RPM News

▲ Remedial Project Manager News ▲

"Communicating Navy Installation Restoration Program News and Information Among All Participants"

Winter 1998

Naval Facilities Engineering Service Center

NFESC

"IMAD" Team

Information Management and Distribution

Southwest Division Naval Facilities Engineering Command reorganized last year. One of the positive changes coming out of our reengineered organization is the work being done by the Information Management and Distribution (IMAD) Team. They came into being when the command recognized that it had no formal processes in place to ensure proper records management; i.e., a system where appropriate records are created, maintained, retrieved, and disposed of in accor-

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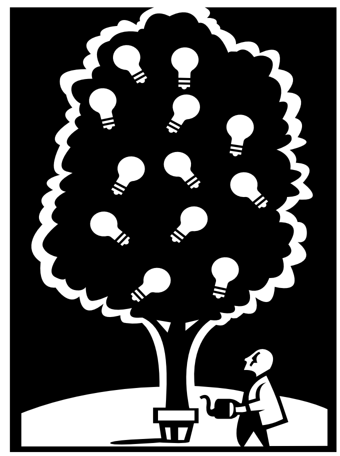
Remediation Technology Decision Trees

New Technology Selection Decision Trees Being Developed for Cost-To-Complete



The Naval Facilities Engineering Service Center will soon begin work on developing a new approach to selecting remediation technologies for the Navy's Cost-To-Complete (CTC) budgeting system. Remediation technology decision trees will be developed which are based upon contaminant and media, rather than by site-type which is the present methodology in CTC. Many additional innovative technologies will be included in the new trees, and unit costs for will be developed each added technology.

This approach is much more direct, since technology selection is more directly related to contaminant and affected media, and less upon site-type. The current approach of selecting technologies according to site-type or generating user-defined treatment trains by selecting technologies from drop-down pick-lists will still be retained to allow for maximum flexibility in building a budget.

Questions or comments can be directed to:

NFESC, Code 414RN
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RPM NEWS

Remedial Project Manager News

Published By

NFESC

Using Appropriated Funds

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Environmental Department Head:

Capt. (S) Scott Bianchi

Information Management Branch:

Mr. Tom Flor

"IMAD" Team

(continued from page 1)

dance with records management regulations and directives. The situation at that time showed that multiple files were being generated and maintained, there was excessive xeroxing, and records were being lost and improperly stored and disposed of. Retrieving information is time-consuming and expensive.

A one-week Team Building session was held with key players to better organize records management. During that week, the team worked on developing a Records Management Policy. The procedures were developed with the final goal that records would be converted to an electronic data management system (EDMS). The team also recognized that the paper records must be in order in accordance with the regulations and directives as this will be the basis for setting up the EDMS and various other standards that will be needed.

The procedures developed in the Records Management Policy have been in use by half the Command since March, with great success. Some of the teams were already using this process prior to the Team Building session. These teams did not realize that they had been using the system because it was invisible to them.

The IMAD Team was Chartered in March 1997 to accomplish the following goals:

- Develop a process for ensuring accurate distribution of incoming mail throughout the area teams in San Diego
- Develop a records management training plan with filing plans, location of files, records retention, and disposal
- Develop a statement of work for designing a records management strategy and process which allows the corporation to comply with existing records management regulations while providing timely, accurate, easy, and cost effective flow of information across the organization
- The statement of work should cover the identification of all requirements needed to support an effective records management system
- Incorporate the requirement for ISO 9000/14000 records management into the corporate records management strategy.

Team reps will be asked to provide various information to facilitate meeting the team's goals. Cooperation from all employees will help the team meet its goals in a timely fashion.

Members of the team

Chris Potter (Team Leader), Administrative Records Coordinator (SST); **Diane Silva**, Records Officer (SST); **Jim Conley**, Ops Program Support Specialist; **Laura Boschen**, Ops Logistic Support Leader; **Debbie Crayton**, BRAC; BLT - Vacant; **Jay Keyes** (Champion), Strategic Ops Officer; **Donna Tierney**, Facilitator; **Susan Sanz**, Computer Specialist; **Arneva Johnson** Housing; **Billy Brooks**, Desert; Vacant - Camp Pendleton; **Mary Gray**, South Bay; **Ana Hough**, North Bay; **Brett Fisher**, Construction; **Tom Phelps**, Real Estate; **Guadalupe Parra**, SST; Vacant - Counsel; **Bonnie Capito**, LANTDIV; **Frank Tierney**, Northwest; and **Sharon Tupasi**, Central West.

Currently, there are 3 sub-teams

1. Equipment Assessment Team

   Susan Sanz and Vivian Sanchez

   a. This Team was chartered to assess the equipment that the Command currently has available.

2. Incoming/Outing Mail Team

   Laura Boschen, Debbie Crayton, Billy Brooks, and Rebecca Musquiez

   b. Train individual's on the process' of handling of incoming and outgoing mail.

3. Series Inventory Team

   Chris Potter, Jim Conley, and Diane Silva

   c. Chartered to do a Command Requirements Analysis for records types, locations, SSIC, filing procedures being used, etc.

NAVFAC, Code 572
SouthWest Division
Pacific Coast Highway
San Diego, Ca.

CALENDAR OF EVENTS

DATE	COURSE NAME	LOCATION	PHONE
Jan 7–9	Effective Streambank Stabilization and Stormwater Channel Design	Madison, WI	(800) 462-0876
Jan 14–15	Natural Attenuation of Chlorinated Solvents in Groundwater (This course is also scheduled for mid–March in the Philadelphia, Pennsylvania area and for mid–May in the Boston, Massachusetts area)	Berkeley, CA	(916) 324-3823 (770) 242-7712
Jan 26–28	Remediation by Natural Attenuation	Madison, WI	(800) 462-0876
Feb 9–13	Advanced Borehole Geophysics	Denver, CO	(803) 883-9104
Feb 9–13	Analytical Methods to Determine Aquifer Properties	Denver, CO	(803) 883-9104
Feb 12–13	Technical Essentials for Successful Environmental Decision Making	Madison, WI	(800) 462-0876
Feb 16–18	Sanitary Landfill Design	Madison, WI	(800) 462-0876
Mar 9–11	Aboveground Storage Tank Management	Madison, WI	(800) 462-0876
Mar 9–11	Planning, Financing, & Implementing a Comprehensive Stormwater Management Program	Madison, WI	(800) 462-0876
Mar 30–Apr 1	Planning and Zoning for Community Land Use Management	Charlotte, NC	(800) 462-0876
Apr 21–22	Proving the Technical Case: Groundwater Pollution	Madison, WI	(800) 462-0876
Apr 27–29	Creating and Using Wetlands for Wastewater Disposal and Water Quality Improvement	Madison, WI	(800) 462-0876
April 27–29	Static and Seismic Slope Stability for Waste Containment of Landfills and Ponds	Madison, WI	(800) 462-0876
Apr 27–May 8	Ground and Surface Water – Quality Methods	Denver, CO	(803) 883-9104
May 4–6	Planning and Zoning for Community Land Use Management	Madison, WI	(800) 462-0876
Jun 10–12	Applied Biogeotechnology '98: Sensible Solutions to the Built Environment	Madison, WI	(800) 462-0876
Jun 15–17	Understanding Sediment Analysis and Interpretation Built Environment	Madison, WI	(800) 462-0876
Jun 17–19	Cleaning Contaminated Sediment Built Environment	Madison, WI	(800) 462-0876

BIOREMEDIATION FACILITY

MARINE CORPS AIR GROUND COMBAT CENTER TWENTY-NINE PALMS CALIFORNIA

By (MCAGCC)
(NFESC)

INTRODUCTION

The Naval Facilities Engineering Service Center (NFESC) works cooperatively with Navy and Marine Corps principals in planning and building biotreatment facilities worldwide. Through NFESC's experience, technical expertise, and research, bioremediation facility design has been significantly refined. NFESC developed plans for and actively helped to oversee construction of a temporary bioremediation facility at the Marine Corps Air Ground Combat Center (MCAGCC). MCAGCC principals extrapolated from and refined NFESC's work, by designing, and supervising the construction of an avant-garde permanent bioremediation facility. NFESC has adopted the MCAGCC design as a paradigm for future bioremedation facilities as an integral portion of the commitment to transfer innovative technologies to the field as well as the public and private sector.

PURPOSE

Bioremediation is a proven controlled ex-situ biological process where biodegradable contaminants are converted to their basic mineral constituents (water and carbon dioxide) under aerobic conditions. NFESC has successfully demonstrated that biopiles are a viable economically feasible means of reducing the concentration of petroleum constituents in excavated soils through the use of aerobic biodegradation. This article addresses the technical basis of biopile refinement resulting from pragmatic lessons learned. A step by step procedure is delimited for constructing a most efficient permanent bioremediation facility.

REMEDIATION SYSTEM DESCRIPTION AND OPERATION

Biopile technology involves forming petroleum-contaminated soils into piles or cells above ground and stimulating aerobic microbial activity within soils through aeration. Microbial activity can be enhanced by adding moisture and nutrients such as nitrogen and phosphorous. Aerobic microbial activity degrades petroleum-based constituents absorbed to soil particles, thus reducing these contaminant concentrations. Biopiles are typically constructed on an impermeable base to reduce the potential migration of leachate to the subsurface environment. A perforated piping network installed above the base is connected to a blower facilitating pile aeration. A leachate collection system is usually constructed, particularly if a moisture addition system is used. Piles are covered with an impermeable membrane to prevent the release of contaminants and/or contaminated soil to the environment and to protect the soil pile from wind and precipitation.

The permanent biotreatment facility at MCAGCC is configured hexagonally to a height of seven feet and is able to treat approximately 3,500 cubic yards of soil per treatment cycle. Liquid transfer pumps and water storage tanks were used to apply water and nutrients during pile construction. A drip irrigation system was installed to provide pile moisture as required. Throughout the treatment cycle, the aeration component of the system creates a 1–3 pound per square inch vacuum. Leachate from both the leachate sumps and pad troughs is diverted for storage and subsequently reapplied to the pile through the drip irrigation system resulting in a closed loop liquid system. Similarly, water entrained in the air is collected by the free-water knockout tank and sent to the water storage tank for recirculation.

BIOREMEDIATION FACILITY DESCRIPTION

In conjunction with the facility description, the innovative features unique to the MCAGCC design are emphasized in order to personify their advantages over traditional biopiles.

Soil Treatment Pad

The soil treatment pad is constructed on a 150 feet x 85 feet 7 inch thick concrete slab underlain with a 60-mil high density polyethylene (HDPE) liner covered on both the top and bottom by a 10-oz-per-square yard geotextile. Two feet of compacted fill was placed over the geotextile and liner. The concrete pad was formed and poured over the compacted fill.

Unique Features of Soil Treatment Pad

Geotextile was placed on either side of the HDPE liner to insure liner integrity. Twenty-four inches of compacted soil base was placed between the pad and the liner to facilitate, forming, trenching and provide better secondary containment. The pad is sloped 1% away from the center toward each end. In the event, that only half the pad is used extraneous moisture drains away from the soil being treated; simplifying decontamination procedures. Differing levels and types of pollutants may be treated on each side of the pad without inducing cross contamination. A concrete sidewalk 4 feet wide surrounds the perimeter of the concrete pad. (Refer to Drawing 1, Plan)

Troughs

The concrete pad contains 12 troughs 57 feet long, 7 inches wide, and 11 inches deep. Negative pressure generated by the blower draws air through the pile via trough piping. Additionally, the troughs serve as a collection vehicle for excessive soil moisture. The troughs are equally spaced at intervals of 12 feet in two rows of six equidistant from each side of the pad. Each trough contains 2-inch slotted polyvinyl chloride (PVC) piping covered by 9 inches of gravel.

Unique Features of Troughs

Troughs are configured to run in the same direction as the loading ramps, as a result during loading and unloading; loaders do not catch on troughs. Troughs have a 7-inch width and an 11-inch depth so loader tires do not crush trough piping. (Refer to Drawing 1, Section 4)

Leachate Collection

Two 8-inch wide drainage channels are located adjacent to the north and south edges of the concrete pad and drain into leachate sumps. Leachate from the leachate collection sumps is pumped to a holding tank for storage and is used to irrigate the pile as necessary. Two 2-inch diameter leachate extraction wells are located adjacent to the leachate sumps.

Unique Features of Leachate Collection

Leachate runs off the treatment pad because of the 1% slope toward the drainage channel at either end of the pad. Each drainage channel empties into the adjacent leachate sump. Leachate is pumped from each sump into a holding tank and stored for reuse to irrigate the pile. Leachate in trough piping circulates to the knock out tank and is pumped to the storage tank. The knock out tank leachate level is controlled by a low and high level switch to keep moisture out of the blower. (Refer to Drawing 2, Leachate Sump & Section 7)

Piping

Unique Piping Features

All trough piping connects to 2-inch wrapped galvanized piping. Galvanized piping is used exclusively where piping penetrates concrete. If PVC is used to penetrate concrete, and the concrete cracks the PVC piping is likely to crack. Extraction piping has a 1% drop all the way to the blower pad;to facilitate leachate drainage to the knockout tank on the blower skid. (Refer to Drawing 1, Section 4 & 7)

Leachate Extraction Monitoring Wells

Two leachate extraction monitoring wells were installed at the northeast and southeast corners of the facility. The monitoring wells were placed prior to placement of the sidewalk. The leachate extraction wells were developed as a contingency in case the integrity of the concrete pad is compromised and leachate becomes trapped between the liner and pad.

Unique Features of Leachate Extraction Monitoring Wells

The liner slopes 1% toward each leachate extraction well. If the pad leaks leachate trapped on top of liner flows to a leachate extraction monitoring well. If the pad is compromised a vacuum pump may be attached to piping at the bottom of the extraction well to aerate soil between the pad and the liner, and excessive leachate may also be pumped out through the monitoring wells._(Refer to Drawing 2, Leachate Sump)

Vacuum Monitoring System

The Entire Vacuum Monitoring System is Unique

The end of the 2-inch slotted PVC trough piping adjacent to the center of the pad is tapped for a quick connect fitting attached to 1/4-inch nylon tubing running through 3/4-inch conduit which exits the east side of the pad adjacent to the blower skid. The nylon tubing inside the conduit exiting the east side of the pad is fitted with quick connect fittings that can be readily connected to a vacuum gauge to ascertain negative pressure in each trough pipe._(Refer to Drawing 2, Piping Layout)

Blower Skid

The blower skid contains a 500 standard cubic feet per minute blower and motor, a free water knockout tank, nutrient recirculation tank, blower discharge, water storage tanks, and liquid transfer pumps.

Unique Feature of Blower Skid

The control panel monitoring system is capable of reporting malfunctions automatically via modem.

SEQUENCE OF CONSTRUCTION EVENTS

- Site was graded;
- Base soil moved during grading was stockpiled;
- Existing soil base was compacted above 95%;
- Elevations were tested per ACI Manual 0.1 foot tolerance;
- Geotextile and HDPE liner were installed (all liner welds received vacuum, pressure and destructive tests/to validate liner weld integrity);
- Six to 8 inches of clean sand was placed over the liner;
- Another 3 lifts (6 inch lifts) of class 2 base were placed on top of the 6 to 8 inches of clean sand (each lift was compacted above 95%);
- Total class 2 base was compaction tested excluding the 6 to 8 inches of clean sand directly above liner to avoid puncturing the liner (testing transpired per ASTM method 2922 Nuclear Compaction Test);
- Trenching was installed and formed 11 inches deep in compacted backfill;
- Piping was installed;
- Perimeter concrete forms and rebar were placed for perimeter concrete placement;
- Reinforcement bar was placed for each successive pour;
- Placement of the concrete slab occurred in **five** successive sequences to facilitate concrete placement and forming (Refer to Figure 1);

1. Placement 1 included areas on the north and south ends of the pad between the concrete curb and the troughs as well as approximately 6 feet on the east and west ends of the slab. Four pours were required for placement 1.
2. Placement 2 included the four trough sections along the west side of the pad. One pour was required for placement 2.
3. Placement 3 included the four trough sections along the east side of the pad. One pour was required for placement 3.
4. Placement 4 included the four trough sections in the center area of the pad. One pour was required for placement 4.
5. Placement 5 included the two ramps on the north and south ends of the pad, and the sidewalks on the east and west sides of the pad. Two pours were required for placement 5.

- Following each pour, concrete was vibrated, flooded, and troweled. The concrete surface has a medium broom finish. Curing compound was applied immediately after placement in two continuous coats sprayed at right angles to each other.
- Control joints 1 1/2-inches deep by 1/4 inch wide were saw cut into the concrete slab within 24 hours of placement. Construction joints between adjacent concrete pours are galvanized steel tongue-and groove type. All construction and control joints are sealed with a watertight, fuel resistant sealant (Sikaflex).
- Two extraction/monitoring wells were installed at the northeast and southeast corners of the facility. Well placement took place prior to sidewalk placement. The side walk was poured around the galvanized steel well riser which extends approximately 12 inches above the sidewalk surface.

IMPLICATIONS

Additional details on permanent biopile system design and construction can be found in NFESC Technical Memorandum TM-2189-ENV BIOPILE DESIGN AND CONSTRUCTION MANUAL or on the web at: luzon.nfesc.navy.mil/esc414/techinfo.htm

Figure 1. Liner installation

Figure 2. Rebar installation

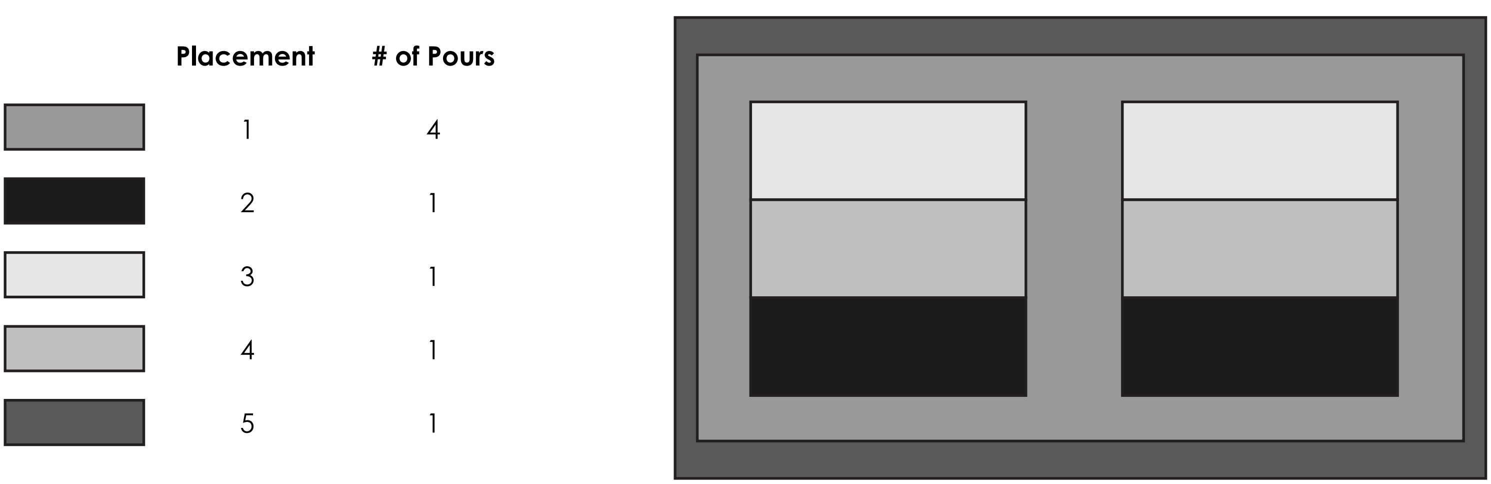


Figure 3. Concrete placement sequence

USE OF SCAPS SUITE OF TOOLS TO RAPIDLY DELINEATE A LARGE MTBE PLUME

By NFESC Code 413

SCAPS BENEFITS

1) Saves significant amounts of money and time;
2) Enables users to rapidly map action level iso-concentration contours;
3) Facilitates rapid site closure;
4) Leads to decision making flexibility while equipment is still in the field.

INTRODUCTION

Use of the Navy Site Characterization and Analysis Penetrometer System (SCAPS) at hazardous chemical release sites has led to significant government savings over the past three years. While SCAPS is best known for its ability to rapidly detect petroleum hydrocarbons using laser spectroscopy, the system is also equipped with sampling capabilities which can lead to expedited site characterization at petroleum and non-petroleum sites. When used in conjunction with on-site or near term analytical laboratories, the SCAPS suite of tools can lead to significant cost savings, time savings and many other benefits for remedial project managers (RPMs).

At the request of RPMs working for the Environmental Department at the Naval Construction Batallion Center (Port Hueneme, California), the Public Works Center (PWC) San Diego SCAPS team was used to delineate the downgradient extent of a dissolved methyl tert butyl ether (MTBE) plume in an unconfined aquifer beneath the activity. Records indicated that approximately 11,000 gallons (42 cubic meters) of leaded and unleaded petroleum products were released from underground storage tank lines of a gasoline station between September 1984 and March 1985. MTBE, which has been used as a gasoline additive since the late 1970s to reduce toxic air emissions associated with fuel combustion, was identified in the downgradient monitoring wells present at the site in 1996. MTBE is poorly degraded, highly mobile, toxic and potentially carcinogenic. Future MTBE action levels for California are anticipated to be 35 parts per billion (ppb).

The goal of the investigation was to select appropriate monitoring well installation locations in order to evaluate whether the plume posed a risk to potential receptors (drainage canals and other surface water bodies). To accomplish this goal, SCAPS was used to help delineate the MTBE plume, prepare an iso-concentration map which displays the 35 ppb contour, identify the optimal monitoring locations, and install _" micro-wells in these areas. Fifteen field days were required to collect a total of 44 water samples and install 11 micro-wells. Approximately 33 acres of the MTBE plume (in map view) were delineated (to the satisfaction of the regulators) in a rapid and cost-effective manner. In addition, a site closure strategy was agreed upon by the customer and regulators less than one month after completion of the field efforts.

METHOD DESCRIPTION

Water samples were collected using a ConeSipper attachment (Figure 1) and analyzed in near real-time using an off-site gas chromatograph with a flame ionization detector. Analytical turn-around time was approximately 90 minutes from the time the samples were collected. Sample locations were selected based on the near real-time results, leading to a dynamic, flexible, work plan. A site map was continually updated using a global positioning system (GPS) and a version of Autocad available on the SCAPS unit.

Figure 1. *ConeSipper, SCAPS attachment and pneumatic valving system used to collect water and soil gas samples.*

Optimum perimeter and sentry well locations were based on the ConeSipper sample results. Wells were installed using a Powerpunch micro-well system on the SCAPS unit. Wells were customized based on the future monitoring requirements of regulatory personnel. For instance, it was desired that shallow and deep samples would be required to monitor the chemical stratification of the central portion of the dissolved MTBE plume. Therefore, six wells consist of one foot (0.3 meter) long screens at specific depths to isolate the portions of the plume in question. The other five wells were constructed with solid polyvinyl chloride casing for the top five feet (1.5 meters) connected to twenty feet (6.1 meters) of screen section.

Regulators and customers were in continuous communication (via fax and phone) with the SCAPS crew throughout the entire plume investigation. As a result, the regulators were involved in the decision-making processes. A final tabulation of the ConeSipper results and a map depicting these values were presented to the customer and regulators prior to leaving the site. This enabled the customer to quickly decide upon their next course of action.

SITE DESCRIPTION

Roughly 11,000 gallons (42 cubic meters) of regular and unleaded gasoline were released from underground storage tank lines at a gasoline station site between September 1984 and March 1985. Prior to this field effort, 42 two and four inch diameter monitoring wells had been installed at the site. The measured gasoline portion of the plume extended close to 1080 feet (329.2 meters) downgradient of the source area (approximately 9.4 acres in map view area), while MTBE concentrations as high as 16,000 ppb were identified in the most downgradient wells (located approximately 1500 feet, or 457 meters, downgradient from the source).

The semi-perched aquifer zone consists of fluvial-deltaic sediments approximately 25 feet (4.6 meters) thick in the vicinity of the site. The uppermost silty sands grade into more sand and silty sand at depths ranging from 7.5 to 25 feet (2.3 to 4.6 meters) below ground surface (bgs). The unconfined water table ranges 8.5 to 12 feet (2.6 to 3.7 meters) bgs. Therefore, the saturated aquifer thickness is approximately 15 feet (4.6 meters). Hydraulic conductivity ranges from 0.2×10^{-3} to 1.4×10^{-3} meters/second. The average linear ground water velocity in the unconfined aquifer ranges from approximately 230 to 1450 feet (70 to 440 meters) per year, assuming a porosity of 0.3.

RESULTS AND DISCUSSION

During the 15 field days, approximately 3000 feet of the downgradient extent of the MTBE plume (including the most downgradient edge) was delineated using an expedited site characterization approach which included SCAPS applications. The amount of area covered during the investigation extended approximately 45 acres. The SCAPS team discovered that the dissolved MTBE plume extends 33 acres in map view area. Prior to leaving the field, the SCAPS team provided the customer with analytical results tables and a digitized map which depicted the plume extent, analytical results, and all sampling and well installation locations (which were surveyed using GPS). A final report was submitted to the customer within one month.

The entire MTBE plume, based on SCAPS ground water samples and monitoring well samples, extends approximately 4100 feet (1250 meters) in length and approximately 500 feet (150 meters) in width through the widest segment. Based on the findings, it appears that MTBE can migrate relatively long distances with a relatively small amount of dispersion. Assuming that MTBE was first introduced into the aquifer in 1984, one can calculate the conservative (most rapid) linear contaminant velocity to be approximately 342 feet (104 meters) per year for this site. This is within the range of calculated ground water flow based on aquifer tests (230 to 1450 feet per year or 70 to 440 meters per year).

Given these relatively rapid contaminant migration rates and slow natural degradation rates, it is recommended that expedited site characterization methods (such as the SCAPS assemblage of applications) be utilized for every site suspected of MTBE contamination. In addition, inclusion of the customer and the regulator in the decision-making process will be conducive to achieving project goals. Benefits of proceeding in this manner include the following:

1) Saves significant amounts of money and time;
2) Enables users to rapidly map compliance level iso-concentration contours;
3) Facilitates rapid site closure;
4) Leads to decision making flexibility while equipment is still in the field;
5) Investigators, customers, and regulators can make critical decisions in near real-time;
6) Reduces worker exposure risk;
7) Reduces the amount of industrial derived waste (IDW) for investigation and installation efforts;
8) Reduces the amount of IDW for future monitoring events;
9) Optimizes monitoring well placement locations;
10) Well design can be customized based on SCAPS soil classification;
11) Interactive decision making (with regulator input) is conducive to creating a productive working relationship while avoiding future misunderstandings.

COST/TIME AVOIDANCE:

The following section compares the costs of using the SCAPS assemblage of site characterization tools with the costs associated with using a conventional approach for the dissolved MTBE plume characterization effort described above. Since SCAPS expedited site characterization activities are much different than those associated with a conventional approach, assumptions and activity descriptions are presented. Disadvantages of using a conventional approach for this site are also discussed.

SCAPS Approach (using the SCAPS assemblage of tools):
The SCAPS team charged $83,250 for the 15 field days required to complete the project. This cost included a pre-deployment site survey, a work plan, a health and safety plan, drilling permits, equipment and personnel mobilization, personnel housing and per diem, geophysical surveys to "clear" for utilities, collection and analysis of 44 ConeSipper samples, 9 ConeSipper duplicates, 9 equipment blanks, installation of 11 customized micro-wells (with vaults and concrete seals), near real-time mapping using GPS and Autocad, near real-time analytical results, a complete map-view delineation of the MTBE plume (4100' X 500'), demobilization, a draft final report, and a final report. The activity contracted an outside lab to run the confirmation samples during the final phase at a cost of $3000. Development and sampling of the eleven micro-wells required approximately two days of effort at a cost of approximately $1000. Analytical laboratory costs for the initial round of micro-well water samples totaled $1100. Only seven fifty-five gallon drums of equipment decontamination rinse water were generated for the entire project. These can be disposed of for approximately $200 (7 drums X 55 gals @ $.50 per gallon of liquid waste). In addition, the SCAPS team provided analytical results tables and an up-to-date site map to the customer prior to demobilizing, enabling the customer and regulators to make critical decisions as soon as possible. During the investigation, the SCAPS crew obtained approval from the customer and regulators for optimal sampling and well placement locations by maintaining communication via fax and phone - effectively generating a dynamic work plan which was tailored to the site conditions as the investigation proceeded. By the time the final report was completed, the customer and regulator agreed to a monitoring plan which would lead to site closure upon demonstration of plume stability.

Passive Bioventing

The Naval Facilities Engineering Service Center has been awarded funding from the Environmental Security Technology Certification Program (ESTCP) for the demonstration and validation of Natural Pressure-Driven Passive Bioventing. The primary objective of this demonstration is to determine the site conditions where passive bioventing would be applicable. A passive system has a significantly simpler design than a conventional system, and can be used at remote sites where power is either unavailable or cost-prohibitive to install. This technology addresses contaminants that are aerobically biodegradable, such as petroleum and many lesser-chlorinated hydrocarbons.

Bioventing is a low cost, *in situ* biological technology that has been successfully used to remediate hydrocarbon contamination in unsaturated soils at Department of Defense and other facilities (Miller *et al.,* 1993; Leeson and Hinchee, 1997). Bioventing is the use of induced air movement through unsaturated soils, with or without nutrient addition, to stimulate indigenous microorganisms to convert organic contaminants, such as petroleum hydrocarbons, to less hazardous substances, especially carbon dioxide and water. (EPA 542-B-94-006 June 1996.)

Conventional bioventing requires at least one electric blower to either inject or extract air through the vent wells in the unsaturated, contaminated zone, providing oxygen to subsurface soils to stimulate aerobic biodegradation. One limitation of conventional bioventing is the cost and logistical problems associated with installation and operation of a blower system.

Passive bioventing differs from conventional bioventing in the mechanism used to deliver oxygen to the subsurface. Instead of using an electric blower, passive bioventing is driven by natural air exchange induced by daily barometric pressure fluctuations. It is possible to utilize this natural phenomenon to aerate some sites. Field tests have shown that barometric pressure changes can cause open vadose wells to inhale and exhale air (also referred to as "breathing") (Foor *et al.*, Zimmerman *et al.*, 1997). The basic approach is to install a one way valve in a well screened in the contaminated soils. The valve allows air flow into, but not out of the well.

For information regarding this project please contact 805)982-4826;

SCAPS Suite of Tools
(continued from page 9)

Total Costs/Timing: $88,550; 15 field days; final report submitted one month from final field day.

Conventional Approach: (Four inch diameter monitoring well installation and one round of sampling):
The probability is that there will be an initial deployment and at least five additional mobilizations to determine the extent of the MTBE plume using a conventional approach. This is based on the assumption that the 3000 longitudinal feet covered by the SCAPS approach would be broken into six 500 foot increments (longitudinal) - for a total of six deployments. Assuming that ten monitoring wells are used for each deployment (for a total of 60 wells) at a cost of approximately $2500 each, the costs for well installation efforts alone will be $150,000. Approximately one drum of solid IDW per well would be generated at a disposal cost of $6000 total (60 wells @ $100 per solid waste IDW drum). If soil samples were collected and analyzed during the well-installation efforts, additional costs would run $30,000 (5 samples per well @ $100 per sample). The costs for well development and the initial round of water sampling for all 60 monitoring wells would total $9,000 (3 hours per well @ $50 per hour). Analytical costs for the first round of fluid samples would be $6000. Costs for disposal of liquid IDW would be approximately $3,300 (2 drums per well X 55 gals @ $.50 per gallon of liquid waste). The reporting and consultation fee for this effort would run $50,000 minimum and could cost as high as $150,000.
Total Costs/Timing: $254,300 - $354,300; 40 field days; six interim reports; final report submitted at least one year from completion date for the initial field effort.

Disadvantages of using the conventional approach for this project:
1) the work plan is not flexible from a field operations standpoint;
2) initial costs for the conventional approach would be two to four times higher than the SCAPS approach;
3) investigators would not know if wells are in correct locations until after analytical results are obtained (typically a two week turnaround time);
4) numerous additional wells would be installed in places which would not be cost-effective for the long-term, rendering future monitoring costs excessive and unnecessary;
5) significant amounts of IDW (180 drums for this example) would need to be handled;
6) duration of the investigation would be at least one year; and
7) at least four meetings with regulators would be expected.

POINTS OF CONTACT

POCs for these efforts include: NFESC (DSN 551-2669), CBC Environmental (DSN 551-2105), NFESC (DSN 551-1299), and PWC San Diego (619-556-9506). For scheduling SCAPS into your process, contact either PWC San Diego (619-556-9506), or PWC Jacksonville (904-772-4548, x8323).

INSTALLATION RESTORATION MOLE PIER DISPOSAL AREA NAVAL STATION, SAN DIEGO, CA

By (SWDIV)
(NFESC)

INTRODUCTION

The Naval Facilities Engineering Service Center (NFESC) and Southwest Division of the Naval Facilities Engineering Command (SWDIV) worked cooperatively with regulatory agencies pertaining to efficient cost effective technology implementation and necessary oversight to attain target cleanup levels at a contaminated mole pier site. By using excavation and thermal treatment mole pier restoration was accomplished promptly and proficiently at least cost. The remedial action was conducted in accordance with the Petroleum Exclusion under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) the "Petroleum Exclusion" regulations under the (State of California Health and Safety Code Section 25317) and requirements established by the State of California Water Quality Control Board, Region 9.

Figure 1. Disposal Pit Location

SITE DESCRIPTION

The mole pier disposal area is located at the southern end of Naval Station, San Diego, CA. The Mole Pier occupies approximately 23 acres configured trilaterally. San Diego Bay and Paleta Creek border the Mole Pier to the west and northwest; and Mole Road and Cummings Road form the perimeter of southern and eastern boundaries.

The Mole Pier was constructed of hydraulic fill in 1942. From 1945 to 1972, hazardous wastes, construction debris, trash, and rubbish from the Naval Repair Facility, Public Works Center, and Station maintenance operations were deposited at the Mole Pier. However, the pier was never intended for use as a landfill.

Two specific areas of the pier required remedial action (Wharf Builders Yard and Disposal Pit). The Wharf Builders Yard is rectangular 200 feet long by 150 feet wide and 10 feet deep and contained the Disposal Pit. The Wharf Builders Yard was used for storage of preserved wood piles. Due to leaching, wood preservatives probably impacted surface soil. As a result of extensive investigation arsenic and copper were identified as potential metals of concern in the Wharf Builder's Yard surface soil and Total Petroleum Hydrocarbons as diesel (TPH-d) was delimited as the constituent of concern in the Disposal Pit subsurface soil. TPH-d concentrations were found as high as 29,800 mg/kg in the Disposal Pit area.

After a comprehensive investigation of applicable remediation technologies; low temperature thermal desorption (LTTD) was selected. Field activities lasting 11 months included site preparation; installation of four monitoring wells; excavation of metals and total petroleum impacted soil from the Wharf Builder's Yard and Disposal Pit areas; screening, shredding and on-site treatment of impacted soil using LTTD; sheet piling and high density polyethylene liner (HDPE) installation; backfilling; compaction and installation of an asphalt concrete pavement over the Wharf Builder's Yard. Processed soil was utilized as subbase beneath the pavement.

FIELD WORK DESCRIPTION

LTTD employed within the context of the mole pier remedial action is an ex situ process using heat as the principal means of physically separating and transferring TPH-d from soil. After being thermally desorbed separated contaminants (vapors and particulates) were decomposed, although desorbers are not necessarily designed to facilitate contaminant decomposition.

TPH-d impacted soil was excavated and loaded into a hopper equipped with a tipping reject grid with bars to segregate material greater than 6 inches in diameter. A hydraulic feed conveyer equipped with a variable speed control adjusted the feed rate to match quantities and characteristics of materials being processed by the shredder. Shredded soil and material screening allowed a particle size of 2 inches or less to pass to the radial loading high capacity conveyor serving the thermal treatment unit. Oversized shredded material was reintroduced into the screening unit for further processing in order to reduce the volume of material requiring off-site disposal. The desorber transferred heat to TPH-d impacted soil. Soil was heated, water and hydrocarbons devolatalized, and off gas organics burned in the after burner.

Approximately 28,300 tons of hydrocarbon impacted soil was treated on-site and used as fill material in the Disposal Pit excavation. To guarantee that other contaminants found elsewhere on the Mole Pier do not migrate back into the treated fill material a long sheet pile cut off wall 150 feet in length was installed along the Disposal Pit's northern sidewall. Additionally, 40-mil HDPE was installed along the northeast sidewall and portions of the south and west sidewalls.

LTTD PROCESS OPERATION

Performance difficulties with several LTTD units unable to satisfactorily thermally treat soil necessitated that a third thermal desorption unit be mobilized to the site. The LTTD unit that proved satisfactory processed 25 tons of soil per hour and was equipped with a stainless steel drum capable of attaining a temperature of 800-850°F in the primary chamber and up to 1,600°F in the afterburner. High temperatures were necessary to successfully treat soil. Contaminated soil was fed by a front end loader into an 8 feet by 14 feet soil feed hopper with a tapered discharge opening into a 36 inch by 24.75 feet variable speed feeder belt conveyor. The feeder conveyor discharged through a vibrating screen that segregated any material greater than 2 inches in diameter into a 24 foot weight belt conveyor. The weight belt conveyor weighed the soil as it was fed through the thermal desorber. Segregated oversized material from the thermal desorber vibrating screen was rescreened and reshredded whenever possible.

The thermal desorber was a countercurrent stainless steel rotary drum 5 feet/4 inches in diameter and 20 feet long with internal flights and chain drive. A direct 17 million Btu/hour burner fired down the drum from the opposite end of the soil feed. The drum was equipped with inlet and outlet breaching and rotary drum seals. The desorber was trailer mounted along with the baghouse. Volatile compounds and moisture in the soil were evaporated by heat supplied by the direct firing burners. Hot treated soil from the thermal desorber discharged via a chute into a 24 foot auger system connecting an integrated knock-out-box and baghouse. The auger system discharged treated soil to a 24 foot belt conveyor which delivered the soil to a twin shaft mixer designed to cool soil via water injection. Evaporated volatles and water along with dust released by the desorption process were carried over by the rotary drum exhaust gases into the knockout box, where large particles dropped out of the gas stream. Baghouse gases were directed to a 7 inch diameter 24 foot long thermal oxidizer, rated at 25 million Btu, where the hydrocarbon contents of the gas stream were treated to the County of San Diego Air Pollution Control District emissions standards. Approximately 28,300 tons of hydrocarbon impacted soil was treated. Treated soil volume was calculated from land surveys conducted throughout the duration of the entire project. The volume of oversize material that could not be treated on site was approximately 802.51 tons (only 2.79% of the excavated soil).

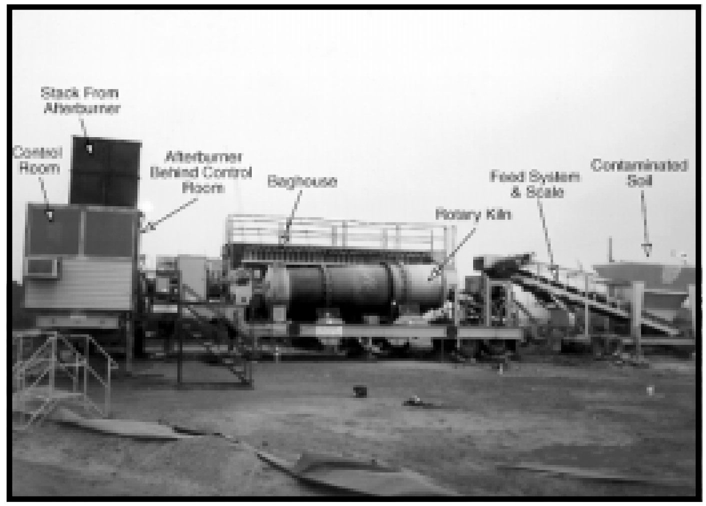


Figure 3. LTTD Unit

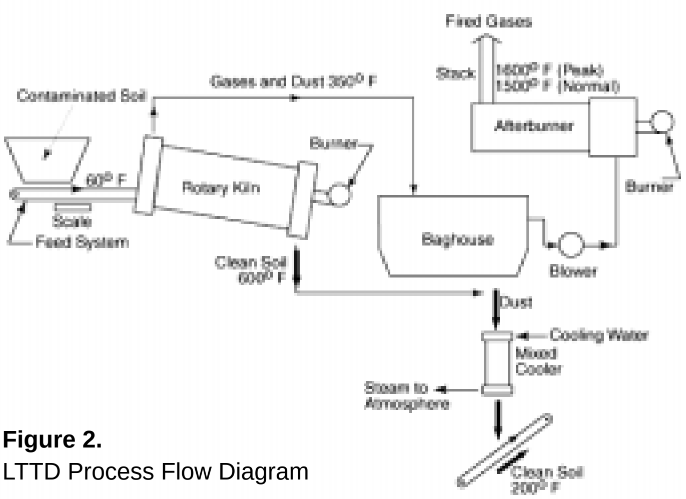


Figure 2.
LTTD Process Flow Diagram

SITE RESTORATION

Approximately 4,000 tons of 3/4-inch crushed rock was used to backfill the Disposal Pit excavation. The 3/4 inch rock was placed, compacted, and used to raise the excavation floor to 8 feet bgs which is 2 feet above groundwater elevation. Approximately 12,000 cubic yards of thermally treated soil was placed in 6 inch lifts in the Disposal Pit excavation and compacted to 90% of dry density. Approximately 4,000 cubic yards of remaining treated soil was spread over a former baseball field adjacent to the Wharf Builders Yard (Refer to Figure 1). The average elevation of the former baseball field adjacent to the Wharf Builders Yard was raised from approximately 15 feet above mean sea level (MSL) to 17 feet above MSL. Treated soil was placed and compacted so any rainfall runoff drained toward the Wharf Builders Yard.

CONCLUSION

The negotiated clean up goals mandated soil be treated to obtain TPH-d levels less than 1,000 ppm. However, most treated soil contained TPH-d levels of less than 100 ppm. Out of 1,400 treated soil samples only four had TPH-d levels over 100 ppm.

A benefit of using LLTD at this site was the time saved completing the project. In-situ treatment was estimated to cost a few dollars less per cubic yard, but the site would have been encumbered twice as long.

Figure 4. Shredding material for Processing

A Demonstration of In Situ Thermal Desorption

Destruction of PCBs in Contaminated Soils at Mare Island

Introduction

A demonstration of in situ thermal desorption (ISTD) was conducted at Mare Island Naval Shipyard in Vallejo, California, in October and November, 1997. The demonstration site was a former electrical shop grease trap where oil containing polychlorinated biphenols (PCBs) was washed out of transformers. Liquid waste and sludge were pumped to the grease trap prior to discharge to the industrial wastewater system. The grease trap was subsequently removed and backfilled with soils contaminated with PCBs. Levels as high as 2,200 parts per million (ppm) were present on the site. Results are not yet available but treatment is expected to be successful based on previous demonstration results.

Treatment trailer

Thermal well treatment area

Advantages of In Situ Thermal Desorption

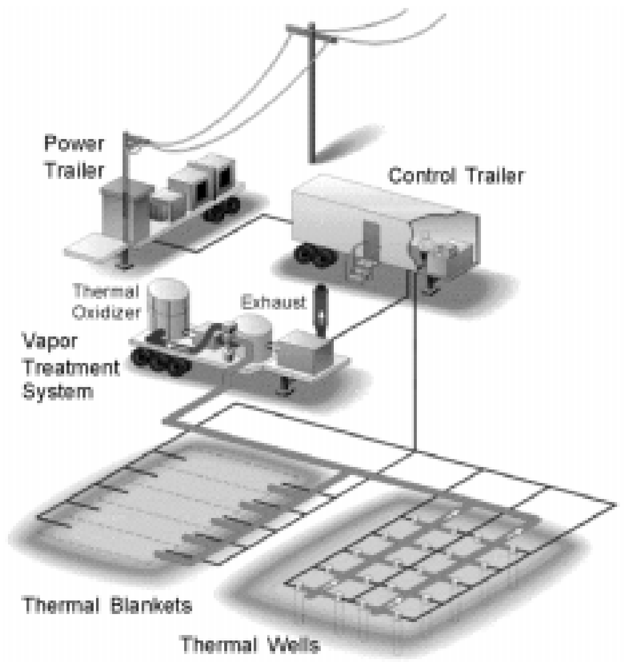
The heating technology was developed over the last 25 years as part of its enhanced oil recovery efforts. ISTD technology provides a combination of benefits which are not offered by any one conventional remediation technique:

- Destroys a mix of volatile and semi-volatile organics to very low residual levels
- Destroys most contaminant molecules in situ and the rest are destroyed in the vapor treatment system
- Carbon dioxide and water vapor are virtually the only air emissions
- Works in both unsaturated and saturated zones and in near surface and deeper contaminated zones
- Not limited by heterogeneous soils including low-permeability clays
- Operates at any depth achievable by standard drilling techniques (vertical or horizontal)
- Operates under and next to roads, structures, foundations, and other heavy, fixed installations without disruption
- Limits neighborhood disruption through quiet, very low profile operations without the dust and noise of excavation.

System Description

There are currently two configurations for ISTD: thermal blankets and thermal wells. The thermal blanket works like a large electric blanket and a powerful vacuum cleaner. Thermal blankets, used for near-surface contamination, work to depths up to eighteen inches. Typically, each blanket is made up of an 8- by 20-foot steel box. Stainless steel webbing is suspended from the bottom of the box. Heating element rods are threaded through the webbing to transfer heat into the soil below the blanket. Several blankets may be set up side-by-side to increase the total treated area. As the soil is heated, contaminants are vaporized. Contaminant vapors are drawn through the heated soil by a vacuum system. Most contaminants are destroyed in the extremely hot soil near the heat source. Remaining vapors are cleaned in the trailer-mounted vapor treatment system which includes a flameless thermal oxidizer and activated carbon filters.

Thermal wells use the same scientific process as thermal blankets, except that heating elements are placed in wellbores drilled on a regular pattern. Typical well spacings can be seven to ten feet. Wells can be drilled vertically into the contaminated zone, possibly as deep as several hundred feet. They may reach horizontally under operating facilities, roadways, and through concrete and other structures. Simulations suggest that thermal wells can work both above and below the water table. Treatment of the saturated zone is possible if the treatment zone is dewatered or recharge rates are limited.



Treatment system arrangement

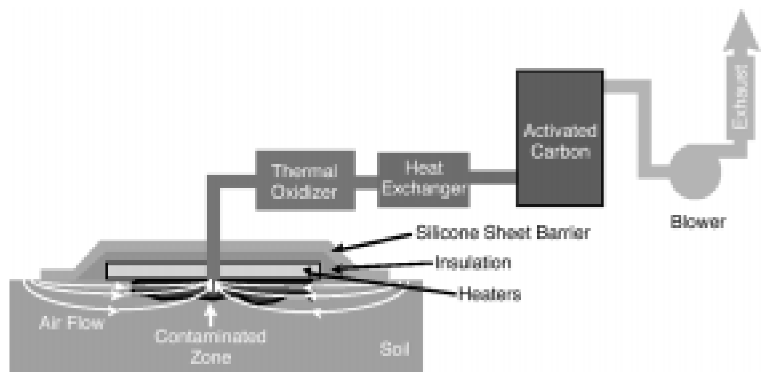
The flameless thermal oxidizer uses a ceramic matrix heated to 1,800°F which ensures thorough mixing, uniform temperature and consistent residence time. This is in contrast to flame-based systems which may create products of incomplete combustion due to the variable nature of vapor flow through the flame zone. Use of the flameless thermal oxidizer results in extremely high destruction efficiency for off-gas vapors. As a result, there are virtually no products of incomplete combustion emissions. Continuous monitoring ensures that the resulting emissions contain only carbon dioxide and water vapor.

In situ thermal desorption will destroy volatile and semi-volatile organic compounds, including PCBs, chlorinated solvents, pesticides, and petroleum wastes. This technology can also collect and capture some low boiling point metals such as mercury, arsenic, and certain forms of cadmium and lead.

Remediation levels and cleanup times can be predicted by computer simulation before the project begins. Monitoring systems and thermocouple probes in the soil are used to measure the progress of the thermal front through the soil. Experience has shown that there is good agreement between the computer predictions and actual results. Pre- and post-treatment samples are used to verify the treatment.

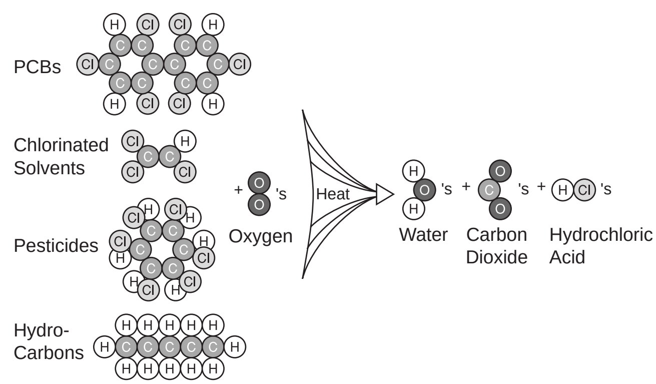
The very low residual organic contaminants left behind have been shown to be significantly lower than typical state and federal cleanup levels. In comparison with other technologies, contaminant destruction by in situ thermal desorption is quite complete.

When PCBs and other chlorinated hydrocarbons are destroyed, hydrochloric acid is produced. These acids are stabilized rapidly by precipitation with natural soil elements, principally iron. For example, hydrochloric acid and iron will form iron chloride, which is harmless and very stable. Experience remediating PCBs shows that acid gas emissions typically are very low.



Treatment system schematic

Because this is a thermal process, when treating chlorinated organics there is the possibility of dioxin and furan formation. The ISTD process vaporizes and destroys dioxins and furans at rates faster than they are created. Analysis of post-treatment soil samples show toxic equivalent concentration levels below the background level of 8 parts per trillion for uncontaminated soils.



Treatment chemistry

Previous Demonstrations of Thermal Blankets and Thermal Wells

PCB Contamination at a State Superfund Site in New York

At a site which site was previously a drag strip on which PCB-laden oil had been sprayed to eliminate dust, PCB contamination was found as high as 5,000 ppm at depths from 6 inches to 18 inches. Thermal blankets used temperatures that ranged from 480° F to 840°.to cleanup soil to below target levels of 2 ppm. Air emissions were well below New York and EPA regulatory limits and virtually no dust or odors were created. A total area of 5,000 square feet was treated over the course of ten days.

Remedial Action Assessment System (RAAS)

RAAS Now Available at an EFD/A Near You

RAAS is a sophisticated, Windows software-based system designed to assist remediation professionals at each stage of the environmental analysis process. The methodology assists the user in developing a site description, estimating baseline and residual risks to the public from the site, identifying applicable environmental restoration technologies, and formulating feasible remedial response alternatives. In addition, the methodology allows the user to quantify, assess, and compare those potential remedial response alternatives across EPA criteria.

RAAS uniquely combines three powerful software modules (site description, risk analysis, and technology performance) to fully integrate environmental restoration decision-making.

RAAS was developed by Pacific Northwest National Laboratory under contract with DOE to support environmental restoration analysis and decision making. Under the auspices of the Alternative Restoration Technology Team (ARTT), the Naval Facilities Engineering Service has completed an initial testing, training, and deployment RAAS for each EFD/A.

For more information please contact your ARTT representative or contact:

NFESC, Code 414RN
(805) 982-5070
DSN 551-5070

In Situ

(continued from page 15)

PCB Contamination at a Federal Superfund Site in Missouri

PCB contamination was reduced to well below the remedial objective of 2 ppm, according to preliminary lab results. The six-acre site, formerly a motor and transformer repair and sales business, is contaminated with the PCB Aroclor 1260 as high as 19,900 ppm. Working in tight clay soil, both thermal blankets and wells were used. Preliminary reports showed PCB contamination averaging 510 ppm at depths to 6 inches was reduced to well below the remedial objective of 2 ppm. Contamination averaging 3 ppm at depths of 6 to 18 inches was also reduced well below the remedial objective of 2 ppm.

Sixteen thermal wells, reaching depths of ten feet and operating at temperatures up to 1,900° F, were used in the second test. PCB contamination was as high as 19,900 ppm in this area. Preliminary lab reports show results below the remedial objective of 2 ppm. The results are noteworthy considering that the demonstration was conducted during an extremely wet spring and early summer for that part of the country.

Chlorinated Solvent Contamination at a Site in Indiana

Fifteen thermal wells treated a 30- by 30-foot area with 1,1-dichloroethylene (DCE) contamination levels up to 650 parts per billion (ppb) at depths to 12 feet. The wells were heated to 1,500° F, with the area between the wells reaching in excess of 250° F. Because DCE is much more volatile than PCBs, lower temperatures are sufficient. The operation proceeded smoothly despite a very cold and wet winter. The remediation objective of 80 ppb was easily met according to preliminary sampling. All but one area had non-detectable quantities of the contaminant (1 to 3 ppb) with the single exception at only 9 ppb. Operations will continue at this location on a second larger site.

Previous Demonstration Treatment Summary

Demonstration Site	Contaminant	Pre-Treatment Concentration	Post-Treatment Concentration	Treatment Goal
New York	PCBs	5,000 ppm	< 2ppm	2 ppm
Missouri	PCBs	19,900 ppm	< 2 ppm	2 ppm
Indiana	DCE	650 ppb	< 9 ppb	80 ppb

Comparable Cost for Soil Remediation

The cost of in situ thermal desorption depends on a variety of factors such as depth of contamination, soil moisture, and contaminant types. In general, in situ thermal desorption would be cost-competitive for TSCA and RCRA wastes with alternative processes, since excavation, hauling, backfilling, and off-site disposal or incineration would not be required. Also, in many industrial and utility applications, remediation could usually be completed with minimal disruption to ongoing operations, reducing the overall cost impact. ISTD treatment costs are estimated to range from $100 to $300 per ton and is available through the NFESC Broad Agency Announcement (BAA) contracting vehicle.

For more information about in situ thermal desorption contact :

1100 23rd Avenue
Port Hueneme, CA 93043-4370
Phone: (805) 982-5560

BIOREMEDIATION FACILITY

MARINE CORPS BASE CAMP PENDLETON (MCBCP)

By (MCBCP), (NFESC)

INTRODUCTION

The Camp Pendleton bioremediation facility is unique because of its large size (approximately 7 acres). The facility consists of three interdependent but distinct parts: the pre-treatment soil storage area; two soil treatment pads; and a post-treatment storage area. The pre-treatment soil storage area contains four lined storage cells located in the northern portion of the facility varying in size from approximately 100 feet x 140 feet to approximately 100 feet x 185 feet. The soil treatment pads are located in the center of the site. The post-treatment soil storage area consists of two lined storage pads, each approximately 100 feet x 200 feet, located south of the treatment pads (Refer to Figure 1).

The facility is operated under Waste Discharge Requirements (WDRs) established by the Region 9 Water Quality Control Board (RWQCB). Quarterly groundwater monitoring reports are submitted for review by the RWQCB. In the WDRs, the final disposition of the post-treatment soil is Camp Pendleton's Las Pulgas Landfill to be utilized as daily cover or industrial landfill.

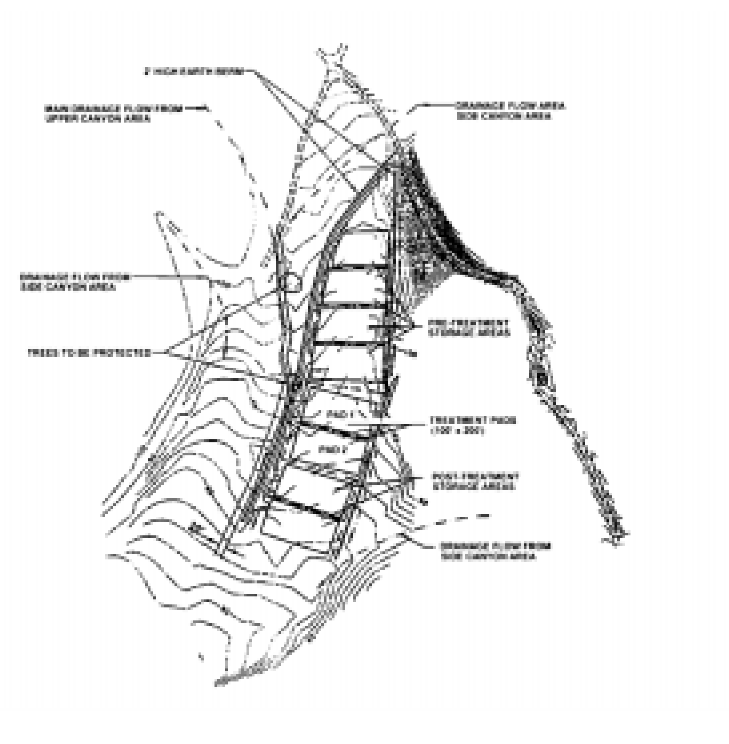


Figure 1. Biotreatment facility at MCB Camp Pendleton.

TREATMENT PAD CONFIGURATION

The soil treatment pads consist of two 200 feet X 100 feet 8-inch thick concrete pads underlain with a 60 mil High Density Polyethylene (HDPE) liner. Each pad has 12 troughs approximately 60 feet long, 1 foot wide and 8 inches deep which serve a dual function - creating a negative pressure through the soil pile and collection of system moisture. The troughs are spaced 15 feet apart. Each trough contains 2-inch slotted PVC pipe covered by 3/4-inch gravel and a 1-inch thick metal grate. The 2-inch PVC enlarges to 4-inch PVC outside the pad and connects to a single 4-inch PVC header which runs to both the free-water knockout system and the water re-circulation system on the blower skid. The blower skid contains a 500 standard cubic feet per minute blower and motor, a free-water knockout tank, nutrient recirculation tank, blower discharge,water storage tanks, liquid transfer pumps and a control panel which monitors the system functions and has the capability to report malfunctions automatically via modem.

TREATMENT PAD OPERATIONS

The soil piles are created with hexagonal dimensions seven feet high with approximately 4,500 cubic yards on each pad (Refer to Figure 2). The liquid transfer pumps and the water storage tanks are utilized to apply water and nutrients during pile construction. While building the pile, the drip irrigation system is constructed to provide moisture. During the treatment cycle, the system operates at a 1-3 pounds per square inch vacuum. Water which leaches through the soil is collected at the header, is pumped to the storage tank and is subsequently reapplied to the pile through the drip irrigation system creating a closed loop liquid system. Similarly, water which is entrained in the air is collected by the free-water knockout tank and sent to the water storage tank for recirculation as shown in Figure 3.

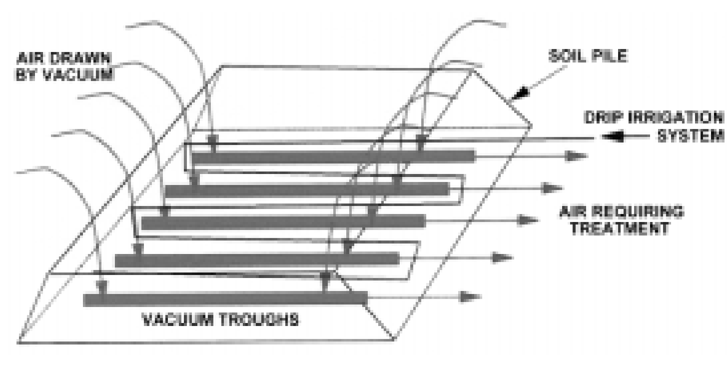


Figure 2. Biopile schematic.

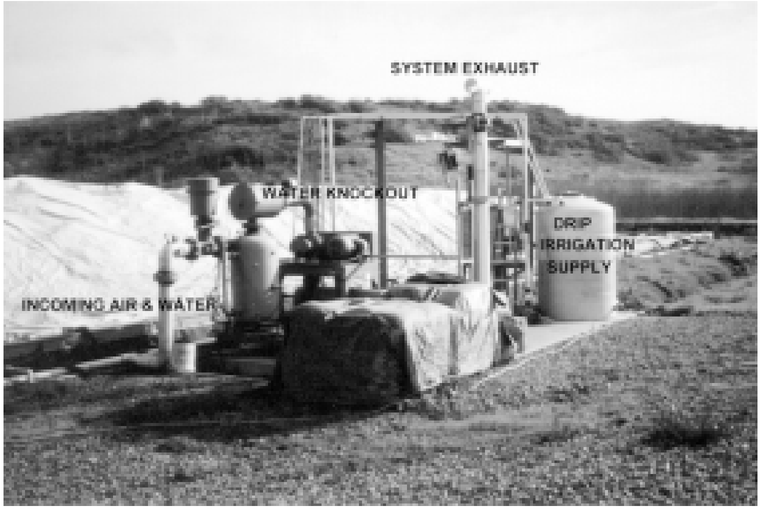


Figure 3. Blower skid.

TREATMENT OF HYDROCARBON IMPACTED SOIL

Treatment was initiated for approximately 6,500 cubic yards of soils. Soils were placed on both treatment pads in the Winter of 1995 and the Spring of 1996. Soils accepted for processing supported the UST remediation program, the Installation Restoration Program (IRP), one MILCON (avoiding at least 2 months in delays), two spills during training exercises and base facilities. Soils were characterized by the originator prior to acceptance, and accepted into the facility with a soil tracking form documenting characterization, receipt, handling and treatment, and discharge from the facility. A system is currently being created to track soils through the Geographical Information System (GIS) from extraction through disposal "a cradle to grave approach" insuring accurate tracking of soils being processed.

The soils treated on pad 1 came from 2 IRP sites. Pre-treatment TPH levels for pad 1 soils ranged from 3,300 PPM to 7,600 PPM. Soils treated on pad 2 came from a total of 16 UST sites and 1 IRP site. Pre-treatment TPH levels for pad 2 soils ranged from 29 PPM to 27,000 PPM.

Soils were placed with minimum compaction in treatment piles on each pad with a front-end loader. During pile construction soils were sprayed with nutrients consisting of ammonium nitrate and diammonium phosphate combined with a small amount of surfactant to assist nutrient penetration of soils. Immediately following soil pile construction, each pile was covered, and the blower system was activated circulating air through the soil piles stimulating microbial action. Physical parameters were monitored during the treatment process to measure metabolization of fuel compounds. The treatment process was completed when residual fuel levels were reduced below regulatory thresholds.

END-TREATMENT SAMPLING RESULTS

At completion of treatment (14 weeks) sampling of soils was undertaken to confirm treatment effectiveness and substantiate a basis for the release of soils from the treatment program. Soil samples from each treatment pad were analyzed to test for the types of compounds identified as a result of pre-treatment testing including: Total Petroleum Hydrocarbons (TPH) by DHS Method 8015 Modified for diesel; Volatile Aromatic Organics by EPA 8020 for lighter molecular compounds; TPH by Deionized Toxicity Characteristic Leaching Procedure (TCPL) with EPA 3510 prep; Nitrogen as Ammonia, Nitrate and Nitrite, Phosphorus as Phosphate, pH and Soil Moisture. All analytical work was completed by a state certified laboratory.

End-treatment pad 1 soil TPH levels ranged from nondetect to 440 PPM. End-treatment pad 2 soil TPH levels ranged from nondetect to 480 PPM.

The end-treatment sampling program identified low to moderate levels of petroleum hydrocarbons in approximately 60 percent of the samples examined from each treatment pad, but measured values were all below 500 mg/kg TPH. No BTEX compounds were detected in the six samples examined with the highest TPH concentrations. Analysis for TPH by Deionozed TCLP with EPA 3510 prep were all below 4.6 mg/kg. Inorganic compound concentrations were generally low or not detected, with the exception of Nitrate, which varied widely. Soil moisture and pH were moderately variable.

Figure 4. Removal of treated soil.

THE INITIAL CYCLE

During the initial cycle the two pads were constructed differently to determine if configuration would increase treatment effectiveness: Pad 1 was constructed with a simple drip system on top of the pile. Pad 2 utilized two drip irrigation systems - one on top and one in the middle of the pile. Additionally, two perforated 4-inch flex pipes connected to the blower were incorporated into the center of the pile in order to enhance pile aeration.

Despite the aforementioned treatment pile construction differences , final end-treatment sampling results from both treatment piles were very similar.

IMPLICATIONS

As part of Marine Corps Base Camp Pendleton's overall environmental compliance program more than 100 UST sites are being assessed and cleaned up, most of which contain multiple USTs. Investigation, replacement and/or remedial activities for these USTs has identified soils that have been affected by diesel and jet fuel hydrocarbons as a result of previous operations and/or leaking tanks. Soil treatment costs usually vary from $19 to $24 per ton depending upon contamination levels and types as well as regulatory requirements.

Evaluation of the Low Range Differential Pressure (LRDP) Leak Detection System for Small Leaks in Bulk Fuel Tanks

The NFESC in conjunction with industrial partner Vista Research, Inc recently completed a 3rd party evaluation of their Low Range Differential Pressure (LRDP) leak detection system for bulk USTs. The evaluation was conducted on a 667,000 gallon tank located at NAS North Island. The LRDP is capable of detecting a < 0.5gph for a test period of less than 24 hours. This exemplary performance now sets a new industry standard worldwide. The LRDP system currently provides the best method to meet upcoming State regulatory bulk tank compliance requirements adopted from the published 1998 Federal regulations deadline for tank monitoring upgrades.

The LRDP is a differential pressure (mass based) measurement system capable of detecting very small leaks in bulk fuel USTs. These tanks can be anywhere from 50,000 gallon capacity to 12 million gallon capacity. This system relies upon a closed reference tube that is the same height as the tank and that is filled with fuel to the same level as the fuel in the tank. The reference tube configuration enhances the precision of the differential pressure sensor measurements by significantly reducing the dynamic range required of the sensor, which then only needs to accommodate the difference in level between the fuel in the tube and that in the tank. This allows the use of a dependable and robust off-the-shelf differential pressure transducer while still maintaining the high precision required to meet bulk tank leak detection regulatory standards.

If the closed tube is appropriately shaped to match the tank configuration, it also compensates for the thermally induced volume changes that are produced in those regions of the tank having a variable cross-sectional area.

The current prototype is the only known system to meet both monthly and annual tests, thereby resulting in significant cost savings. This system can easily be implemented in any size tank of any configuration and is readily integratable into the DoD tank farm Fuel Automated System(FAS).

For further information contact

Telephone: (805) 982-1618
FAX: (805) 982-4304

Telephone: (805) 982-1808

NFESC's Environmental Support Contract Offers Navy Expertise In ERAs

The Naval Facilities Engineering Service Center (NFESC) has recently contracted with Science Applications International Corporation (SAIC) to provide environmental engineering and scientific support services in a wide range of technical and programmatic areas. One area of expertise covered by this contract, that is of special interest to the Navy, is Ecological Risk Assessments (ERAs). ERAs are quantitative and/or qualitative appraisals of the actual or potential impacts of a hazardous waste site on plants and animals, other than humans and domesticated species. NFESC is in the unique position to immediately provide specialized contract services to activities on a cost reimbursable basis to conduct ERAs or to provide independent technical reviews of your contract's ERA workplans and reports.

SAIC scientists have developed and conducted site-specific ERAs for both the Navy and the Environmental Protection Agency for the past 10 years. The SAIC office in Narragansett Bay RI has assisted Northern Division with ERAs, including the growing complex at the Naval Education and Training Center (NETC) in Newport RI, as well as the Naval Construction and Battalion Center (NCBC) in Davisville RI, which is undergoing closure. Wanting to meet this need, as well as to reap the benefits of its investment in ERA development, Northern Division has retained SAIC to develop and implement a master plan for conducting four ERAs.

SAIC completed the master plan, which specifies the general approach, historical background, the methods for conducting the ERAs. According to Gregory Tracey, Ph.D., principal SAIC scientist on this project, "The master plan has significantly reduced the time required to complete site-specific plans, since they can now be submitted as addenda to the master plan". The time required to complete each assessment will be 5 to 6 months, rather than the customary 12 to 24 months. In the past, each site-specific plan was hundreds of pages in length. Each of these documents is now 20 to 30 pages long. SAIC has completed draft ERAs for two sites at the NCBC in Davisville and two at the NETC in Newport.

Under EFA Northwest's CLEAN program, SAIC has also conducted ERAs for the Naval Undersea Warfare Center (NUWC), Keyport and SUBASE Bangor in the Puget Sound, Washington State. At NUWC, the ERA delineated risk in four separate aquatic habitats, including a freshwater marsh with brackish influence, tideflats, a shallow water lagoon, and a true saltwater habitat. At SUBASE Bangor, conceptual site models were developed that allowed for the modeling of contaminant transfer from sediments to benthic organisms, to fish and piscivorous wildlife. Contaminants of concern at these sites included a broad range of chemicals including, metals, pesticides, and volatile organics. Special analytical services were used to assess chemicals such as torpedo propellant components and their breakdown products. Field sampling was designed and conducted by SAIC to facilitate a weight-of- evidence approach to the assessments, preventing any single type of data from dominating the analysis and conclusions. At many of the marine sites it was concluded that remediation was not required. At SUBASE Bangor, for example, monitoring is being conducted. Based on the initial ERA conducted by SAIC, only one site at NUWC, an abandoned landfill adjacent to a marine area, required additional sampling to clarify potential risks to ecological receptors and human health. SAIC continues to evaluate risks at this site.

For further information on SAIC's capabilities, please contact Project Manager, SAIC, at (201) 498-7346,
For further information or to discuss the possibility of utilizing this contract, the NFESC point of contact for ERAs at DSN 551-4798 or (805) 982-4798,
Contracting Officer's Representitive, NFESC, DSN: 551-4840 or (805) 982-4840,

New Sensor Demonstrates Rapid and Cost Efficient Collection and Analysis of VOC's in Groundwater at NAS Whiting Field

Figure 1. Hydrosparge Schematic

NFESC Code 413 and the Naval Facilities Engineering Command's Southern Division conducted a demonstration of the Army Corps of Engineers Hydrosparge VOC Sensor at Naval Air Station (NAS) Whiting Field.

The new sensor deployed on a Cone Penetrometer (CPT) (Figure 1) is used for collection of Volatile Organic Compounds (VOC's) in groundwater. It successfully demonstrated rapid collection and cost effectiveness for characterization of a VOC contaminated groundwater plume. The Sensor probe as shown in Figure 2, is a collection of functional parts and depends largely on the In-Situ Sparge Module. This module is delivered in a small diameter, temporary ground-water well or sampling probe found on many types of Direct Push technologies. Helium gas is used to drive the VOCs out of the water and into the purge chamber. This is analogous to SW-846 sample preparation method 5030A. The VOCs are then siphoned into the Direct Sampling Ion Trapping Mass Spectrometer (DSITMS) which is located above ground. The DSITMS and the In-Situ Sparge Module were developed by Oak Ridge National Laboratory (ORNL). The Army Corps of Engineers Waterways Experiment Station is fielding the Hydrosparge VOC Sensor probe and performing validation testing as part of the tri-service Site Characterization and Analysis Penetrometer System (SCAPS).

<u>**Procedure**</u> The procedure consisted of first pushing a conventional Cone Penetrometer probe into the ground to define soil stratigraphy and dynamic pore pressure. Water sample collection depths were then chosen from zones that had permeable soil types and lower pore pressures to assure adequate sample volume. A second push was then completed with the Fugro™ water sampler to provide access to ground water. This device has 18 inches of screen that can be exposed once the depth of interest is reached. A separate push was completed for each water sample collection depth. Once the water sampler screen area was exposed, the water began to fill the push rods and its level was monitored until it stopped increasing. The In-Situ Sparge Module was then carefully lowered down the push rods until it reached the water. The Hydrosparge analysis lasted for approximately 5 minutes. After the analysis was complete, a bailer was used to collect water samples from within the push rods for off-site analysis using traditional laboratory methods.

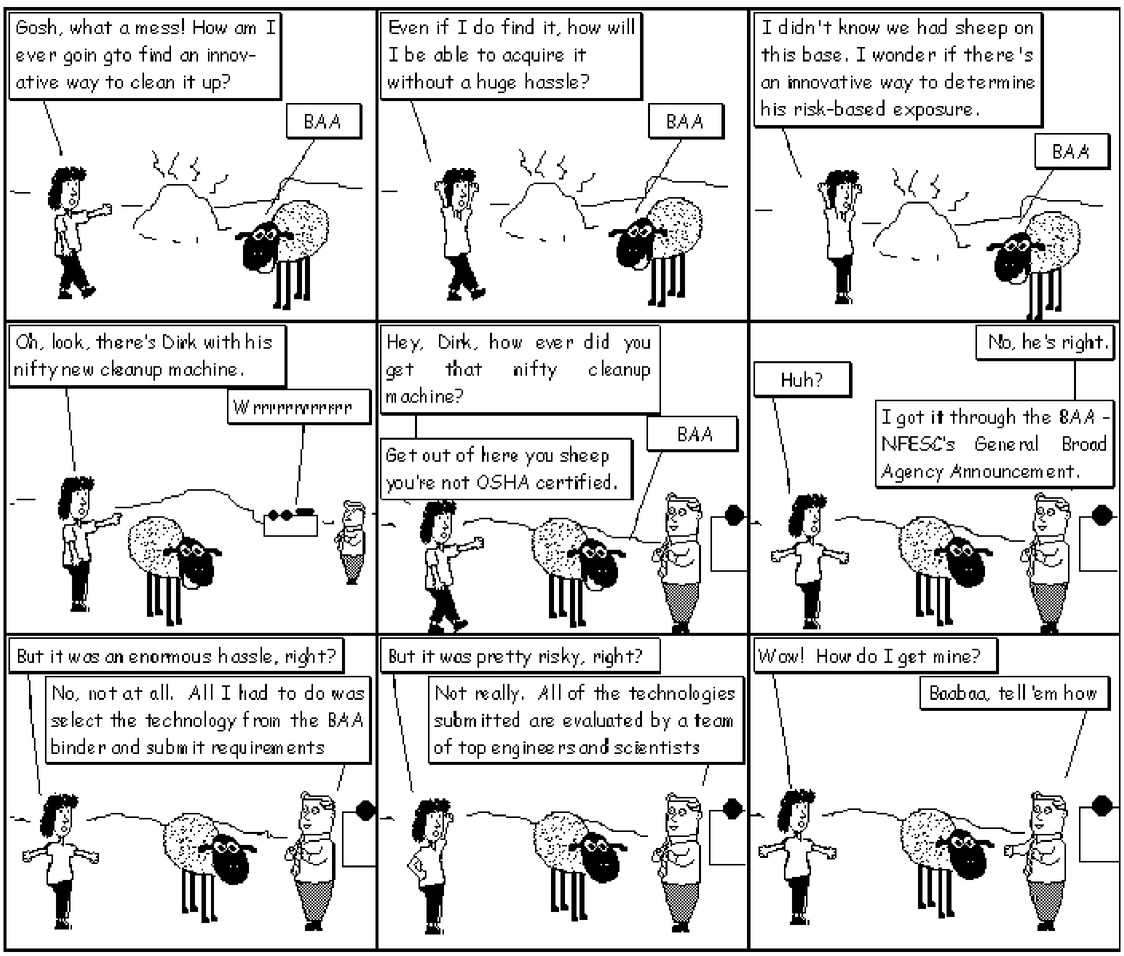
The demonstration resulted in the completion of 15 CPT soil stratigraphy pushes and installation of 17 temporary ground-water wells. A total of 4840 linear feet were pushed in thirteen days for an average of 372 feet per day, and an average single push depth of 151 feet below ground surface. A total of 11 ground-water samples were analyzed using the Hydrosparge VOC Sensor probe and 16 ground-water samples were collected for off-site analysis. Comparing the Hydrosparge and the off-site analysis results by linear regression yields a coefficient of determination (r^2) of 0.88. This shows good agreement between the on-site, in-situ analysis and the off-site, fixed laboratory analysis. It should be noted that Hydrosparge and soil stratigraphy results were available real-time.

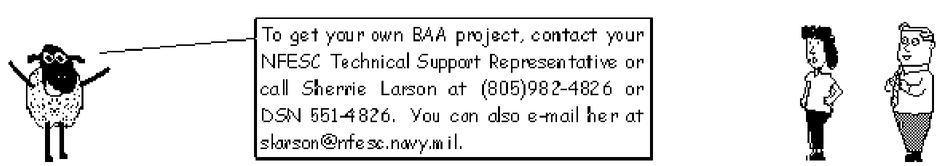
Figure 2. Cone Penetrometer Rig

Use of Hydrosparge and CTP resulted in a cost avoidance of approximately $50,000 when compared to the estimated cost of completing the objectives using conventional monitoring wells.

For more information please contact DSN 551-6258 or DSN 583-5561.

NFESC's General Broad Agency Announcement





Industry Forum Held in Port Hueneme

The Naval Facilities Engineering Command (NAVFAC) hosted an industry forum on the reprocurement of Remedial Action Contracts (RACs) at the Naval Construction Battalion Center, Port Hueneme, California, on 6 November 1997.

Four current regional RACs are expiring, and NAVFAC wanted input from the industry on how to improve their reprocurement acquisition strategy. The Commerce Business Daily notice read "NAVFAC seeks industry recommendations, industry standards, commercial business practices, and suggestions for the reprocurement of expiring Remedial Action Contracts (RACs)." Areas targeted for improvement in this upcoming acquisition process include:

- Cost/time savings suggestions
- Streamlining the acquisition process
- Ensuring competition
- Providing responsible contract management

About 200 industry professionals representing 100 contracting firms attended the one-day forum. The morning began with NAVFAC's Director of Environment, Dr. James W. Wright briefing the audience on the NAVFAC Environmental Cleanup Program.

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Port Hueneme

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Mr. Robert R. Boyer, NAVFAC's Director of Contracts, followed with a presentation on acquisition strategy, then led an afternoon question and answer session. Key topics discussed are summarized below.

- It is possible for a contractor to receive more than one award.
- Past performance on a contractor's non-Navy work will be considered, as long as it was environmental cleanup work
- A proposal package can be submitted as one 200-page package or as 4 50-page packages or however the contractor wants to submit it
- If you have a CLEAN contract, can you have a RAC? Citing Organizational Conflict of Interest (OCI), this question was answered "no"
- Is a Project Management Office (PMO) required? The general consensus was that yes, PMO is not going away.
- A Construction Management model has been used by the Air Force. There was not enough information on the status or benefits of this arrangement to incorporate it into this solicitation.

The four contracts that are expiring cover NAVFAC's Pacific Division (Pearl Harbor, Hawaii), Southwest Division (San Diego, California), Southern Division (Charleston, South Carolina), and Engineering Field Activity West (San Bruno, California).

Here are some changes NAVFAC and industry have already agreed to undertake for this reprocurement:

There will be a single solicitation and the Cost Plus Award Fee type contract will be awarded for the base year plus four options. NAVFAC anticipates awarding all four contracts at the same time. There will be no draft solicitation, and no paper copies of the solicitation. Oral presentations will be made. The proposal submission size will be greatly reduced.

NAVFAC will improve this solicitation by:

- Ensuring QA/QC/Navy Lab approval requirements are better defined
- Providing more timely and accurate forecasts of work to be performed
- Ensuring submittal requirements conform to the program
- Evaluating references for offeror corporation, projects, and key proposed staff

For further information, contact NAVFAC's Contract Office, 703 325-7654, DSN 221.

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