

# NAS NORTH ISLAND - NAVY REGION SOUTHWEST NAVY ENVIRONMENTAL LEADERSHIP PROGRAM

## CLEANUP

### ELECTROMAGNETIC OFFSET LOGGING

#### LEAD ACTIVITY

Naval Aviation Depot (NADEP) North Island

#### STATUS

Complete

#### MISSION

Define hydrocarbon plumes in the subsurface using surface to borehole geophysics

#### REQUIREMENT

Petroleum-contaminated sites are typically characterized using conventional methods that include drilling boreholes and collecting soil and groundwater samples. In most cases, substantial costs are associated with collecting data using these methods. A technology is required to minimize the number of boreholes while providing sufficient data to delineate the contaminated area.

#### DESCRIPTION

NADEP at Naval Air Station (NAS) North Island evaluated the performance capabilities of electromagnetic offset logging (EOL). Tetra Tech EM Inc. (Tetra Tech), formerly PRC Environmental Management, Inc., conducted a field demonstration of GEHM Environmental's (GEHM) EOL technology in the vicinity of Buildings 379 and 397 to delineate the northern and eastern boundaries of a petroleum product plume. GEHM Environmental, a division of the GEHM Corporation is the sole provider of the proprietary EOL technology. This EOL technology uses surface to borehole geophysics

to provide volume and location estimates of contaminants that can be used for remediation design. In an induction electrical resistivity survey, an electric current is passed through the ground. Various soil types and contaminants conduct and resist these electrical currents differently. Petroleum products are highly resistant to these electrical currents.



Processing Data in the Field

The EOL technology records locations within a survey area that exhibit highly resistive measurements, thereby defining a plume. In general, higher petroleum contaminant concentrations will be represented by higher resistivity values; however, this relationship may not always be linear due to changes in geology and fluid chemistry from point to point. Therefore, EOL results must be interpreted within the context of the site geology and hydrogeology. After the data are gathered, they are processed into a three-dimensional representation of the underground petroleum contamination. The EOL technology was demonstrated at NAS North Island in October 1996 to identify the presence of petroleum contamination at the Buildings 379 and 397 study area at the NADEP. The data were collected and processed in the field through integrated voltage output, plotting, and review of field records of the output for field quality control. GEHM then conducted a proprietary analysis of the field data.

The objectives of the demonstration were (1) to reduce or eliminate the need to drill inside Building 379 and to minimize the number of proposed additional boreholes on the northern and eastern sides of Building 379; (2) to collect spatial resistivity evidence of hydrocarbon contaminants for use in remediation design; (3) to test the EOL process for its applicability in delineating LNAPL (light non-aqueous phase liquids) plume boundaries; and (4) to compare the costs of traditional drilling methods to a combined approach of using the EOL process to screen untested areas before using traditional drilling and sampling techniques.



EOL Equipment Installed in Monitoring Well

The EOL data were compared to actual site data by OHM Remediation Services Corporation (OHM) to determine the accuracy of the EOL data. The EOL data suggested that there was no free product under Building 379. However, actual site data obtained in June 1997 indicated the presence of free product under the building. Interference from surrounding buildings and subsurface structures may have been the cause of the inaccurate readings.

## **BENEFITS**

- Even though the EOL did not accurately indicate the presence of free products, it could substantially reduced time and costs over conventional intrusive site characterizations since it reduces the number of wells or boreholes required
- Non-intrusive methods are used for initial site characterization

## ACCOMPLISHMENTS/CURRENT STATUS

Date	Activity
OCT 1996	EOL demonstration conducted; GEHM prepared EOL 3-D resistivity survey report
NOV 1996	Data collected and three-dimensional report was generated; Tetra Tech issued EOL demonstration evaluation report
APR 1997	Additional site characterization was conducted using conventional site assessment techniques
OCT 1997	Results of site characterization performed were compared with the EOL survey findings

## FUTURE PLAN OF ACTION & MILESTONES

Not applicable

## COLLABORATION/TECHNOLOGY TRANSFER

The EOL technology is applicable to other sites with light non-aqueous phase liquid (LNAPL) plumes and with some limited background information available. Characteristics of a site where the EOL technology would be useful include a site with access limitations, utilities that prevent traditional drilling and sampling, a site with relatively low electrical noise, or large LNAPL plume. The EOL technology is currently being used for DNAPL (dense nonaqueous phase liquids) detection at NAS Alameda, California; Tinker Air Force Base, Oklahoma; Letterkenhy Army Depot, Pennsylvania; and Allegheny Ballistic Laboratory, Virginia.

## BIBLIOGRAPHY

- Tetra Tech EM Inc. (formerly PRC Environmental Management, Inc.)  
Electromagnetic Offset Logging at Naval Aviation Depot Buildings 379 and 397.  
25 November 1996.

## RELATED GOVERNMENT INTERNET SITES

None available

## RELATED NAVY GUIDEBOOK REQUIREMENT

Not applicable

*UPDATED: 01/23/02*