Fall 2003

RPM News

▲ Remedial Project Manager News ▲

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

In This Issue

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RPM NEWS
Remedial Project Manager News

Published By
NFESC

Naval Facilities Engineering Service Center

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In Situ Air Sparging Application to Remediate VOC-Contaminated Groundwater

The Southwest Division of the Naval Facilities Engineering Command (SWDIV) contracted with Battelle to complete remedial activities at Installation Restoration (IR) Sites 1 and 2 at the former Naval Station (NS) Long Beach, California (Figure 1). The property is being transferred from the Navy to the Port of Long Beach under the Base Realignment and Closure (BRAC) program. IR Sites 1 and 2 consist of Areas of Potential Concern (AOPCs) 1 and 4, which were impacted by landfilling and drum storage activities occurring from the 1940s through the 1980s. Through implementation of debris removal and subsequent in situ air sparging (IAS) technology, SWDIV successfully reduced groundwater contaminant concentrations to levels below respective risk-based remedial action objectives (RAOs) in all but one monitoring well after 15 months of system operation. SWDIV works closely with regulators and members of the Restoration Advisory Board (RAB) to resolve project challenges, and consistently manages to be on time and on budget.

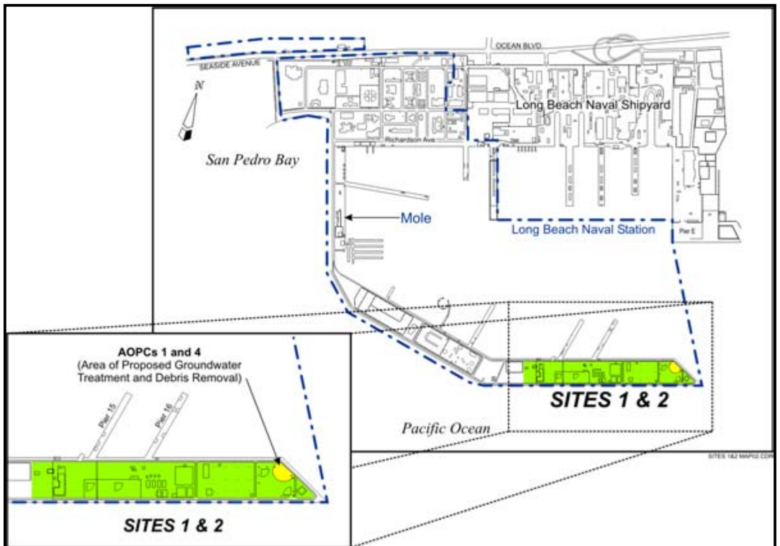


Figure 1. Long Beach Naval Complex

Technology Description

The IAS technology removes volatile organic compounds (VOCs) from groundwater by pulsing air into appropriate depths of the aquifer to enhance partitioning of VOCs into the vapor phase. A soil vapor extraction (SVE) system is then used to withdraw the vapors migrating into the vadose zone from the sparging activity. The vapor is treated with potassium permanganate ($KMnO_4$)-impregnated activated carbon (to break down contaminants such as vinyl chloride) and regular vapor phase granular activated carbon (GAC) prior to discharge into the atmosphere.

Background

SWDIV's remedial approach includes deed restrictions; long-term groundwater monitoring; excavation, removal and off-site disposal of waste drums, contaminated soils and debris; and on-site treatment of groundwater with the IAS technology. The remedial activities have been implemented in two phases. Phase I activity performed by Battelle and subsequently the Foster Wheeler team, involves excavation of drums and containers and surgical removal of contaminated soils for disposal at RCRA- and California-hazardous waste facilities. Of the 19,000 yd^3 of soils excavated, 5,500 yd^3 was used as backfill to avoid costs. The Phase I work was completed in February 2001. Phase II is the implementation of the IAS technology to remediate VOC-contaminated groundwater.

Table 1. Timeline for IR Sites 1 and 2

Time	Event
1940s–1960s	Landfilling of Solid Waste
1960s–1980s	Waste Drums Stored on Pallets
1995–1996	Remedial Investigation
1996	Uncovered Debris during Petroleum Response Action
1999	Final Feasibility Study Report Submitted
06/2000	Record of Decision Finalized
09/2000	Remedial Design/Remedial Action Work Plan Finalized
10/2000	Remedial Action Begins
02/2001	Phase 1 Remedial Activities (Excavation and Debris Removal) Complete
02/2001–10/2001	Phase 2 IAS/SVE System Design, Installation, Shakedown, and Startup
10/2001–05/2003	Phase 2 IAS/SVE System Operations and Maintenance
05/2003	Long-Term Monitoring of Groundwater for Rebound
To be determined	Environmental Restoration Complete

The primary contaminants of concerns (COCs) are vinyl chloride, 1,2-dichloroethene (1,2-DCE), trichloroethylene (TCE), and benzene. Table 1 presents a timeline showing the milestones achieved. It is worth mentioning that SWDIV planned and worked around the breeding and nesting season (from February to August) of a sensitive migratory bird, the black-crowned night heron, allowing time for the Port of Long Beach to relocate more than 40 full-grown trees at and near the excavation site.

IAS/SVE Implementation

IAS/SVE field activities included installation of 15 groundwater monitoring wells, baseline groundwater sampling, field-design study, and full-scale system installation and operation. The IAS technology system consists of 48 dual-depth sparge wells, which are supplied with pressurized air by two 30-horsepower compressors. Sparge wells are installed along the edge of the Navy Mole (Zone A) and in three contaminated areas (Zones B, C, and D) (12 in each zone) (Figure 2). Each dual-depth sparge well consists of two 1-inch PVC casings, one screened from approximately 19 to 20 ft below ground surface (bgs), and the other screened from approximately 38 to 39 ft bgs. This design provides flexibilities of injecting air into the shallow or deep depth of the aquifer as desired. The SVE system consists of 20 extraction wells (5 in each zone) that are connected to a 500- and a 300-standard cubic feet per minute (scfm) extraction blowers. A water knockout tank is placed inline prior to each blower to remove water from the vapor stream.

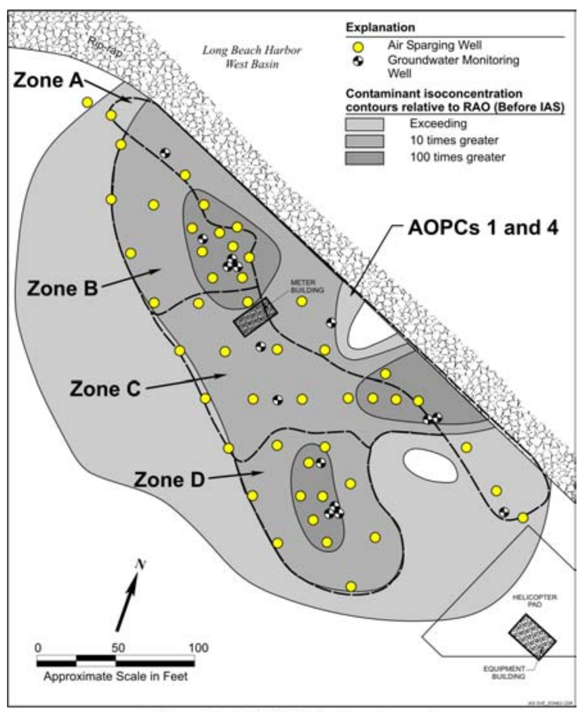


Figure 2. IAS/SVE System Layout

The combined vapor stream from the two blowers is treated by a 2,000-lb $KMnO_4$-impregnated carbon unit followed by two 2,000-lb GAC units. Because chlorinated compounds, especially vinyl chloride, adsorb poorly on regular GAC, the MnO_4-impregnated carbon is used as an oxidizer to break down the double bonds on vinyl chloride molecules to increase GAC performance. Prior to entering the oxidizer, the vapor stream passes through a heat exchanger. This step reduces the vapor temperature from 180°F to ambient levels and further removes water from the vapor stream. Wastewater from water knockout tanks and heat exchanger condenser is transferred to and stored temporarily in 3,000-gal polyethylene storage tanks for off-site disposal.

Operation of the IAS/SVE system consists of maintaining air injection at desired flow rates, maintaining effective vapor recovery from the extraction wells, rotating banks of injection wells and extraction wells, and monitoring volatile organic compound (VOC) concentrations in the SVE off-gas. The pulsed operation is used to minimize the effects of hydraulic mounding and contaminant migration and to allow for diffusion of contaminants outside the established flow path. Previous studies suggest that mass removal can be increased by 20 to 30% through pulsed operation. The pulsed operation also can reduce the sizes of the compressors and blowers and save energy costs.

Starting in January 2002, a quarterly groundwater monitoring program was implemented concurrently with the IAS/SVE system operation to evaluate remedial progress and to determine if the RAOs for groundwater have been met. The analytical results from the groundwater sampling also provide feedback regarding site conditions and enable informed decision-making for system operation adjustment. Groundwater samples are collected from site monitoring wells for VOCs analysis (EPA Method 8260B). Water quality parameters, such as dissolved oxygen, are measured in the field during sampling. Results are provided in quarterly groundwater monitoring reports by Battelle, who also is responsible for operating and maintaining the system. In addition to comparing groundwater contaminant concentrations to respective RAOs, the percent VOC reduced for individual wells is calculated to track the efficiency of the system at reducing the VOCs. The percent reduction is simply calculated by the following equation:

$$\text{Reduction} = 100\% \times \left(1 - \frac{C_f}{C_o}\right);$$

where C_f = contaminant concentration at a quarterly sampling event,and C_o = baseline contaminant concentration

Results

The IAS/SVE system has been effective at reducing groundwater VOC concentrations. As shown in Table 2, after five quarters of system operation, COC concentrations in all but one well have been reduced to levels below the respective RAOs. For instance, vinyl chloride concentrations have been reduced from levels as high as 14,000 to 45 µg/L or lower. It is estimated that approximately 1,153 kg of VOCs (as hexane) were recovered from the subsurface during the 15-month operation.

Table 2. Quarterly Groundwater Monitoring Results during System Operation

COC	Groundwater Monitoring Event[a]	Base-line	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	5th Qtr
Benzene	Number of Wells Exceeding RAO (6 μg/L)	1	2	1	0	0	0
	Maximum Concentration Observed (μg/L)	91	11	15	4	<2	<2
	Percent Reduction[b]	NA	97	98	96	100	100
cis 1,2-DCE	Number of Wells Exceeding RAO (10,000)	3	0	1	1	0	0
	Maximum Concentration Observed (μg/L)	84,700	9,260	22,100	29,300	4,090	1,270
	Percent Reduction[b]	NA	66 - 95	74 - 99	61-94	76 - 99	97-100
TCE	Number of Wells Exceeding RAO (27 μg/L)	2	0	0	0	0	0
	Maximum Concentration Observed (μg/L)	200	26	12	<2	<2	4
	Percent Reduction[b]	NA	87 - 96	94-98	99-100	96-100	97-99
Vinyl Chloride	Number of Wells Exceeding RAO (13 μg/L)	10	7	6	3	4	1
	Maximum Concentration Observed (μg/L)	14,000	4,080	3,570	53	472	43
	Percent Reduction[b]	NA	48-100	43-100	89-100	89-100	99-100

(a) Groundwater samples are collected from 15 monitoring wells in the treatment area.
(b) Percent COC reduction is calculated for wells that have baseline levels exceeding respective RAOs.

Based on the site closeout strategy approved by the Navy and concurred by the California Department of Toxic Substances Control (DTSC) and Los Angeles Regional Water Quality Control Board (RWQCB), the IAS/SVE system along the site perimeter will continue to operate until all RAOs in perimeter wells have been met for two consecutive quarters. The IAS/SVE system will continue in the source area until all RAOs have been met or until the average quarterly VOC removal becomes relatively constant for three consecutive quarters. Based on the current trends, the system may be ready for shutdown after the next quarterly sampling event. As is typical of many installation restoration sites, long-term monitoring (LTM) will follow remedial actions to verify that environmental restoration is complete. LTM also will be used to assess contaminant rebound, which often occurs with in situ technologies. In accordance with the Records of Decision (RODs) for IR Sites 1 and 2, LTM will be performed for a minimum of one year after shutdown of the IAS/SVE system.

Future Work

After system shutdown, SWDIV will continue to monitor the groundwater for rebound. If no rebound is found, SWDIV will work with the regulatory agencies regarding permanent shutdown of the system and site closeout.

For more information, contact:
(619) 532-4313

BAA Announces New Book of Abstracts

The latest book of eligible Broad Agency Announcement (BAA) Abstracts has been posted on the Naval Facilities Engineering Service Center (NFESC) BAA page on the Defense Environmental Information Exchange (DENIX) web site and is available for use by Remedial Project Managers (RPMs). These new abstracts, combined with over 200 previously submitted abstracts, provide solutions to reduce environmental impacts from current and past Navy operations. The BAA program solicits abstracts for restoration, conservation of resources, unexploded ordnance (UXO), pollution prevention and compliance issues and covers a broad spectrum of contaminants.

To go directly to all the eligible abstracts on DENIX, use the following link and after logging on to DENIX, click on Technologies and Methodologies: *http://www.denix.osd.mil/denix/DOD/News/Navy/BAA/baa.html*

More information on the BAA program can be found at: *http://enviro.nfesc.navy.mil/erb/support/navy_contracts/baa.htm*

BAA Book 15 Table of Contents

Vendor	Title/Concept
ART Engineering, LLC	In-Situ Contamination Mapping using EnviScan GPR Technology
ORINCON Defense	Sediment characterization using a fathometer
Awesome Products Corp	Environmental compliance by not discharging cleaning chemicals into water
Natural Logic	Flow Methodology and Management of Materials and Pollution
ARUSI	The Closed-Loop Bioreactor System for In-Situ Bioremediation of Contaminated Soil and Groundwater
Gordon Dean	Remediation of DNAPL Using Calcium Oxide (Quick Lime)
WRS Infrastructure & Environment, Inc	Electrical Resistive Heating with the Electro-Thermal Dynamic Stripping Process
Integrate, Inc.	Environmental Technical Data Management Using TerraBase
EnviroMetal Technologies Inc.	Permeable Reactive Barrier (PRB) Using Granular Iron for Remediation of VOCs in Groundwater
EnviroRemedy International, Inc.	ART In Well Air Stripping Technology
Worldstone Inc.	Separation Tank Monitoring
University of Connecticut Dept of Geology and Geophysics	Comparison of Hydraulic Conductivity Determinations in Direct Push and Conventional Wells
Abele Research, Inc.	Abele Research, Inc. Scientific Concepts and Solutions for Industry
Virginia Tech Depart of Civil & Environmental Engineering	Estimation of Timeframes for and Comparison of Groundwater Remediation Technologies
Crestline Consulting	Using Mathematical Programming in Environmental Project Decisions
COLUMBIA Technology, LLC	Rapid Subsurface Imaging of VOCs using Direct Sensing Technologies and Rapid 3D Visualization Tools

For more information, contact: (805) 982-1551

Surfactant Enhanced Aquifer Remediation (SEAR) for DNAPL Removal

Introduction

The focus of this article is to provide Navy remedial project managers (RPMs) with a brief summary of the topics covered in the recently released SEAR Implementation Manual which can be found at: http://enviro.nfesc.navy.mil/erb/erb_a/restoration/technolgies/remed/phys_chem/sear/tr-2219-sear.pdf. The cleanup of sites impacted with dense non-aqueous phase liquids (DNAPLs) such as chlorinated solvents is a major challenge. Many DNAPL constituents have very low aqueous solubilities that limit the effectiveness of pump-and-treat operations and result in slow mass transfer rates into the dissolved phase. SEAR was developed as a method to increase the solubility and mobility of DNAPL and therefore, enhance the removal rate achievable with pumped groundwater.

Surfactants are surface active agents or compounds that have two different active sites, a water-liking (e.g., hydrophilic) head and a water-disliking (e.g., hydrophobic) tail. Thus, they exhibit solubility in both water and oil and help to improve DNAPL recovery in the source zone. Naval Facilities Engineering Command (NAVFAC) has recently developed a series of technical manuals to support Navy RPMs in the full-scale application of SEAR at DNAPL sites. The companion technical manuals include the SEAR Design Manual (April 2002), which can be found at: http://enviro.nfesc.navy.mil/erb/erb_a/restoration/technologies/remed/phys_chem/sear/tr-2206-sear.pdf and the SEAR Implementation Manual (April 2003).

The Design Manual covers the selection factors and overall design process for the SEAR technology and the Implementation Manual covers the major tasks and planning parameters involved in field implementation of an in situ surfactant flood. It is hoped that the guiding principles presented in these two volumes will assist Navy RPMs in understanding basic design and implementation issues for attaining remedial objectives and for improving overall system performance. By optimizing DNAPL removal, we minimize the risk of unintended DNAPL migration.

SEAR Implementation

The cost-effective implementation of a SEAR project requires a thorough understanding of the chemical flooding process, system construction requirements, as well as design and operation limitations. Understanding this information will help Navy RPMs to secure the appropriate level of services and performance for their site. The Implementation Manual helps to familiarize readers with the use of the SEAR technology by highlighting field planning activities, system component and construction requirements, and field operations as follows:

Field Planning Activities

There are several project management issues that are critical to the successful implementation of a SEAR project including teaming, health and safety, system permitting, and risk management. The foundation for the success of any project is the building of a strong team. It is important to assemble a multi-disciplinary team including geologists or hydrogeologists with remediation and modeling experience, environmental engineers with pumping and wastewater treatment experience, chemical or petroleum engineers with knowledge of surfactant chemistry and multi-phase fluid flow, and others such as analytical chemists, microbiologists, and toxicologists.

Health and safety and regulatory permitting issues should also be considered early on in the planning process to ensure timely execution of the project. Health and safety issues include minimizing exposure to DNAPL-contaminated fluids, ensuring adequate secondary containment, and proper handling and storage of flammable cosolvents such as alcohols. Permitting issues include the ability to obtain an underground injection control (UIC) permit from the appropriate state authority and the need to obtain permission for the reinjection of contaminants above maximum contaminant levels (MCLs) at sites with surfactant reuse. Navy RPMs should also be aware of various risk management issues associated with SEAR such as the role of a competent aquitard in preventing unintended DNAPL migration and the impact of geologic heterogeneity and low matrix permeability on the efficiency of DNAPL removal. The manual also describes other major field planning activities such as performance assessments, site logistics, and the benefits of pilot-scale studies.

SEAR System Components and Construction Requirements

The manual provides a detailed discussion of the primary system components and assembly issues associated with SEAR systems. The manual details the equipment required for chemical preparation, injection and extraction operations, system monitoring, process control, and wastewater treatment. It also provides some suggestions for hardware and materials of construction and guidelines for system component shakedown and preparation.

Some of the major pieces of equipment used in chemical preparation include fiberglass or composite plastic tanks, recirculation pumps, or in-line mixers. A typical pump and tank configuration is shown in Figure 1. The preparation of the surfactant solution involves careful mixing of surfactant, salts of sodium and/or calcium (e.g. electrolytes), cosolvent such as alcohol, and sometimes a polymer for viscosity control. All of these ingredients must be mixed in the proper ratios to ensure the consistent quality of the surfactant solution during flooding operations.

Injection and extraction operations require properly constructed injection and extraction wells, alongside standard equipment items that include injection and extraction pumps and controllers, flowmeters, and a combination of hoses, tubing, pipes, and valves for carrying fluids to and away from the treatment zone. Various pieces of monitoring equipment are used to collect data to gauge SEAR progress and to maintain and refine SEAR system operating parameters. This equipment includes multi-level samplers, field meters, in-line probes, pressure instruments, autosamplers, and other equipment.

Due to the extent of data collection activities for SEAR projects, the use of automated data recording devices is suggested. A Supervisory Control and Data Acquisition (SCADA) system can be used to incorporate electronic monitoring and control devices for automated measurement and regulation of flowrates, system pressure, water levels, and other parameters.

Finally, a wastewater treatment system must be designed and constructed to treat the DNAPL and surfactant mixture extracted from the subsurface. Technologies for contaminant removal may include conventional processes such as air-stripping and steam-stripping or innovative processes such as liquid-liquid extraction and pervaporation. The surfactant can be treated using biological treatment or discharged directly to the sanitary sewer after the addition of foam suppressing chemicals. The surfactant can also be concentrated for reuse on-site by filtration and foaming methods. Other pieces of equipment used are decanting equipment, chemical metering equipment, surge/process storage tanks, and contingency storage tanks.

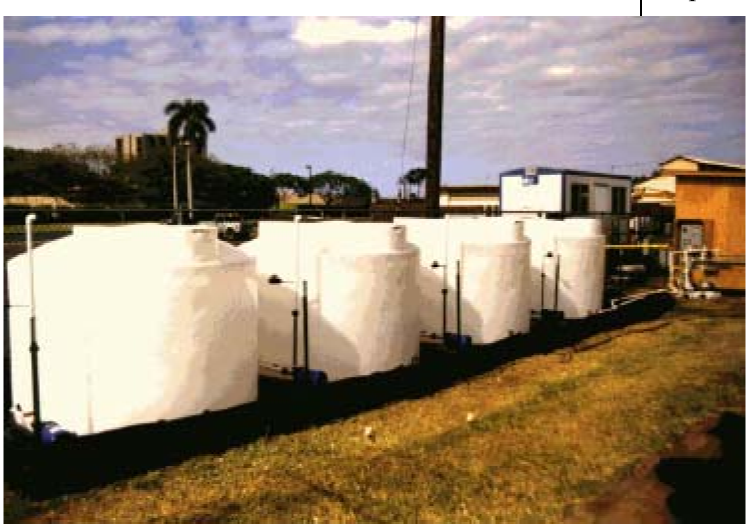


Figure 1. Storage tanks used for blending electrolyte solutions.

Field Operations

The manual also discusses major field operations such as system start-up and shakedown, flooding operations, preparation and chemical analysis of SEAR fluids, monitoring of system performance, equipment maintenance, and system shutdown. The first step in field operations is system start-up and shakedown to ensure that the system is operating properly. Typically, a minimum of one pore volume of water is flushed through the treatment zone during this testing period. Surfactant flooding operations are then begun once the system operation is stable. During flooding operations, it is important to ensure an adequate supply of appropriately formulated surfactant solution. The steps for proper chemical preparation and quality control are described in the manual. Frequent system monitoring is also needed to maintain control over injected fluids and to track the progress of remedial efforts.

Figure 2 shows how visual inspection can provide real-time qualitative information on the breakthrough of the surfactant mixture at the extraction wells. The procession from light to dark back to light visually indicates the sweep of the surfactant solution through the subsurface as it picks up more and more contaminant and then less as the site is cleaned up. Equipment maintenance and instrument calibration should occur on a frequent basis to ensure proper functioning of the components and to maintain the target flow conditions and removal efficiencies.

The duration of surfactant flooding operations is site-specific, but is typically less than other remedial technologies and on the order of months instead of years. After surfactant flooding operations are complete, a water flood is used to remove residual concentrations of injected chemicals. The SEAR system is then decontaminated and disassembled. SEAR treatment can then be followed up with monitored natural attenuation or other less aggressive remedial approaches to treat the dissolved phase groundwater plume to MCLs.

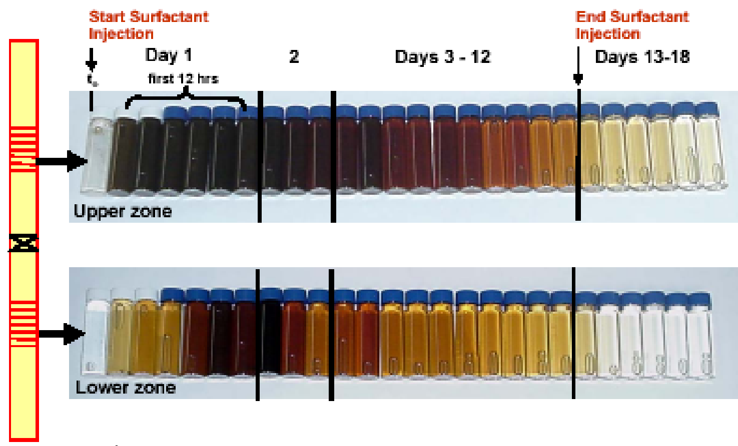


Figure 2. Visual Monitoring Samples collected from a SEAR site.

Conclusions

In addition to the above topics, the SEAR Implementation Manual provides references, practical guidelines for injection/extraction wells and multi-level samplers, SEAR field procedures, and contracting guidance. Navy RPMs considering the use of SEAR for DNAPL removal at their site should consult both the NAVFAC SEAR Design Manual and the SEAR Implementation Manual. Both manuals are valuable technical resources with helpful information to assist Navy RPMs in the development and execution of a successful SEAR project.

For more information, contact: (805) 982-1660

NAVFAC Installation Restoration (IR) Geographic Information System (GIS)/Data Management Workgroup

The Naval Facilities Engineering Command (NAVFAC) Installation Restoration (IR) Geographic Information System (GIS)/Data Management Workgroup was established by the IR Managers to develop a corporate methodology using common business practices for managing and facilitating the use of IR data through web-based GIS applications in a consistent and cost effective manner. The system is called Navy Installation Restoration Information Solution (NIRIS).

A database structure and Navy Electronic Data Deliverable (NEDD) have been developed which will be used by all the Engineering Field Divisions/Activities (EFD/As), Naval Facilities Engineering Service Center (NFESC), and our contractors to manage all IR Program data. The beta testing of the database structure was completed in August 2003. The structure was locked into Version 1.0 in September 2003. Future updates will be conducted on an annual basis. With the completion of the database structure, EFD/As can load existing and future data into the database and should start using the NEDD in future data deliverables. In FY04/05, NIRIS will have applications added to allow remedial project managers (RPMs) to access, share and evaluate IR data using web-based and desktop applications, making evaluation and visualization of data easier and more cost effective.

Activities planned for FY04 are the development of automated data management tools, which automate the loading, verification, and validation of the data into the database; and the development of user applications that allow data to be extracted for evaluation and visualization using various software packages.

For further information, contact your local workgroup representative, or call:

(805) 982-4990

Zero Valent Iron (ZVI) Injection Technology Demonstration at Hunter's Point Shipyard

Executive Summary

Ferox^{SM} injection is a patented technology of ARS Technologies, Inc. (ARS) for in situ subsurface remediation of source areas of chlorinated volatile organic hydrocarbons (VOC). The Ferox^{SM} technology involves injection of liquid atomized zero valent iron (ZVI) powder into targeted subsurface zones, using a packer system to isolate discrete depth intervals within open boreholes. A ZVI slurry is delivered to the subsurface in a liquid atomized form using pure nitrogen gas as a carrier fluid. If needed, ARS employs pneumatic fracturing as a first step prior to the injections to promote movement of the ZVI through the subsurface and contact with contaminants. Introduction of ZVI into the subsurface encourages chemical reduction of chlorinated VOCs.

To evaluate the Ferox^{SM} technology's performance in treating chlorinated VOCs, (see Figure 1) the U.S. Department of the Navy (DON) conducted a Ferox^{SM} injection technology demonstration at Remedial Unit C4 (RU-C4) in Parcel C at Hunters Point Shipyard in San Francisco, California. At RU-C4, an approximate 10-foot layer of artificial fill overlies fractured bedrock. At RU-C4, chlorinated VOCs, primarily trichloroethene (TCE), are present in both soil and groundwater. Before treatment began, TCE concentrations in groundwater were as high as 88,000 micrograms per liter. Pneumatic fracturing was employed, and ZVI was injected into four boreholes to treat soil and groundwater contamination in the vertical profile from the groundwater table (about 7 feet below ground surface (bgs)) to about 32 feet bgs.

Following ZVI injection, strongly reducing conditions in groundwater were observed out to a radius of 15 feet from each of the four injection boreholes. Within this 15-foot radius, which was considered to be the area of full treatment, the average oxidation-reduction potential was reduced to -372 millivolts. The depth of the treatment zone was estimated to extend from the top of the water table (about 7 feet bgs) to 32 feet bgs. Thus, the treated area covered approximately 1,818 square feet, and the treated subsurface volume was approximately 1,683 cubic yards.

Based on 12 weeks of groundwater monitoring results following ZVI injection, near complete, reductive dechlorination of all chlorinated VOCs was achieved. Reduction of TCE, the predominant contaminant, to ethene and chloride was rapid and nearly complete, with a reduction of 99.2 percent within the treatment zone. No significant increases in TCE degradation intermediates (such as cis-1,2-dichloroethene and vinyl chloride) were observed. (See Figure 2). Significant rebound of chlorinated VOC concentrations did not occur even as of the last sampling event, which was 3 months after ZVI was injected. A statistical analysis of changes in contaminant concentrations outside of the treatment zone further supports the conclusion that TCE was destroyed rather than displaced as a result of the injections. Thus, it was concluded that the Ferox^{SM} injection technology provided effective in situ remedial treatment of the source zone of chlorinated VOCs at this site.

The total cost of the field-scale implementation of the Ferox^{SM} injection technology at RU-C4 was $289,274, or $172 per cubic yard of the treatment zone. Excluding costs for sampling, analysis, and management of demonstration-derived wastes, the total cost was $196,665, or $117 per cubic yard. Economies of scale for certain cost elements, such as mobilization and demobilization, could result in somewhat lower unit costs for larger-scale applications.

Acknowledgements

This project was selected for field implementation by Naval Facilities Engineering Command's (NAVFAC's) Alternative Restoration Technology Team (ARTT). The goal of projects coordinated by the ARTT is to demonstrate and validate innovative technologies to expedite regulatory acceptance and implementation of innovative remediation technologies at Navy and Marine Corps sites. Through this program, NAVFAC develops, demonstrates, and validates new technologies to address pervasive Navy environmental problems for which implementable and cost-effective solutions are lacking. Pat Brooks, NAVFAC, Southwest Division (SWDIV) served as the key technical representative for this project.

For more information, contact: (619) 532-0930

Figure 1. Ferox[SM] Injection Technology Demonstration

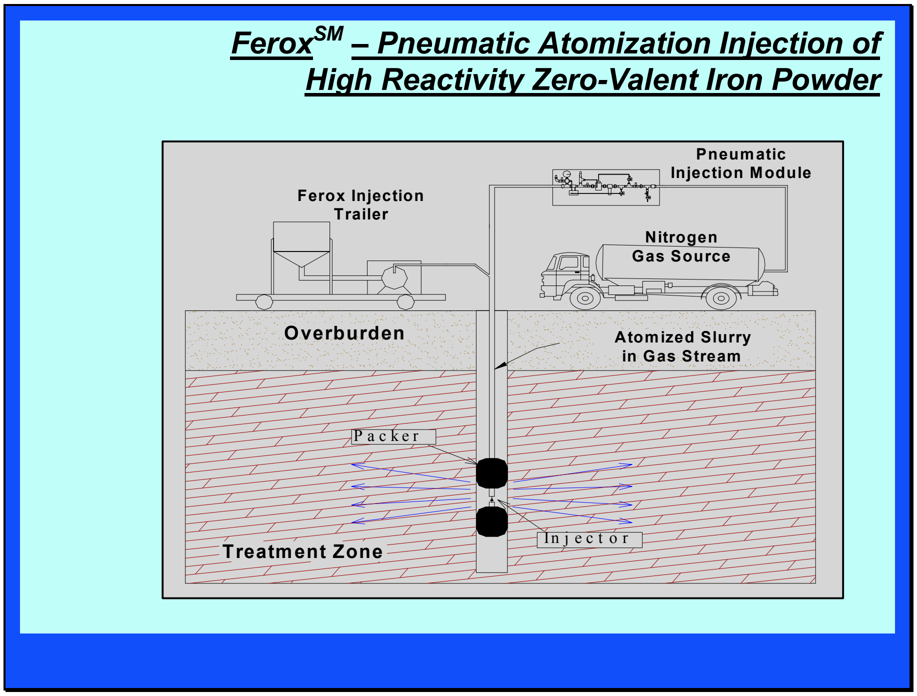
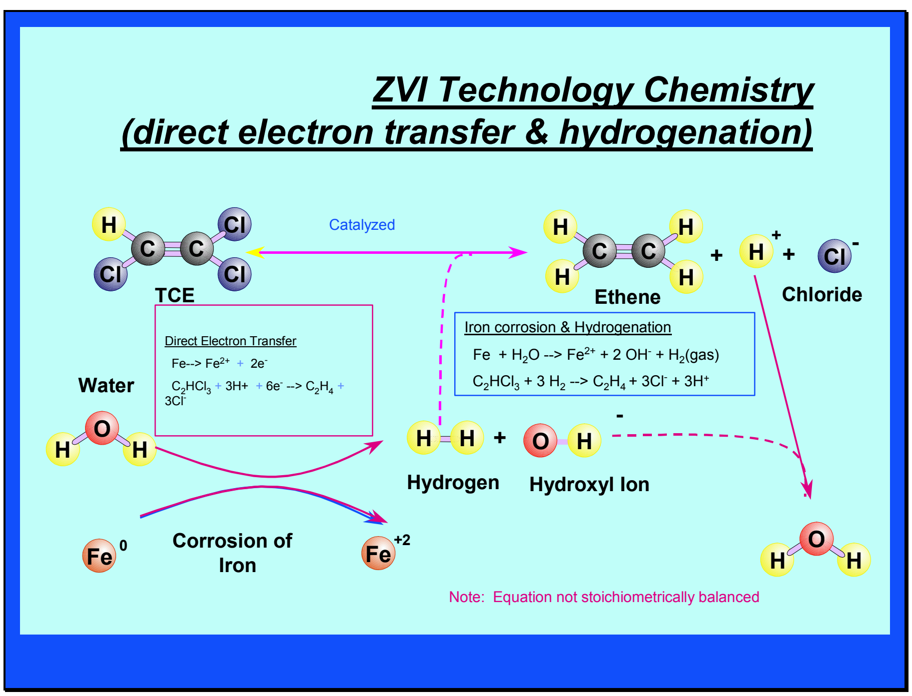


Figure 2. ZVI Injection



Naval Facilities Engineering Command

REMEDIATION INNOVATIVE TECHNOLOGY SEMINAR
RITS Fall 2003

The **Remediation Innovative Technology Seminar** (RITS) provides training on new and innovative technologies, methodologies, and guidance under the Navy's Environmental Restoration Program. The Naval Facilities Engineering Command (NAVFAC) sponsors RITS in coordination with its Engineering Field Divisions (EFDs), Activities (EFAs), and its Engineering Service Center. RITS training serves as one of many ways the Navy promotes innovative technologies to achieve site restorations more efficiently, cost effectively, and with higher performance.

While the RITS is developed primarily for the Navy's Environmental Restoration and Base Realignment and Closure (BRAC) environmental professionals, it is also available to other DOD personnel, the Navy's environmental cleanup contractors, and environmental regulators.

Topics for this offering:

ESTCP Program Information. The goal of the Environmental Security Technology Certification Program (ESTCP) is to demonstrate and validate promising, innovative technologies that target the DOD's most urgent environmental needs. This presentation will focus on how ESTCP functions, discuss the solicitation process for demonstration/validation of innovative technologies, and describe recently validated or promising technologies that are being demonstrated. Specifically, technologies will be described that address characterization and remediation of groundwater, sediments, or soils contaminated with chlorinated solvents, energetics, perchlorate, heavy metals, and petroleum-related compounds. The presentation will close with a discussion of future research direction and how RPMs can provide input on end-user needs.

Preparing for Optimization and Site Closeout. Many remedial actions at Navy Installation Restoration sites are currently in the design and implementation phases. Decisions made during these phases have significant technical and financial implications on site cleanup. This presentation will examine the physical, chemical, and biological processes that underlie these important management and engineering decisions. The characteristic life cycle behavior of remediation systems will be discussed to provide the technical context upon which optimization strategies are based. Specific topics include environmental partitioning and mass transfer, target treatment zones, remedy optimization, performance objectives, life-cycle design, exit strategies, and technical impracticability.

In Situ Chemical Oxidation: Case Studies and Technology Advancements. Chemical oxidation techniques are frequently used for remediation of contaminated sites. This discussion will focus on advancements made in chemical oxidation technologies in recent years, application improvements, and various chemical oxidants and injection schemes. Case studies will be presented, along with advantages and disadvantages and what site-specific conditions would be suitable for their successful application. RPMs will learn about what factors to consider in selecting chemical oxidation, selecting a suitable variant, designing the field application, and monitoring performance.

DCE/VC Stall at Natural Attenuation Sites. The Monitored Natural Attenuation (MNA) process for remediation of chlorinated solvents in groundwater causes dechlorination of more toxic parent compounds and less toxic daughter products are produced. While reduction of tetrachloroethene (PCE) and trichloroethene (TCE) to dichloroethene (DCE) is easily accomplished, further reduction of DCE and Vinyl Chloride (VC) to ethene and ethane is often not observed. This topic will discuss why this stalling occurs, present case studies of where this has happened, offer techniques for preventing this type of stalling, and provide options for stimulating further degradation of DCE and VC to ethene and ethane once the stall has occurred.

Agenda

0800 - 0830	Welcome and Introductions
0830 - 1000	ESTCP Program Information
1000 - 1130	Preparing for Optimization and Site Closeout
1130 - 1230	Lunch
1230 - 1430	In Situ Chemical Oxidation: Case Studies and Technology Advancements
1430 - 1600	DCE/VC Stall at Natural Attenuation Sites

Registration

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Innovative Landfill Cover Designs Harness Nature to Protect the Environment

The Interstate Technology & Regulatory Council (ITRC) has just published an overview of an innovative approach to designing and constructing landfill covers to keep the environment safe from contamination. *Technology Overview Using Case Studies of Alternative Landfill Technologies and Associated Regulatory Topics* (ALT-1) reveals flexibility in the regulatory framework for alternatives that may rely on native vegetation rather than artificial liners to keep water from reaching buried waste.

ALT-1 presents three types of case studies related to solid waste, hazardous waste, and mixed waste alternative landfill cover projects.

- One group documents alternative landfill cover regulatory controls, design, and construction at solid and hazardous waste facilities.
- Another section reports research on types of alternative landfill covers being conducted by the Desert Research Institute, discussing the cover elements as the test fill was constructed, the associated monitoring, and an evaluation of the alternative landfill cover results. Additional research information is provided on a compact disk (CD) provided with this case study document.
- A third section compiles cited research information assimilated on behalf of the Air Force Center for Environmental Excellence (AFCEE) describing alternative landfill covers, specifically evapotranspiration designs, with discussion and references containing information verifying the concept.

This technology overview is intended for use by regulators, facility owners and operators, consultants, academics, and stakeholders associated with solid, hazardous, and mixed waste alternative landfill cover projects. The case studies don't offer specific answers to all the possible questions that practitioners might have regarding regulatory flexibility, design, construction techniques, or long-term postclosure care associated with alternative covers, but instead are presented as they were developed to satisfy the requirements of the regulators, facilities, and consultants working on the specific projects they describe.

In compiling these case studies and developing the technology overview document, the ALT Team concluded that alternative landfill cover designs represent a substantial contribution to the waste management industry and can be as protective and economically feasible as traditional capping technologies, but the industry has limited experience and needs valid guidance describing the regulatory flexibilities currently available, critical design parameters, construction considerations, monitoring, and postclosure care. The follow-up technical and regulatory guidance from this ITRC team—including a decision tree for evaluating the design, construction, and monitoring of alternative landfill covers—will encourage the proper application of this innovative technique and increase awareness of these new cover designs within the regulatory, consulting, and stakeholder communities.

The ALT Team, led by Charles Johnson (*charles.johnson@state.co.us*) of the Colorado Department of Public Health and Environment, is one of 15 currently active ITRC technical teams that are producing guidance documents and conducting training on the deployment of innovative environmental technologies. ITRC teams have produced more than 40 guidance documents, all available online at the ITRC Web site (*www.itrcweb.org*). Click on "Guidance Documents" and then "Alternative Landfill Technologies" to access ITRC's newest product.

ITRC is a state-led group working to overcome regulatory barriers to the deployment of innovative environmental technologies. The ITRC Board is cochaired by Brian C. Griffin (*bcgriffin@cox.net*), a senior program advisor with the Southern States Energy Board, and G. Ken Taylor (*taylorgk@dhec.state.sc.us*), director of the Hydrogeology Division of South Carolina's Bureau of Land and Waste Management. ITRC participants come from the ranks of state regulatory agencies, Federal agencies concerned with environmental cleanup, environmental consulting firms, and technology vendors. These diverse professionals work together in technical teams to develop documents and training to expand the knowledge base among members of the environmental community and help regulators develop a more consistent and streamlined approach for regulating innovative technologies. ITRC products also help environmental consultants improve the way innovative technologies are deployed.

For more information, contact: (540) 557-6101

Improved Sampling Strategies For Contaminated Sediment Sites

Introduction

The Navy has many installations located near ecologically sensitive coastal areas where sediments may have been impacted by a variety of Navy and/or non-Navy sources. In February of 2002, the Chief of Naval Operations (CNO) released the *Policy on Sediment Site Investigation and Response Action*, which provides several guidelines for Navy remedial project managers (RPMs) to follow at contaminated sediment sites. In general, the policy requires that all sediment investigations and response actions be directly linked to Navy releases and also states that the Navy will not clean up contamination where it has not contributed to the risk or where the source has not been identified and contained. The Office of Naval Research (ONR) recently sponsored a series of studies to improve sediment site investigation efforts in order to better assess the ecological risks at these sites and to develop more defensible lines of evidence related to tracking contaminant sources. The new methodologies developed and studied in the field include the following:

- Principal Component Analyses (PCA)
- Compound-Specific Stable Isotope Fingerprinting
- Rapid Characterization
- Watershed Sampling Strategy
- Seasonal Sampling Strategy and Source Input
- Organotolerance of Bacteria
- Lines of Evidence for Natural Recovery.

All of these methods can be used as part of a comprehensive oceanographic sampling strategy for a given site. Navy RPMs can use these methods to couple evidence of biodegradation and the effects of seasonal variation with estimates of contaminant transport and measurements of watershed contaminants outside of the Navy study area (background or reference). These new methods, if implemented as part of the overall sampling strategy, can provide a more ecologically relevant understanding of the impact of contaminants on the environment in the context of industrialized watersheds.

Navy Research Efforts

The following briefly describes Navy-funded research and development (R&D) efforts related to these new sediment site characterization methods:

Principal Component Analyses (PCA). PCA is one method for identifying or ruling out potential sources of organic contaminants. PCA uses the ratios of individual compounds within a mixture to help to identify the characteristics of the potential source or sources. The Navy-supported research has focused on PCA of polycyclic aromatic hydrocarbons (PAHs), but this method may also apply to polychlorinated biphenyls (PCBs). The primary advantage of this analysis is that it can be performed on existing data sets that have already been collected as part of a typical Navy Remedial Investigation (RI).

Compound-Specific Stable Isotope Fingerprinting. This method is used for contaminant source identification and has been utilized for PAHs and trinitrotoluene (TNT) in sediments as part of Navy-funded research programs. The method involves the measurement of the ambient concentration of individual compounds and the determination of the ratio of carbon-13 to carbon-12 for each compound. These ratios can be specific to the geographic origins of the source material, the isolation procedure, or the synthesis method. These ratios are also preserved despite biological, chemical, or physical processes acting on the compounds once released into the environment. This analysis is more expensive than standard concentration measurements for sediment, but can provide valuable information for source determinations. Figure 1 is an example of chemical fingerprinting for PAH congeners.

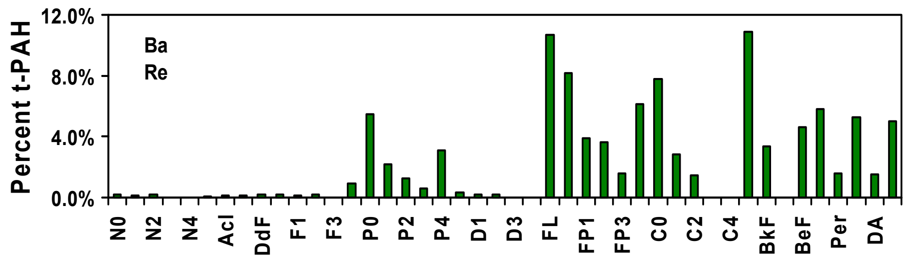

Figure 1. Chemical fingerprinting.

Rapid Characterization. Rapid characterization techniques using immunoassay kits have been developed to estimate PAH and PCB concentrations during an initial site survey. Figure 2 shows a typical immunoassay instrumentation setup. This initial screening is followed by resampling to obtain a more detailed genetic and biochemical analyses of site samples. The rapid characterization immunoassay can be performed in less than 24 hours, which allows it to be used in conjunction with a 2-day watershed sampling event. This rapid characterization allows the RPM to choose more effective sample locations based on preliminary analytical results, instead of waiting 2 weeks for the complete set of results.

Figure 2. Immunoassay instrumentation for sediment screening.

Watershed Sampling Strategy. A new strategy has been developed by ONR for the selection of sediment sampling stations and the determination of the number of sampling events based on an oceanographic understanding of estuary-specific processes. These considerations include:

1. hydrodynamic issues based on water flow,
2. physical characteristics of the area surrounding the Navy sediment site,
3. importance of seasonal fluctuations in temperature and rainfall, and
4. distribution of sampling stations across the watershed.

This strategy was applied during sampling events in the lower Chesapeake Bay, Charleston Harbor, San Francisco Bay, and the upper Delaware and Schuylkill rivers (near Philadelphia).

Seasonal Sampling Strategy and Source Input. Most sediment sampling approaches do not adequately consider the effects of seasonal variation or contaminant concentration variance in different types of sediment. An oceanographic plan calls for sampling of the same watershed stations over several seasons. Sampling the watershed seasonally for several years allows the RPM to assign ecologically relevant error bars to the measured contaminant concentration at a site. It is also important to measure the amount of contaminant bound to particles in the water column, moving over the sediment tidally, or depositing onto the surface sediments (e.g., sediment traps). The sediment trap material may provide a more site-specific and ecologically relevant reference material than the “pristine” areas that are often chosen as reference sites in Navy RIs. In addition, data on water flow can be used to estimate contaminant transport through a specific area of the watershed.

Organotolerance of Bacteria. Identifying the source of volatile organic compounds (VOCs) to sediments may lead to the identification of non-Navy potentially responsible parties (PRPs) that contribute higher molecular-weight organics to the site. One strategy to determine the source of high molecular-weight organics is to employ a radiotracer assay that measures the response of the bacterial assemblage to VOC exposure. Many bacteria in sediment become organotolerant as they are repeatedly exposed to VOCs. The degree of organotolerance can be directly measured by exposing subsamples of the native bacterial population to increasing amounts of a VOC. In one Navy study, the growth rate of bacteria in sediments from chronically exposed areas was not affected by the addition of naphthalene. However, bacteria from sediments in more pristine areas were dramatically affected. This type of assay was applied to sediments from the Charleston Harbor, San Diego Bay, and the Philadelphia area.

Lines of Evidence for Natural Recovery. There are few valid methods currently available to measure the intrinsic rates of contaminant biodegradation in sediments. Intrinsic biodegradation is also known as natural recovery. Several independent methods are often needed to make a compelling case for natural recovery. These methods include:

1. the genetic capacity for biodegradation,
2. the presence of metabolic intermediates known to result from biodegradation,
3. the change in ambient contaminant concentration in response to electron acceptor availability, and
4. radiotracer mineralization by the native bacteria.

The best support for natural recovery is to first determine that the genetic capacity exists by finding in situ evidence that metabolism is occurring (e.g., the presence of intermediates). The next step should be to estimate the in situ rate via radiotracer additions. Next, the estimated degradation rate should be compared with contaminant transport rates and ambient contaminant concentrations to determine if the calculated biodegradation rate is feasible.

Conclusions

Sediment site investigations should employ oceanographic sampling strategies in order to provide data that is ecologically significant and useful in understanding the relative risk of contaminants on Navy property compared to the rest of the industrialized watershed. As described above, several new methods are available that can be used in an overall sampling strategy that combines measures of transport and biodegradation with a seasonal and watershed-level sampling approach. More information on the above research is available in the Naval Facilities Engineering Command (NAVFAC) special publication titled *Accelerated Implementation of Harbor Processes Research* that was released in May 2003 (SP-2135-ENV). This publication is also available on the Naval Facilities Engineering Service Center (NFESC) web site:
http://enviro.nfesc.navy.mil/erb/erb_a/restoration/fcs_area/con_sed/sp-2135-harbor-proc.pdf

For more information, contact:
(805) 982-1656

Acknowledgements

Special thanks to the research personnel working on these various Navy-funded projects, including J. Leather, R. Coffin, T. Boyd, M. Montgomery, and L. Chrisey.

UPDATE From the Remedial Action Operation/Long Term Management (RAO/LTMgt) Optimization Workgroup

The RAO/LTMgt Workgroup promotes optimization in the Navy Installation Restoration Program (IRP) with the ultimate purpose of achieving efficient, protective, and cost-effective site closeouts. Optimization of all environmental restoration response actions at Department of Defense (DOD) facilities is required (*Defense Environmental Restoration Management Guidance, September 2001 - Section 20*). Further guidance from Naval Facilities Engineering Command (NAVFAC) on conducting independent optimization studies is forthcoming. With this in mind, the workgroup strives to develop products, tools, and guidance documents that provide clear and consistent approaches to optimization and site closeout.

To facilitate collection and tracking of optimization data, the RAO/LTMgt Workgroup and NAVFAC Headquarters (HQ) are developing a new section within the Normalization of Environmental Data Systems (NORM) data management system. Within this section, the project manager can report baseline conditions, optimization studies and recommendations, implemented strategies, and progress in terms of cost avoidance and improved results. This type of information can be used to illustrate NAVFAC's optimization activities and lessons learned.

The RAO/LTMgt Workgroup has completed two guidance documents to assist Navy Remedial Project Managers (RPMs) and their contractors. The *Guidance for Optimizing Remedial Action Operation (RAO)* is a link that presents a step-wise process for optimizing RAO projects. The objective is to provide information on how to reduce operating costs while maintaining program effectiveness. The *Guide to Optimal Groundwater Monitoring* can be used to ensure that monitoring programs are designed and periodically optimized to cost-effectively support monitoring goals without compromising program and data quality.

Two additional guidance documents will soon be available in early 2004. The *Guide for Optimizing Remedy Selection and Remedial Design* will provide guidance for optimizing the remedy evaluation, selection, and design phases by incorporating technology life-cycle concepts, and serves as a companion to previous NAVFAC optimization guidance. Life cycle considerations include designing for the entire life of the project (not just initial conditions), addressing asymptotic contaminant removal over time, selecting the target treatment area, developing an exit strategy, transitioning to an alternate treatment technology such as monitored natural attenuation, and developing a site closure strategy.

The *Guide for Documenting Site Closeout* will outline a consistent approach for Navy RPMs to follow in recognizing and documenting specific milestones for achieving site closeout. Specific documents are needed at appropriate stages of the closeout process to record agreements. In addition, as regulators and Navy RPMs change with a project over time, it is important that decisions and milestones are documented and adhered to. This may be increasingly important as some Environmental Restoration, Navy (ER,N) sites move onto the Base Realignment and Closure (BRAC) V list. A draft guidance document will be presented to the Installation Restoration (IR) Managers this fall, and will undergo a subsequent review and revision.

Finally, the RAO/LTMgt Workgroup completed a survey of the Department of Navy (DON) groundwater pump and treat systems. Findings and recommendations are documented in a report, *DON Pump and Treat Systems, February 2003*. Operational and cost information on all DON Pump and Treat (P&T) systems as well as information about any optimization efforts were collected and analyzed. This report contains no site-specific information, but rather a summary of DON systems together. The report concludes with P&T optimization and management recommendations.

For more information, contact: (805) 982-2636

New Methods for Monitoring Coastal Contamination Migration

Introduction

Landfills and hazardous waste sites located in coastal environments pose a potential environmental threat to surface water bodies through the exchange of groundwater-borne contaminants. It is estimated that one out of five Navy landfills are subject to groundwater exchange through tidal influence. Therefore, the ability to determine where groundwater is discharging, at what rate, and what contaminant concentrations are entering the surface water body is important to understanding these sites and determining the need for remediation.

Groundwater discharge (seepage) into coastal environments has been studied extensively using a variety of methods. The primary driver for seepage in near-shore environments is probably discharge from land to surface water induced by the hydraulic gradient in the terrestrial aquifer. However, significant contribution to seepage may also derive from groundwater circulation and oscillating flow induced by tidal stage. In coastal areas with strong tides, tidal mixing zones may be created by the movement of seawater into the aquifer. This tidally mixed zone may be important in controlling the exchange of groundwater due to a process referred to as tidal pumping. Tidal pumping occurs when seawater mixes with groundwater at high tide and then, as the tide recedes, the mixture of seawater and groundwater is drawn out into the coastal waters. Because this process repeats every tidal cycle, appreciable volumes of groundwater can be extracted over time. The conceptual model for migration of contaminants from groundwater to coastal surface water is shown in Figure 1. Groundwater discharge can contribute significant quantities of water to an overlying surface water body. The impact, both chemical and physical, may be heightened in smaller bodies of water such as embayments and lagoons due to their limited volume and restricted fluid exchange with the open ocean.

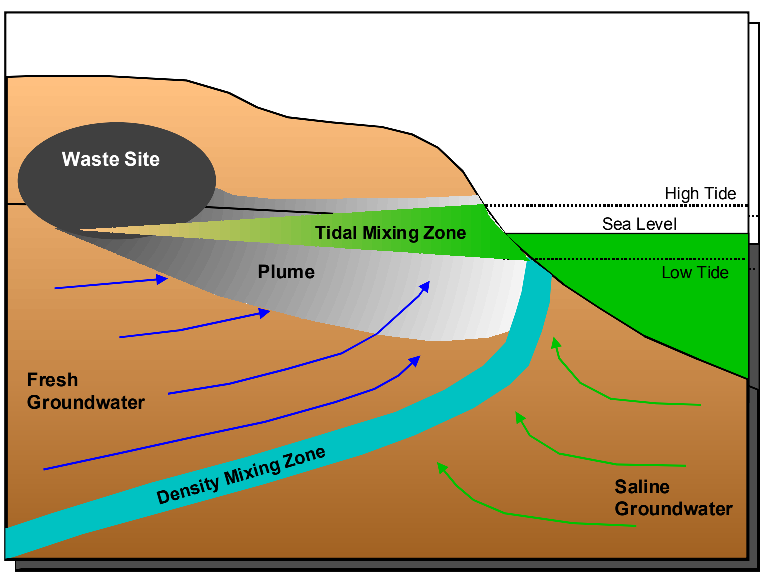

Figure 1. Conceptual model of coastal contaminant migration process.

New Monitoring Methods

Two major obstacles in studying groundwater exchange have been (1) identifying the spatial location where exchange is likely to take place and (2) accurately measuring the groundwater seepage across the sediment-water interface. This article will describe two new techniques for identifying potential areas of groundwater impingement into surface water as well as quantifying flow rates and contaminant levels. These two new monitoring techniques, the Trident® Probe and the UltraSeep Meter®, were developed by Navy engineers in conjunction with scientists from Cornell University.

Trident® Probe

The Trident® Probe is a flexible, multi-sensor sampling probe for screening and mapping groundwater plumes at the surface water interface. It consists of a simple direct-push system equipped with temperature, conductivity, and porewater sampling probes. A schematic and photo of the Trident® Probe are shown in Figure 2. Contrast in temperature and conductivity between surface water and groundwater are used to determine likely areas of groundwater impingement. The water sampler is used to collect samples for subsequent chemical analysis. The conductivity measurements can be used to detect contrast in salinity and/or clay content in unconsolidated sediments. The conductivity signal varies primarily as a function of clay content and porosity. Areas of likely groundwater seepage are generally associated with low conductivity, either as a result of low salinity, low clay content (high permeability), or both. Areas of groundwater seepage may appear either warmer or colder in contrast to the surface water depending on seasonal and site characteristics. The water sampling probe allows interstitial water to be extracted from the sediment at selected depths up to about 60 cm below the sediment-water interface. Porewater is collected by syringe or vacuum pump extraction through a small-diameter stainless steel probe.

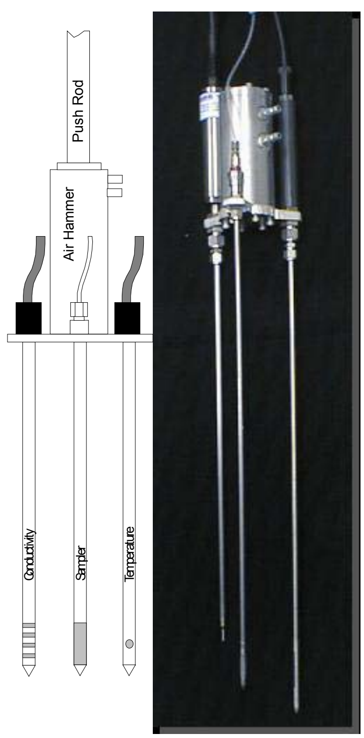

Figure 2. Schematic diagram and photo of Trident® Probe.

Recent trials show that the Trident® Probe provided rapid spatial assessment of both groundwater exchange parameters (temperature contrast and conductivity and contaminant concentrations). Figure 3 is an example of temperature contours developed from Trident® measurements taken at North Island Site 9 in San Diego, California. The contours mapped are the differences in temperature between surface and groundwater interface. The area having the greatest difference indicates a potential area of groundwater discharge.

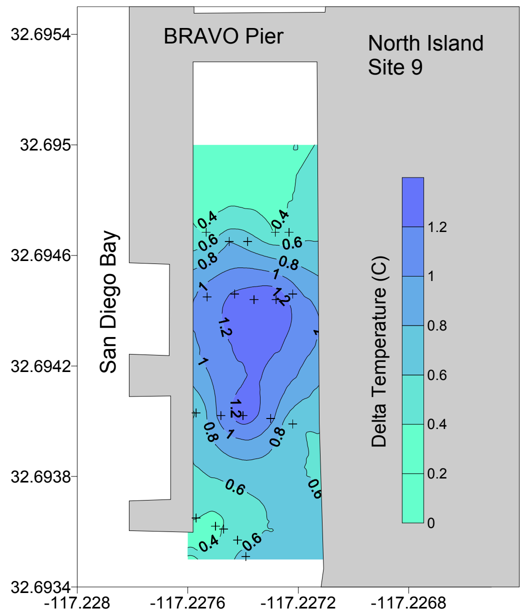

Figure 3. Temperature difference mapping at North Island Site 9.

UltraSeep® Meter

The UltraSeep® Meter is a modular, state-of-the-art seepage meter for direct measurement of groundwater and contaminant discharges at the surface and groundwater interface. It features an ultrasonic flowmeter that provides continuous, direct measurement of groundwater flow. The water sampler employs a low-flow peristaltic pump with sample selector valve and sample bag array. The on-board sensors measure temperature and conductivity and the controller stores data and controls sampling events. The feedback control system regulates water sampling to maximize sampling volume without restricting flow. The flowmeter provides accurate detection of a specific discharge or recharge in the range of 0.1 to 150 m^3/d. Figure 4 is a photograph of the meter.

The ability to collect a continuous seepage record is critical to understanding the dynamics of the exchange process, especially in areas with strong tidal influence. In addition, the flow sensing capability allows water samples to be collected in proportion to the seepage rate, enabling the direct quantification of the chemical loading associated with the groundwater discharge. At coastal sites, a typical deployment runs over a 12 to 18 hour period to capture an entire semi-diurnal tidal cycle. During this time, the seepage rate is continuously monitored and up to 6 water samples can be collected for chemical analysis. At the end of deployment, the meter is recovered using either a lift line to the recovery boat or by diver assistance.

Figure 4. Photo of UltraSeep® Meter.

Conclusions

Cost avoidance from employing these new monitoring methods is potentially significant over conventional terrestrial investigations and fate and transport modeling. Improved site knowledge also leads to the selection of more appropriate, less expensive remedial alternatives. These technologies should be considered if one or more of the following conditions exist at a site:

- There is a clear identification of a terrestrial contaminant plume migrating to the shoreward boundary of the surface water body,
- Applicable regulations or other compliance/cleanup drivers require identification of contaminant exposure levels in the surface water or at the interface,
- Hydrogeologic modeling results are ambiguous or require field validation,
- The area where the plume is impinging needs to be clearly delineated to address risk and/or remedial options (Trident®),
- The rate of discharge and associated contaminant loading requires delineation to address risk and/or remedial options (UltraSeep®).

Cornell University's development and evaluation of these new monitoring techniques were supported by the Space and Naval Warfare Systems Command (SPAWAR) and the Naval Facilities Engineering Service Center (NFESC).

For more information on coastal contaminant migration monitoring, please contact:
(805) 982-4890

Technology Transfer (T2) News

T2 web site address:
http://enviro.nfesc.navy.mil/erb/restoration/technologies/tech transfer/main.htm

Survey Results of Pump and Treat Systems at Navy Sites

Naval Facilities Engineering Command's (NAVFAC's) Remedial Action Optimization (RAO)/Long Term Management (LTMgt) Work Group recently released the results of a groundwater pump and treat systems survey at Navy Installation Restoration (IR) sites. The RAO/LTMgt Work Group prepared a questionnaire that was disseminated to NAVFAC Engineering Field Divisions /Activities (EFDs/As). The resulting data was consolidated into a report. The main objectives of the survey were to assemble operational data on Navy pump and treat systems, to identify optimization efforts, to evaluate transitions to alternative remedial technologies, and to provide information to assist in the development of policy and guidelines for pump and treat optimization efforts. The results of the survey can be found on the Naval Facilities Engineering Service Center Environmental Restoration and Base Realignment and Closure (BRAC) (NFESC ERB) web site in the report titled "Department of the Navy Groundwater Pump and Treat Systems" (see NFESC SP-2129-ENV). This document can be found at:
http://enviro.nfesc.navy.mil/erb/erb_a/support/wrk_grp/raoltm/pt_rpt.pdf

New Implementation Guide for Assessing and Managing Contaminated Sediment at Navy Facilities

A new NAVFAC guidance document is available that presents guidelines for conducting sediment site assessments and remedial alternative evaluations within the Navy's IR program. The guide is intended for use by Navy remedial project managers (RPMs) and their technical support staff as stepwise guidance that will apply to most Navy sediment investigations. Sediment investigations often are more complex than terrestrial investigations for a variety of reasons including a lack of sediment cleanup criteria and aquatic toxicity data for many contaminants, and incomplete knowledge and understanding of aquatic food webs. Additionally, sediments commonly require specialized methods for sampling, analysis, and remediation.

This guide identifies and discusses sediment-specific issues related to site characterization, risk assessment, and remedial alternative evaluation, and then directs the reader to related web sites and resources for more detailed technical information. The new guide is available on the ERB web site and is titled "Implementation Guide for Assessing and Managing Contaminated Sediment at Navy Facilities" (see NFESC UG-2053-ENV). This document can be found at:
http://enviro.nfesc.navy.mil/erb/erb_a/restoration/fcs_area/con_sed/ug-2053/ug-2053-sed.pdf

Act Now to Get Technical Support Under the New Rapid Response Task Order!

NFESC sponsors a Rapid Response Task Order under the Environmental Technology Implementation Contract (ETIC) to provide technical support to RPMs. Under this task order, funds are available for RPMs to access additional technical expertise needed to support their projects.

The technical support efforts can include a wide variety of activities such as technical review of reports, data, sampling strategies, and work plans; remedial technology selection and system design; attendance of experts at meetings with regulators or the public; developing technical presentations; participating in site visits; collecting soil or groundwater samples and performing chemical analyses; preparing technical data sheets and issue papers; and conducting project follow-up activities.

For more information, contact: Your Technical Support Representative (TSR) or (805) 982-2636

For more T2 information contact: (805) 982-2194