RPM News

▲ Remedial Project Manager News ▲

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

Summer 1997

NFESC Naval Facilities Engineering Service Center

Call In!

For the Latest News In Cleanup Technologies
Teleconferencing With NFESC

Since April, 1996, the Naval Facilities Engineering Service Center (NFESC) has organized and hosted the Installation Restoration (IR) teleconference. The monthly teleconference is an hour long telephone meeting designed to assist project and technical managers with the wide range of technical issues associated with site remediation. Participants have at the very least found the discussions informative. However, most have discovered the conference to be considerably relevant as well as beneficial to the needs of their on going projects. By choosing to participate in the conference forum, you will get the opportunity to:

- Speak with other Remedial Technical Managers (RTMs) and Remedial Project Managers (RPMs) who have had or are currently experiencing similar problems.
- Help others who may benefit from your past experiences and lessons learned.
- Initiate a network of contacts for future technical support.
- Discuss technical issues with invited experts.
- Keep current with innovative technologies and strategies associated with NFESC's Tiger Team efforts.

After each conference, minutes are written and distributed by email. The following is a list of past conference topics:

• Landfills	4 April 1996
• Landfills & Sediment	18 April 1996
• Intrinsic Bioremediation & PAH Clean Up Levels	2 May 1996
• Enhanced Bioremediation	16 May 1996
• Small Arms Ranges	30 May 1996
• Small Arms Ranges (Part 2)	13 June 1996
• In Situ Cleanup Of Chlorinated Solvents	20 June 1996
• GIS (Geographic Information Systems)	11 July 1996
• Background Arsenic Levels	25 July 1996
• Institutional Land Use Controls	8 August 1996
• PCB/Pesticide Remediation	22 August 1996
• Pesticide Remediation	5 September 1996
• DQOs (Data Quality Objectives)	21 September 1996
• RBCA (Risk Based Corrective Action)	17 October 1996
• Groundwater Modeling	19 November 1996
• Groundwater Modeling to Aid Natural Attenuation	19 December 1996
• Impracticability of Groundwater Restoration	16 January 1997

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RPM NEWS

Remedial Project Manager News

Published By

NFESC

Using Appropriated Funds

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Teleconferencing with NFESC

(continued from page 2)

The following quotes/correspondence have been provided from those who have already participated in the teleconference forum.

"A half dozen of our folks were glued to their telephones for an open forum that included concepts, designs, regulatory issues, cost, research, and more."

Northern Division,
Naval Facilities Engineering Command

"I think the teleconferences are an excellent way to promote better communication across the EFD's (Engineering Field Divisions). The recent teleconference on Risk Based Corrective Action, for example, was extremely informative and useful. Keep up the good work! I look forward to participating in future IR Teleconferences."

Ginny Garelick, Southwest Division,
Naval Facilities Engineering Command

"I have been following the IR Teleconferences since their inception. I am writing to thank your for the work you are doing in coordinating technical experts and timely topics. I suspect there are more closet IR Teleconference junkies like myself. Thank you."

Des Chandler, Southwest Division,
Naval Facilities Engineering Command

"Definitely, this has been helpful, this is the first time I have been on the conference calls, and I can see there is a significant value to it. So I plan on joining them again."

Walt Kitchin, Southwest Division,
Naval Facilities Engineering Command

"Keep up the good work, as you're doing an excellent job!"

Jay Newbaker, Northern Division,
Naval Facilities Engineering Command

The IR Teleconferences take place on the third Thursday of each month at 11:00 AM PDT/PST. To obtain the topic of discussion and the instructions on how to connect to the upcoming IR Teleconference, or if you desire a copy of conference minutes or would like notification and minute distribution service to be extended to you by email, please contact:

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Environmental Training Calendar For 1997

DATE	TITLE	LOCATION	PHONE
Jul 7-11	The Princeton Course Groundwater Pollution and Hydrology	San Francisco, CA	(813) 855-6898
Jul 14-16	Understanding Marine Sediment Analysis and Interpretation	Seattle, WA	(800) 462-0876
Jul 16-18	Cleaning Contaminated Marine Sediment	Seattle, WA	(800) 462-0876
Jul 28-Aug 1	The Princeton Course Groundwater Pollution and Hydrology	Orlando, FL	(813) 855-6898
Aug 4-7	AFCEE Annual Joint Service Pollution Prevention Conference and Exhibition	San Antonio, TX	(703) 522-1820
Aug 12-14	Subsurface Contamination Investigation Field Course	Fort McCoy, WI	(800) 462-0876
Sep 8-12	Advanced Environmental Restoration Course	Washington, DC	(805) 982-6528
Sep 8	Environmental Chemistry Refresher	Madison, WI	(800) 462-0876
Sep 9-11	Environmental Chemistry for Investigating and Remediating Soil and Groundwater Contamination	Madison, WI	(800) 462-0876
Oct 5-7	ASCE In Situ Remediation '97 of the Geoenvironment in conjunction with the ASCE Annual Convention	Minneapolis, MN	(800) 548-2723 *extension 6300
Oct 20-23	University of Massachusetts 12th Annual Conference on Contaminated Soils	Amherst, MA	(413) 545-2934
Dec 2-4	E.J. Krause & Associates/Environmental Industry Associations Announces HasWasteWorld SUPERFUND XVIII	Washington, DC	(301) 986-7800

EPA NEWS

EPA Announces New Service For Sharing Information On Site Characterization and Remediation Technologies

The U.S. Environmental Protection Agency (EPA) Technology Innvovation Office (TIO) offers an e-mail service to keep you informed of important technology developments. The service provides an e-mail about once a month, sharing the latest information on site characterization and remediation technologies. The e-mail message highlights new publications and events. More information can be found on TIO's home page at http://clu-in.com.

To suscribe to the service, send an e-mail to: listserver@unixmail.rtpnc.epa.gov

On the first line of the message area, type: suscribe TechDirect firstname lastname

Questions or comments on this service can be directed to:

Mr. Jeff Heimerman
(703) 603-7191
Email: heimerman.jeff@epamail.epa.gov

What's A QIF?

Quality Improvement Forum (QIF) At Naval Facilities Engineering Command Southern Division (SOUTHDIV)

The Quality Improvement Forum (QIF) provides a way for SOUTHDIV to discuss innovative procedures and process improvements to expedite cost-effective environmental restoration. The QIF is comprised of one Core Team and multiple Focus Groups. The purpose of the Core Team is to identify key issues and present new ideas for discussion and action. If an issue requires additional attention, a Focus Group is formed. Examples of Focus Groups already formed are:

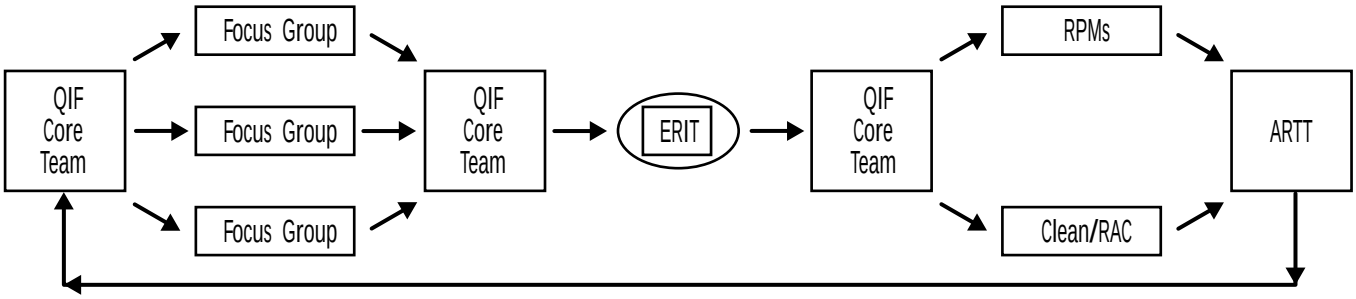
- Performance Criteria Package (PCP)
- Innovative Technologies
- Investigative Derived Waste (IDW)
- Report Format
- Data Quality Objectives (DQO) Process and Geostatistics
- Monitoring Well Standards
- Site Closure Documentation
- Environmental Site Information System (ESIS)
- Risk Based Decision Making
- Comprehensive Long-Term Environmental Action Navy (CLEAN) /Remedial Action Contract (RAC) Interface

The purpose of each Focus Group is to recommend solutions. Each Focus Group has a Core Team link. The Core Team link presents the recommended solution to the Core Team at the QIF meeting. If the solution is a policy, it is reviewed by the Environmental Restoration Improvement Team (ERIT) for approval.

The QIF is a way to optimistically formulate ideas and communicate strategies. Everyone works together as a team to overcome any obstacles of transferring CLEAN work to the RAC.

The QIF communicates ideas and solutions with the Alternative Restoration Technology Team (ARTT) as appropriate. The Remedial Project Managers (RPMs) take ideas and solutions from the QIF and share them with the ARTT.

SOUTHDIV has established an intellectual approach to meeting environmental remediation goals. The QIF's on-going effort to address and follow up on every action item brought forth by the Core Team is truly impressive. The QIF is an example of how SOUTHDIV continually strives to cost-effectively meet Navy installation restoration goals.



Flow Chart of QIF Process

For more information on the QIF, please contact:

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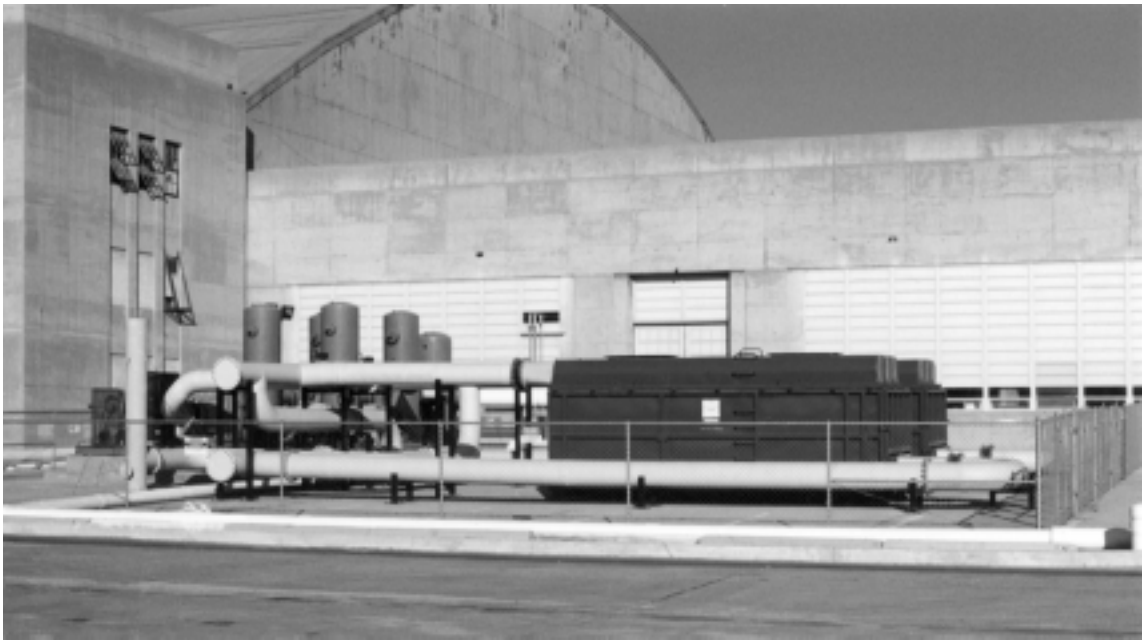
Sharing Remediation Equipment Within DoD

"A Win-Win Situation"

Recently, there has been discussion about the potential transfer of Soil Vapor Extraction (SVE) equipment currently operating at the Central Base Area Operating Unit (OU) at Norton Air Force Base (AFB), located in San Bernardino, California to Marine Corps Air Station (MCAS) El Toro, located less than 100 miles away in Irvine, California.

Fact finding site visits to Norton AFB were conducted by the Base Realignment and Closure (BRAC) Environmental Coordinator (BEC) for El Toro and Naval Facilities Engineering Command, Southwest Division (SWESTDIV) personnel in September 1996. These site visits were conducted for several reasons:

- Norton AFB is several years ahead of MCAS El Toro in the BRAC closure process
- Norton AFB and MCAS El Toro have Volatile Organic Compound (VOC) groundwater plumes originating from source areas in the vicinity of aircraft maintenance hangars
- Both VOC source areas have relatively high dissolved VOC concentrations near the source and low dissolved VOC concentrations off site near the extent of regional groundwater plume
- Both Department of Defense (DoD) installations are on the National Priorities List (NPL) and under the jurisdiction of the same regulatory offices of the U.S. Environmental Protection Agency (US EPA), California/EPA (Cal/EPA) and Santa Ana Regional Water Quality Control Board (RWQCB)
- Norton AFB has a signed Record of Decision (ROD) and Remedy in Place (RIP) at the Central Base Area OU where the equipment is being used



Soil Vapor Extraction equipment on site at Norton AFB

Based on this information, Norton AFB has valuable information and lessons learned that will benefit the BRAC process at MCAS El Toro. Mr. Tom Bartol, BEC at Norton AFB, has provided valuable insight through informative overhead presentations. The presentations and copies of the ROD have been forwarded to the El Toro team and are expected to be an asset in continued planning for VOC source area cleanup at MCAS El Toro.

Studies conducted at the VOC source area at MCAS El Toro support the selection of SVE technology as a remedy for vadose zone contamination. SVE pilot studies are currently ongoing at the source area and the Marine Corps/Navy and BRAC cleanup team supports this technology for VOC removal from the vadose zone.

Information provided by Mr. Bartol during site visits to Norton AFB have suggested the SVE has been successful during the first year of operation at the Central Base Area OU. The current schedule is to continue operation until approximately April 1997. This schedule and the extreme similarities between the two facilities are the primary basis for exploring the possibility of transfer of the SVE equipment to MCAS El Toro.

A cooperative agreement between the Departments of the Air Force and Navy (DoAF and DON) resulting in the transfer of remediation equipment between the BRAC facilities is a "win-win" situation for both services, as well as for the DoD. The Air Force has not completed its screening of potential uses internally for its government-owned SVE equipment; however; the potential exists for a transfer to the DON. Referring back to the President's Fast Track Cleanup Initiative, the transfer of equipment would be a demonstration to the public of the DoD's commitment to this concept. MCAS El Toro would gain a customized design and accelerated cleanup, and the DoD would benefit through cost savings and positive public relations. Funding issues would have to be worked out between the two services; however, utilization of the Norton AFB equipment at MCAS El Toro would be less cost to the DoD than a customized design and implementation at each facility. The Air Force could recover a portion of its design/construction funds, the Marine Corps/Navy could procure the vadose zone remedy at a reduced cost, and DoD could advertise interservice technology transfer, fast track cleanup and taxpayer dollar savings. After successful remediation at MCAS El Toro, we could experience similar cost savings.

For more information, please contact:

Mr. Joseph Joyce
BRAC Environmental Coordinator
MCAS El Toro
(714) 726-3470

Mr. Tom Bartol
BRAC Environmental Coordinator
Norton AFB
(909) 382-5027

What Is TENEP and THOMAS?

The Electronic Network of Environmental Professionals (TENEP)

Introduction to TENEP by Larry Owens and Kathy Wilkerson <tenep@envision.net>

TENEP is an on-line network providing environmental professionals with a forum for discussion on topics such as:

- technology
- remediation
- hazardous waste
- engineering design
- environmental chemistry
- major projects coming up
- environmental laws and regulations
- ISO 14000 and sustainable development
- upcoming short courses and continuing education opportunities

The goal is to link environmental professionals together for dialogue on various topics, thereby increasing information and technology transfer. This list server is a free service sponsored by ENVision (ENVision Environmental Engineering and Information Technology Inc.). It is moderated to ensure that quality posts are passed on to subscribers free of abusive language or attitudes, excessive self-promotion, environmental/industry activism or political motivation.

We encourage all subscribers to make it a priority to submit posts to TENEP. Please send posts to **<tenep@envision.net>**
TENEP is the subscribers' forum to:

- Respond to your colleagues.
- Request assistance related to a particular topic.
- Present issues and request discussion by the group.
- Share information/technology with your colleagues.
- Take responsibility for enhanced environmental quality world-wide!

To subscribe, visit the TENEP page of the ENVision website at: **<http://www.envision.net/TENEP/>**

For additional information about how to access TENEP, please contact:
Ms. Kathy Wilkerson
ENVision Associate
wilkerson@envision.net
http://www.envision.net

Introduction to THOMAS by Kathy Wilkerson <wilkerson@envision.net>

THOMAS is legislative information on the internet. This service of the U.S. Congress, implemented through the Library of Congress, has been developed "in the spirit of Thomas Jefferson". The service is free and is readily available to Internet users. It debuted in 1995, and is regularly updated. This service can provide information concerning:

- Environmental laws and regulations of the United States of America
- Proposed new legislation, and what progress it has made in the current session of Congress

To visit Thomas, you need to bypass Monticello and visit **<http://thomas.loc.gov>**

What does Thomas have to offer?

Databases! Thomas' Databases include:

- Hot Bills
- Bill Summary & Status
- Bill Text
- Congressional Record Text
- Congressional Record Text
- Congressional Advisory Board Reports
- Constitution of the United States and
- How Our Laws Are Made

The next database that will be brought online will be the full text of Committee reports.

Links! Thomas' Home Page provides links to Congressional Internet Sites and links to information that does not reside within the THOMAS system. Congressional links include:

- House of Representatives
- Senate
- Government Printing Office
- General Accounting Office

One example of a link to information outside the THOMAS system, is the link to "Federal Regulatory Information: Full-Text, Agency and Background Resources available via the Internet" by N. Lagace and J. Brandt of the University of Michigan, Ann Arbor MI (1994), at:
<http://asa.ugl.lib.umich.edu/chdocs/federalregs/regshome.html>

To learn more "About THOMAS", visit:
<http://thomas.loc.gov>

Lewes EA Completed In-House In 10 Days

The close of FY96 presented typical challenges to Naval Facilities Engineering Command, Northern Division's (NORTHDIV's) Environmental Planning Team. With limited resources, the team had to complete a multitude of National Environmental Policy Act (NEPA), Clean Air Act, coastal zone and historic preservation compliance requirements so that crucial construction and repair projects could be awarded.

One additional event made the typical end-of-the-year crunch even more difficult. During that time period, the team received a request to complete within 10 days, the required compliance actions to transfer the former naval reserve center in Lewes, Delaware, to the State of Delaware. Although the implementing legislation had only just passed into law, there was strong interest in making an immediate transfer. The necessary compliance actions included meetings, site visits, surveys and the preparation of an Environmental Assessment (EA) in accordance with NEPA.

The task seemed impossible - prepare a complete document in-house in 10 days that normally takes months for a consultant to prepare. But the Environmental Planning Team, consisting of Bob Osterueller (Team Leader), Tina Deininger and Kurt Frederick, had a strategy—keep it simple and focused. A meeting was held with Delaware's Department of Natural Resources and Environmental Control, and a site visit was conducted at the property to determine if any historic structures, wetlands, or threatened/endangered species were present. The former reserve center is located in, and completely surrounded by, Cape Henlopen State Park.

The 17-acre site features two main buildings and supporting structures. Although the property is located within a relatively undisturbed coastal dune environment, there are no jurisdiction wetlands or nationally endangered/threatened species present. The site is within and is part of a historic district eligible for listing on the National Register of Historic Places. At the time of transfer, there were no environmental clean-up actions remaining at the former reserve center.

Although the actual Navy action was the disposal of the former reserve center property, NEPA requires the Navy to evaluate the impacts associated with the proposed reuse of the property. The State intends to establish an environmental training center at the site, which is expected to attract 10,000 visitors annually. After evaluating the existing land use of the surrounding park, the impacts of this reuse were considered minimal. The impacts on historic structures were also evaluated in accordance with the National Historic Preservation Act. Since the Navy placed strict restrictive covenants on the property at the time of transfer, the disposal, it was determined, would not adversely affect the historic properties.

The Navy was able to determine that the disposal of the former reserve center would have no significant impact on the environment as a whole. The appropriate documentation of this determination was completed within 10 days of the request to expedite the transfer, and during a ceremony held on October 8, 1996, NORTHDIV's Commanding Officer, CAPT Paul Chamberlin, turned the property over to Senator Joseph Biden and Governor Thomas Carper.

For more information please contact:

Mr. Bob Ostermueller
NORTHDIV
(610) 595-0759
DSN 443-0759

Ask ARTT

Alternative Restoration Technology Team Formed

A new team of Navy environmental professionals has been formed to promote the use of innovative technologies. The Alternative Restoration Technology Team (ARTT) performs the following tasks for the Navy's cleanup program:

- Identify barriers that make it hard to use innovative technologies
- Recommend process changes to eliminate those barriers
- Propose ways to develop and use new technologies
- Develop strategies to support use of innovative technologies
- Identify sites and innovative technologies for demonstrations
- Establish and coordinate communication among the Navy's Remedial Project Managers (RPMs)

ARTT is an advisory group. *RPM News* will keep you informed of their activities and progress.

For more information please contact:

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NAVFAC ARTT contact
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DSN 221-6460

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NFESC ARTT contact
NFESC, Code 414NT
(805) 982-5478
DSN 551-5478

Biopile Technology for Remediating Petroleum-Contaminated Soil

Marine Corps Base Hawaii (MCBH), Kaneohe Bay, Hawaii

INTRODUCTION

At MCBH Kaneohe Bay, Hawaii petroleum-contaminated soil was excavated, placed in an above ground biopile, and remediated. A biopile is an efficient, economical and practical means of remediating these soils. Microorganisms consume hydrocarbons as their primary food and energy source, leaving nontoxic by-products (carbon dioxide and water). In other words, the hydrocarbons are biologically transformed into inert compounds. Optimizing the conditions for microbial reproduction is an uncomplicated process. Degradation is mainly contingent upon oxygen supply, nutrient supply, soil moisture content, temperature, and pH.

BIOPILE LOCATION

The project site was located approximately 700 feet northwest of the intersection of Mokapu Road and the unnamed site access road along the northwest slope of Puu Hawaii Loa Volcano at MCBH, Kaneohe, Hawaii.

SOIL CLEANUP LEVELS

Proposed cleanup levels are presented in the following table. The levels take into account the volatility and solubility of hydrocarbons, potential for human contact, proximity to groundwater, effect of leaching by rainfall, and contact by storm runoff.

Soil Cleanup Levels (mg/kg)

Soil Sources	TPH	Benzene	Toluene	Ethylbenzene	Total Xylenes
Off-site	200	0.3	0.3	1	1
On-site	2000	0.3	0.3	1	1

TPH by modified Environmental Protection Agency (EPA) Method 8015
Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX) by EPA Method 8020

At the outset of the project, MCBH did not believe that they would be able to provide enough contaminated soils to operate the biopile and would need to bring in soils from off-site. Therefore, in the operating permit, a cleanup level of 200 mg/kg TPH was established by the State of Hawaii to allow treated off-site soil to be used as landfill cover. In actuality, MCBH was able to provide on-site soils for biopile operations. An operating permit would not have been necessary under this scenario and the clean-up level for these soils was 2,000 mg/kg TPH . Also, the soil could then be used as fill for excavated Underground Storage Tank (UST) locations.

DESIGN, CONSTRUCTION, AND OPERATION

The biopile base consisted of an asphalt pad (formerly a parking lot). The border of the biopile was 51 feet x 61 feet x 4 inches and was constructed of treated lumber. A 60 mil HDPE liner was placed over the asphalt base. The liner covered and was attached to the treated lumber border in order to contain any leachate that may have reached the bottom of the pile. The liner was covered by 6 inches of clean soil base compacted and sloped at a 1% grade. The soil base prevented the liner from being torn during pile construction.

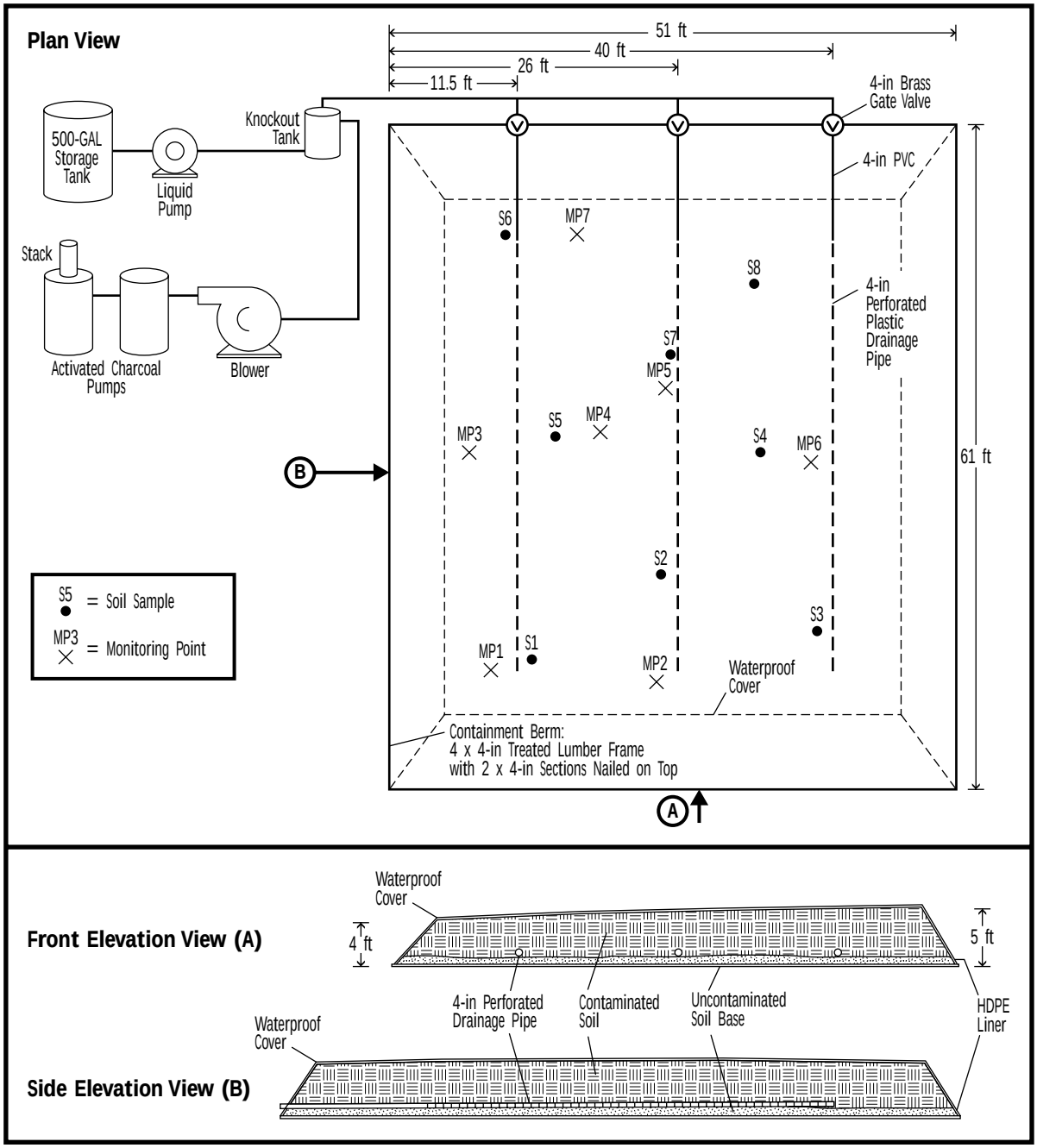
The aeration system consisted of three evenly-spaced perforated plastic drain pipes placed on top of the soil base and connected to a PVC piping manifold leading to a vapor-moisture knock-out drum and blower. The drain pipe was 4 inches in diameter and 30 feet long, surrounded by a 12-inch diameter gravel bed to increase the area of influence and protect the pipe from clogging. The manifold piping was 4 inches in diameter. Ball valves were installed at the manifold branching points to balance the airflow through each leg of the drain pipe. A pitot tube and differential pressure gauge were used to monitor and balance air flow in individual legs.

From the knock-out drum, air traveled to the blower while water was collected in a storage tank on site. The blower was a 1.5 hp high vacuum positive displacement blower and air was passed through an activated carbon system before atmospheric release.

Petroleum-contaminated soil was spread in lifts several feet thick over the 6 inch clean soil base until the pile was completed. The lifts were laid from the back of the pile to the front while straddling the drainage piping to prevent soil compaction and avoid crushing the pipes. Nutrients and water were added at this point. The overall height of the pile was approximately 5 feet.

After the biopile was constructed it was covered with a nylon reinforced tarp to keep rainfall from contacting the contaminated soil.

The following figure shows the layout of the system.



Biopile Design At MCBH Kaneohe Bay, Hawaii

The blower was turned on and run fairly continuously throughout biopile operation. Soil pile temperature, pH, and moisture were monitored regularly. Respirometry ports were monitored weekly to check oxygen levels throughout the pile.

SOIL SAMPLING AND ANALYSIS

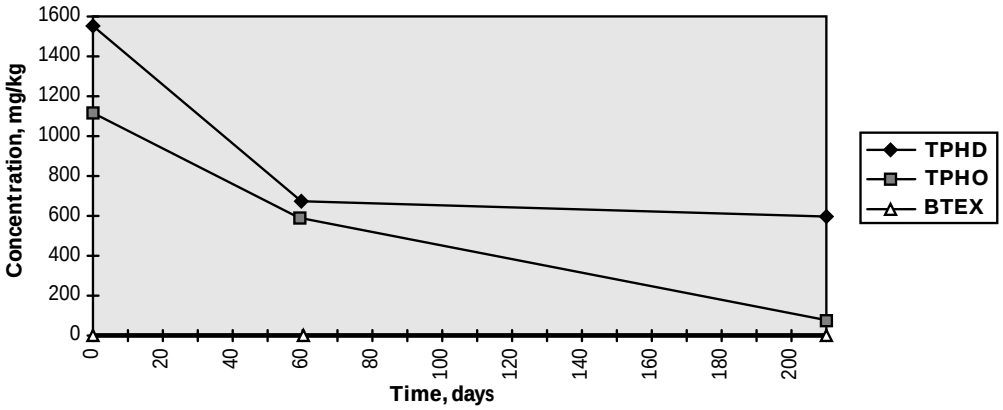
Prior to biopile operation, soil designated for processing at the facility was characterized prior to transport in order to avoid mixing different contaminants and to guard against introducing soil containing hazardous wastes to the facility. A treatability study was also performed for the initial soil pile to determine optimum nutrient loading, aeration, and soil pile moisture content. Achievable remediation levels corresponding to site specific conditions and toxic constituents were delimited.

Soil samples were collected and analyzed for TPH and BTEX during tank excavations. Additionally, baseline conditions were established through a sampling event conducted immediately following completion of pile construction. Soil sampling and analyses were conducted at two subsequent intervals: intermediate (after 45 days of soil treatment), and final (upon completion of the soil treatment program). The subsequent sampling events are established based on soil respirometry testing.

Soil samples were collected at a rate of one sample per 100 cubic yards. A random, systematic method was used to select sampling locations. Samples were collected by auguring into the treatment cell and analyzed for TPH by modified EPA method 8015 and for BTEX using EPA method 8020.

RESULTS

At the project outset, it was estimated that the biopile would be operated and maintained for three months. It actually operated for seven months. Eight soil samples were collected in three distinct sampling events. After 63 days of treatment, the average Total Petroleum Hydrocarbon as Diesel (TPHD) content in the biopile soil was reduced 57.1% from an initial average concentration of 1,549 mg/kg to 665 mg/kg. After 145 additional days of treatment, the average soil TPHD content was reduced an additional 11% to an average concentration of 590 mg/kg. The overall TPHD reduction over the 209-day period was 61.9%. The average soil TPH as Oil (TPHO) fraction declined 48% from an initial value of 1,079 mg/kg to 561 mg/kg over the first 63 days and an additional 91.4% over the next 145 days. Seven of the eight final soil samples were below detection limits for TPHO. The overall TPHO reduction over the 209-day run was 95.6%.



Contaminant Level Reduction Over Biopile Operation Time

CONCLUSION

The final TPHD levels were above the 200 mg/kg TPH level initially required by the Hawaii Department of Health for treatment of off-site soils, but fully met the requirement of 2,000 mg/kg TPH for treated on-site soils. Therefore, the treated soil can be disposed of as fill at existing UST sites.

For more information, please contact the following Technology Application Team (TAT) members at the Naval Facilities Engineering Service Center (NFESC) in Port Hueneme, California:

Mr. Robert Kratzke, TAT Leader	Mr. Bill Major	Ms. Amy Walker	Mr. John Wollenberg	Mr. Jeff Heath
(805) 982-4853	(805) 982-1808	(805) 982-1653	(805) 982-5844	(805) 982-1657
DSN 551-4853	DSN 551-1808	DSN 551-1653	DSN 551-5844	DSN 551-1657

Constructed Wetland at NAB Little Creek Treats Stormwater Pollution

Constructed wetland at Little Creek Naval Amphibious Base, VA

On December 4, 1996, a group of Navy personnel attending the 1996 Department of the Navy (DON) Environmental Manager's Meeting in Norfolk, Virginia, toured the newly constructed wetland at the Naval Amphibious Base (NAB), Little Creek. The wetland was constructed in partnership with the Naval Facilities Engineering Service Center (NFESC), Port Hueneme, California, the Virginia Institute of Marine Science, the Naval Facilities Engineering Command Atlantic Division (LANTDIV), and local regulators. This wetland is the first of its kind at a Navy installation. The constructed wetland (approximately one acre), built in an upland site on the south side of Little Creek Cove, will be used as a research platform to study a wetland's ability to remove contaminants from stormwater runoff. While most constructed wetlands are freshwater, this system is tidally controlled with brackish water.

The U.S. Environmental Protection Agency (US EPA) has shown that more than a third of the Nation's waters are too polluted for basic uses such as swimming and fishing. They attribute this primarily to contaminated stormwater runoff entering the body of water either through sheet flow (which is a non-point source) or direct input through a storm drain pipe (point source). Contaminants from non-point sources can be highly variable and may include pesticides, metals, oils, nutrients, suspended solids and other substances. Despite engineering controls used at point sources to remove contaminants, the water quality of many lakes, rivers, and oceans remains poor because of this difficulty in removing non-point source contaminants.

An alternative solution to this problem is to use wetlands to treat stormwater runoff. Wetlands have the ability to naturally remove contaminants from stormwater runoff in several ways. Wetland plants filter and uptake many contaminants; heavy metals can be bound up in wetland soils; or microscopic organisms can remove and decompose petroleum hydrocarbons and similar compounds.

The tidal wetland project at Little Creek was constructed as a field demonstration and will be monitored extensively to show how effective this type of wetland system is at treating stormwater runoff. This technology can be applied to other Naval installations throughout the U.S. This region will help the Navy reach its goals to reduce toxics and non-point source pollutants into the Chesapeake Bay.

For more information, please contact:
Website: http://cayuga.nfesc.navy.mil/cc/projects/cnwthom.htm
or
Ms. Barbara Nelson
NFESC Code 411
(805) 982-1668
DSN 551-1668

SCAPS Success Story

"The Philadelphia Experiment"

SCAPS truck on site at the Philadelphia Naval Base

The Site Characterization and Analysis Penetrometer System (SCAPS), available from the Navy Public Works Center Jacksonville (PWC JAX), is used to detect and delineate Petroleum, Oil, Lubricant (POL) contaminant plumes in subsurface soil, and to characterize geologic conditions. SCAPS pushes sensors into the ground to detect petroleum hydrocarbons in situ and in real-time.

The 20-ton SCAPS truck, equipped with a cone penetrometer and Laser Induced Fluorescence (LIF) system, rolled into the former Philadelphia Naval Base shortly after Labor Day and stayed throughout mid-October. Above-ground Storage Tank (AST) sites, Underground Storage Tank (UST) sites, and a fuel blending area were investigated.

AST SITE

During an earlier MILCON project, two 88,000-gallon ASTs and petroleum-contaminated soil within the berm were removed. The adjacent area, presumed to be contaminated by migration of free product, was investigated by SCAPS. Per agreement with the Pennsylvania Department of Environmental Protection (PADEP), direct push wells would be installed if contamination was found. After a series of 10 pushes, preliminary SCAPS data indicated very low levels of petroleum hydrocarbons. The SCAPS crew sent soil samples to their laboratory and performed immunoassay tests to confirm the LIF readings. The Navy's Comprehensive Long-Term Environmental Action Navy (CLEAN) contractor, Environmental Assessment (EA) Engineering, also completed standard soil borings next to push locations to confirm the SCAPS readings. Based on these findings, direct push wells were not installed and the standard ASTM monitoring well may not be needed.

NAVSSES TANK FARM

At the tank farm, LNAPL (Light NonAqueous Phase Liquids) or free-floating product was found in a monitoring well. The presence of LNAPL indicates possible releases of No. 2 diesel fuel formerly stored at the site. PADEP asked the Navy to conduct an Interim Remedial Action (IRA) for free product recovery. A vacuum-enhanced extraction (bioslurping) system is planned. The presence of the SCAPS unit on-site presented an opportunity to locate an optimum site for the bioslurping system and to determine if one of the existing wells could be used as the bioslurping extraction well. Based on the findings of the seventeen pushes, two direct push wells were installed in other highly contaminated areas. These wells have not been sampled yet, so free-product levels have not been determined. SCAPS determined that, for the time being, an existing well can be used as the extraction well for the bioslurping system.

WHARF G TANK FARM

As an IRA last March, a SkimRite free-product recovery/skimming system was installed. Since then, the system has recovered less than 50 gallons of free-product. The SCAPS unit was used to evaluate the present location of the recovery system. A total of 13 pushes were made to determine that there is a better location to place a new recovery well. Since LIF data indicated the highest petroleum hydrocarbon concentrations were southwest of the existing recovery system, the recovery system will probably be moved.

AIRCRAFT PROPULSION TESTING SITE

A storage and blending area for fuels and lubricants was identified by the Environmental Photographic Interpretation Center (EPIC) as a potentially contaminated site. SCAPS was used to screen the soil for petroleum hydrocarbon contamination and to identify soil sampling locations for traditional soil borings confirming LIF findings. Soil samples were sent to the lab, and immunoassay tests were run to confirm the SCAPS findings. The SCAPS unit also installed one upgradient and two down gradient direct push wells for groundwater sampling. All soil samples were below the PADEP clean-up level for petroleum hydrocarbons. If the results of groundwater sampling efforts are similar, this site may not require further sampling.

GASOLINE TANK FARM

During the Environmental Baseline Survey (EBS) Phase II, this site, consisting of 14 USTs totaling 250,000 gallons, was identified as a potential area of concern because PAHs, TPH, and lead were detected above screening levels. SCAPS was used to assess the horizontal and vertical extent of petroleum hydrocarbons previously detected in the soil. A series of 10 pushes identified high petroleum hydrocarbons along the edges of concrete slabs under which USTs were once located. A strong gasoline odor was present. Once again, soil samples and immunoassay tests confirmed the LIF readings. Three direct push wells were installed to monitor the groundwater conditions at the site. The Navy's CLEAN contractor, EA Engineering also completed standard soil borings next to SCAPS pushes and installed standard ASTM monitoring wells next to the direct push wells. The test results for groundwater from both types of wells will be compared. If the results are similar, the Navy might be able to show PADEP and the Environmental Protection Agency (EPA) that direct push wells are easier, faster and cheaper to install than ASTM wells and generate very little Investigation-Derived Waste (IDW).

PARKING LOT

The final site investigated was a parking lot covering an old locomotive round house, several USTs, and an active gasoline station. A series of 11 direct pushes identified an area near the gasoline station with high levels of petroleum hydrocarbons at a depth of 14 feet. Additional SCAPS work will be required to determine the horizontal and vertical extent of the contamination.

Advantages of the SCAPS system over traditional field methods include "real-time" delineation of petroleum contamination, soil classification, smarter placement of monitoring wells, reduced IDW, and the ability to install direct push micro-wells. SCAPS should be thought of as a platform to launch various field screening tools and technologies.

Some new tools for the SCAPS that will be available in FY97 are:

308mm Laser System - Detects "lighter" hydrocarbon products and augments the current laser system.

Cone Sipper - Sampling tool for retrieving vapor and water samples from depth.

Volatile Organic Compound (VOC) Detection System - Combines cone sipper vapor retrieval with analytical instrument to quantify contaminant in vapor form.

Piezo-cone - Solid state tool to quantify soil pore pressure for determination of the site hydrogeologic conditions.

Video Microscope - Miniaturized downhole camera to offer visualization of subsurface soil, in-situ.

For more information about the SCAPS system, please contact:

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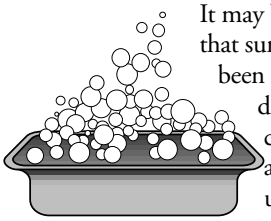
Surfactant Enhanced Aquifer Remediation (SEAR) For NAPL Contamination



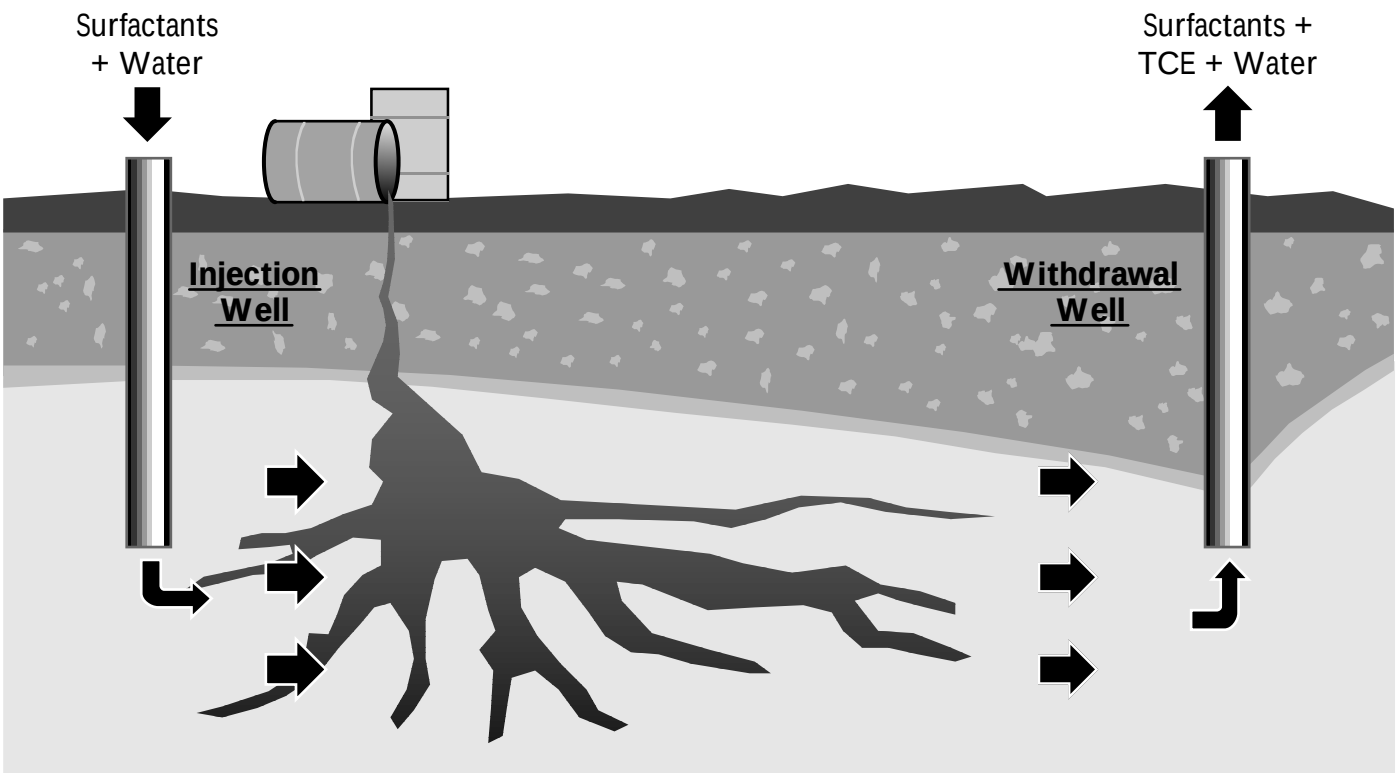
It may be amusing to some that surfactants, which have been used in many of our daily household cleansers for decades, are finally being put to use for the remediation of our hazardous waste sites. One could ask, if water alone could handle everything, as is being attempted with pump and treat, where would we be with all of our fragrant soaps and detergents? It'd be a drab world indeed! SEAR as a concept is really not much different than the use of soapy water to soak the dirty clothes clean. And we all know that works....most of the time!

Pump and treat is probably familiar lingo to most involved in site remediation, but what is SEAR? It is an enhancement to the pump and treat technology which uses surfactants to clean up regions of an aquifer containing non-aqueous phase liquids (NAPLs).

NAPLs contaminants exist as a separate organic phase rather than in the dissolved (aqueous)-phase. They are commonly found in the vicinity of the original spill or leak where they have become trapped by capillary and sorptive forces. Because they typically have low water solubilities, removal by pump and treat alone can take decades; yet without addressing them, site cleanup cannot be achieved. The problem posed by NAPLs is that with time they will slowly dissolve; therefore, so long as they remain in the subsurface, they act as a continual source of contamination to the surrounding soils and groundwater.

NAPL contaminants that are denser than water, also known as DNAPLs, are especially troublesome because they tend to sink into the saturated zone, for which there are few alternatives for remediation. SEAR is unique in its ability to effectively address saturated zone contamination. Probably the most well known DNAPL contaminants are the chlorinated solvents, such as trichloroethyelene (TCE) and perchloroethylene (PCE).

What are surfactants and how can they enhance aquifer remediation? Surfactants are a class of molecules which form aggregates called micelles. Micelles start forming at a concentration specific to each surfactant, known as the critical micelle concentration (CMC). These micelles provide a favorable environment into which organic molecules can partition, thus increasing their effective aqueous solubility. The surfactants used in SEAR are non-toxic, food-grade and biodegradable. When applied to subsurface NAPL contaminants, they operate in a manner which is analogous to the way detergents (which contain



Surfactant Enhanced Aquifer Remediation

surfactants) remove oils and grease from clothing and dishes. Basically, the surfactants assist in transferring the unwanted organic matter from the material that is being cleaned (aquifer solids) into the water phase where they can be washed away. In SEAR, salts and solvents are often used as additives to the surfactant solution to further increase the NAPL solubility and/or to improve the flow characteristics of the resultant surfactant/NAPL/water mixture.

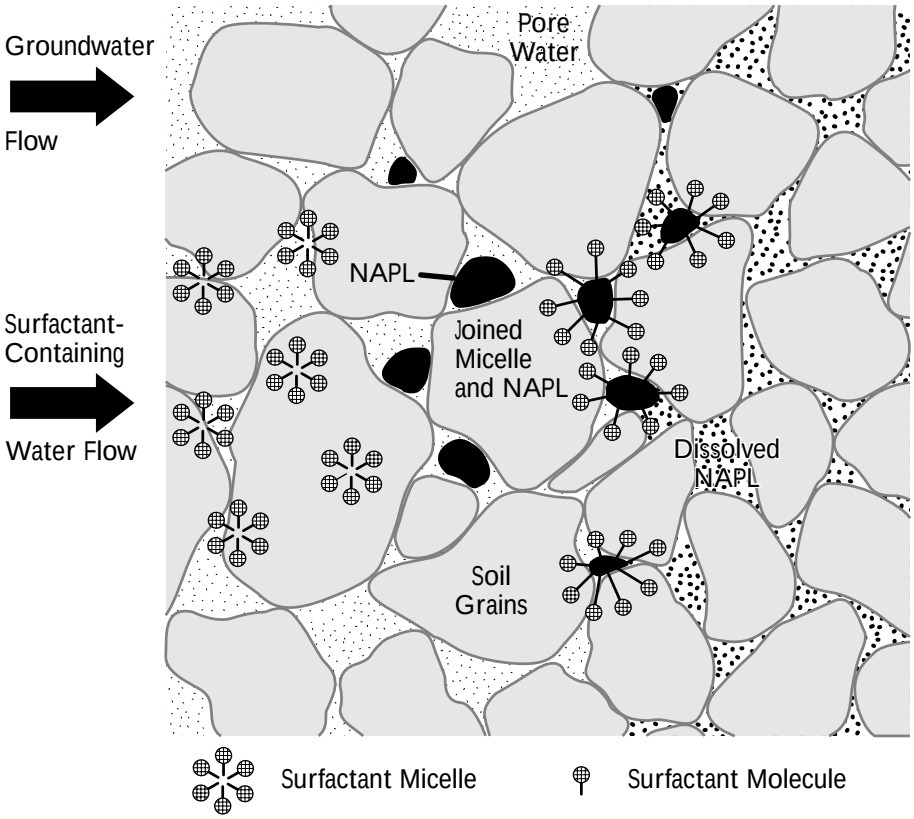
The method by which surfactants are administered in the aquifer is simple. The surfactant solution is prepared in tanks above-ground, and then injected into the aquifer. The solubilized NAPL (surfactant/NAPL/water mixture) is removed at the extraction wells. Hydraulic control of the solubilized NAPL is maintained by using higher pumping rates at the extraction wells than at the injection wells.

SEAR is applied in the following steps: first the suspected source area must be delineated to determine the lateral and vertical extent of NAPL contamination. This is accomplished by the installation of soil borings and monitoring wells. Soil and groundwater samples are collected to characterize the aquifer material and groundwater for NAPL and other chemical constituents, as well as for hydraulic parameters. In addition to assisting in the identification of the likely boundaries of the NAPL zone, these aquifer properties are needed to select the appropriate surfactant and for the design of the surfactant test.

The initial site characterization work is usually followed by a partitioning interwell tracer test (PITT) which involves the introduction of chemical tracers into the groundwater to quantity the volume of NAPL present. During a PITT, conservative or non-partitioning tracers, which remain in the water phase and move with the velocity of the water, are injected simultaneously with non-conservative or partitioning tracers, which partition between the water and NAPL phase and thus become retarded by the presence of NAPL. By analyzing the recovery of both types of tracers at the recovery wells with time, the amount of NAPL in the subsurface environment can be determined. Once the amount of NAPL initially present is known, surfactants are introduced. Between two to ten pore volumes of surfactant solution are generally used to flush the aquifer volume containing NAPLs. Following flushing by surfactants, another PITT is conducted to determine the quantity of NAPL removed. Sometimes, additional core sampling is used to confirm the removal of NAPL.

In the past year, several surfactant demonstrations have been successfully completed at Hill Air Force Base (north of Salt Lake City, Utah). At Operable Unit (OU) 1, four test cells (approx. 3 m x 5 m each) which were physically isolated with sheet piling, were used to examine the effectiveness of various surfactants for extracting a complex NAPL. At OU 2, a DNAPL site, a larger test (6 m x 6 m) was conducted without the use of sheet-piling. Instead containment of the solubilized DNAPL was achieved hydraulically. In these field tests, two to ten pore volumes of water containing surfactant at concentrations above the CMC (approx. 2-8 wt%), and in some cases, salt and alcohol additives, were used to flush the contaminated region. NAPL recoveries as high as 99% were reported.

Currently, NFESC and the US Environmental Protection Agency's National Risk Management Research Laboratory (EPA/NRMRL) are funded under the Environmental Security Technology Certification Program (ESTCP) to evaluate the benefits of recovering and recycling surfactant for the overall economics of applying SEAR.



Surfactant NAPL Interaction

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Demonstration of a Solvated Electron Technology at the National Test Site in Port Hueneme, CA For PCB/Pesticides Cleanup

This project was one of the first to be commenced under the Clinton Administration's Rapid Commercialization Initiative, a cooperative effort among private enterprise and certain government agencies to quickly bring new technologies to bear on the nation's environmental issues. Commodore Environmental Services, Inc., was one of ten companies chosen to participate in the program. A demonstration of their technology, Solvated Electron Technology, was conducted with materials contaminated with halogenated compounds from various DoD sites. The demonstration was conducted at the National Test Location (NTL) on the Naval Construction Battalion Center, Port Hueneme, California.

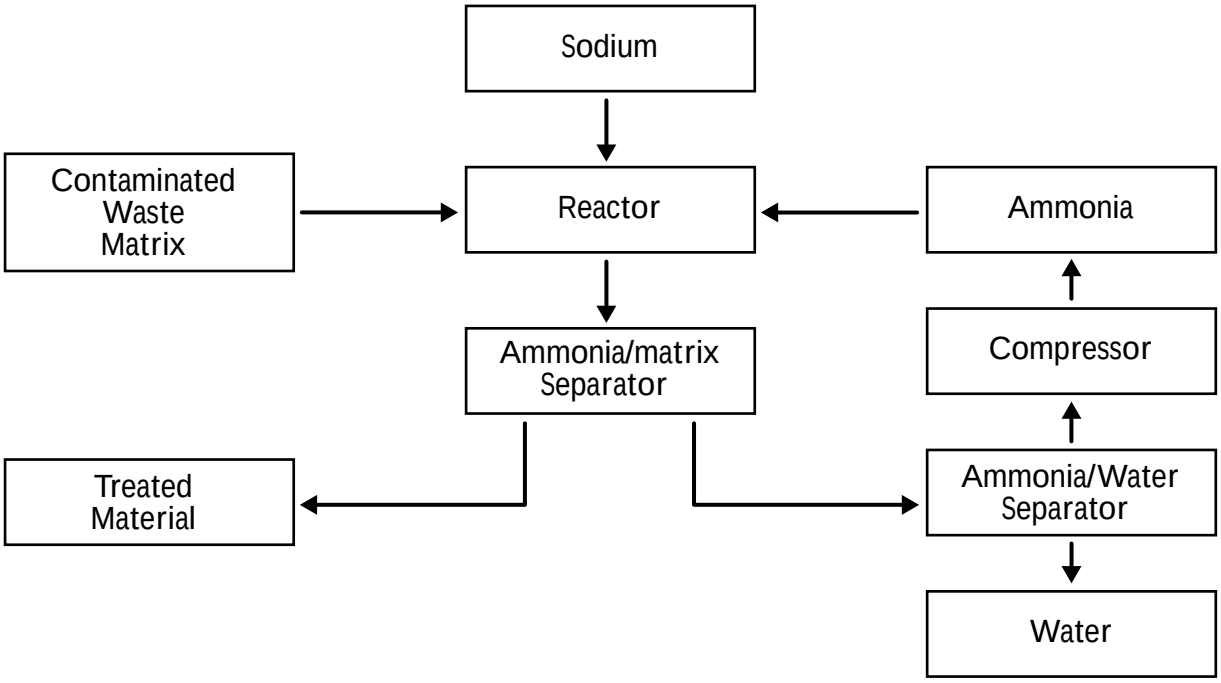
The technology, based on solvated electron chemistry, demonstrated dehalogenation of polychlorinated biphenyls (PCBs) and pesticides compounds in a variety of contaminated matrices which included soil, water, oil and activated carbon. The process incorporated chemical reactions discovered over one hundred years ago, wherein metallic calcium or sodium is dissolved into anhydrous ammonia to produce a solution containing electrons as shown in the following reaction:.

$$(Na^0 + \text{anhydrous } NH_{3\,(liquid)} \longrightarrow Na^+ + e^-_{(liquid)\,(blue\ colored)})$$

A bright blue color immediately visible is indicative of an abundance of free electrons in the solution. The free electrons, a powerful reducing agent, rapidly attack chlorinated compounds, breaking the chlorine-organic molecule bond, and resulting in a near complete dechlorination.

For example:

$$C_{12}H_4Cl_{6\,(hexachlorobiphenyl\text{-}PCB)} + 12\,Na + 6\,NH_3 \longrightarrow C_{12}H_{10\,(biphenyl)} + 6\,NaNH_2 + 6\,NaCl$$



Solvated Electron Chemistry Process Technology

A flow diagram of the process used in the demonstration is depicted in the following figure:
At the test site, variations of batch processing were demonstrated in the Commodore Mobile Disposal Unit 2 (CMDU2). Solid (soil and charcoal) or liquid (oil and water) contaminated material was loaded into a reactor vessel. Then anhydrous ammonia was added and mixed to ensure complete exposure of contaminant to anhydrous ammonia. After mixing for two to five minutes, metallic sodium (blocks) were dropped into the vessel and mixing continued for 10 minutes. All tests were run in batch mode in the same unit, using the same basic process, except one water test. The water test was a separation process, based on ultrafiltration, which isolates PCBs from aqueous matrices. The PCB can then be destroyed in the CMDU2.

The Commodore Mobile Disposal Unit 2 (CMDU2) was used for this demonstration.

The CMDU2 is shown in these photos.

After the reaction was determined completed, the vessel was heated externally (until pressure rose to 165 psig) in order to increase the vessel's pressure to discharge the treated materials and ammonia. All of the treated products were stored for analysis and final disposal in accordance with regulatory requirements. The ammonia was recovered by condensation for recycling and reuse in the following process.

The CMDU2 was designed with safety relief valves to operate at 250 psig. The unit's vessels were also designed to operate under temperature ranges from -30°F for ammonia condensation to 90°F generated during the reaction.

For the demonstration, PCB spiked oil, PCB contaminated soils, pesticide contaminated soils, PCB spiked water, and PCB contaminated spent activated carbon were treated in the CMDU2.

The demonstration results showed that the treatment successfully reduced PCBs in all the tested media as indicated in the table on the following page.

Summary of Test Results

Contaminant & Matrices	Starting Range	Completed Range
PCB in Oil	160,000-410,000ppm	<1ppm
PCB in Soil	777-931ppm (1)	4.5-20ppm (2)
PCB on Spent Activated Carbon	518ppm	<0.93-1ppm
PCB in Water (spiked)	3,100ppm	<0.53-<0.61ppb
Pesticide in Soil		
4,4-DD	3.9-240ppm	<0.02ppm
4,4-DDE	0.9-69ppm	<0.02ppm
4,4-DDT	1.6-180ppm	<0.02ppm
Dieldrin	BQL-15ppm	<0.02ppm
Chlordane	1.6-81ppm	<0.02ppm

BQL - Below Quantitative Limits

Note:
(1) Initial report on PCB contamination level indicted >50ppm. Additional characterization found levels between 777 and 931ppm.
(2) Incorrect contamination levels were used for calculating metallic sodium requirements, therefore incomplete destruction resulted.

The test results indicated the solvated electron chemistry process has ability to destroy halogenated compounds to below regulatory limits when sufficient quantities of reactants are present.

Potential applications not evaluated during this demonstration are decontamination of equipment and protective clothing surfaces. The technology could also potentially treat a variety of matrices contaminated with chlorofluorocarbons (CFCs), some chemical warfare agents, and explosives. Treatability studies would be required to determine applicability to specific sites and contaminants.

Commodore Corp. has obtained two nationwide Toxic Substances Control Act (TSCA) permits for two pilot scale units, which can dehalogenate both solids and liquids. Commodore has plans to build several variations of commercially viable units, including two main categories: batch and continuous process. Estimates for soil remediation using this technology range from $400 to $600 per ton of soil, competitive with the cost of in situ vitrification, thermal desorption or incineration.

The Naval Facilities Engineering Service Center has several vehicles available to cost effectively obtain this technology for field cleanup application.

For further information about the results of the demonstration at the National Test Site, please contact:

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