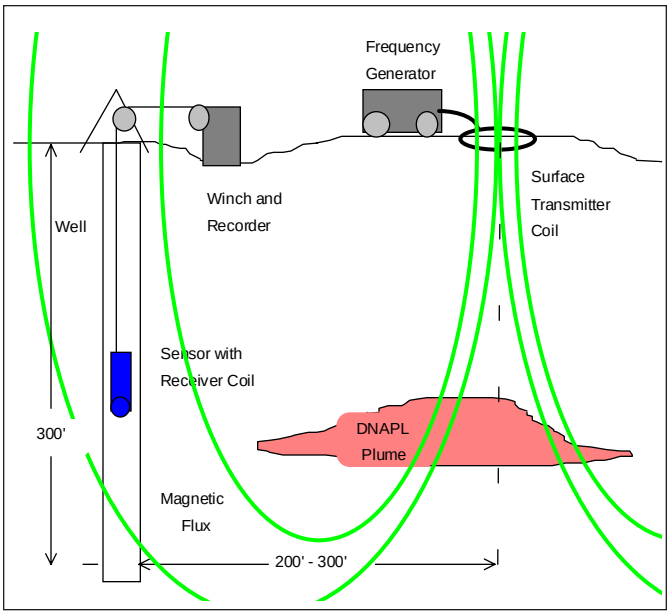

Figure 4. EMR data acquisition.

BAA Field Demonstration Program

NFESC is demonstrating innovative remediation and assessment technologies that are ready for field demonstration. These projects are being performed under the Broad Agency Announcement (BAA) Program.

The Environmental Security Technology Certification Program (ESTCP) is providing funding for the EMR demonstration.

Field Demonstration

A saturated sediment site in California and a sandy shale pit in Oklahoma with documented DNAPL contaminated was selected for this demonstration.

The goals of the demonstration program are to predict the location and volume of DNAPL at each site. After each EMR survey is completed, the target areas will then be investigated using conventional drilling and sampling methods to validate the accuracy of the EMR surveys. It is hoped that EMR surveys will be able to locate DNAPL at concentrations as low as 100 ppm.

The first project is being held in California and will be completed in the Fall of 1998.

For more information on EMR, contact:

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