CHAPTER 2

Restoring the Future

SMART Programs and Technologies

SMART Programs and Technologies are synonymous with the need to balance human and ecological risk with environmental cleanup costs. These help us to set priorities with regulators and other stakeholders. We continue to work closely with other military services, private industry, regulators, environmental organizations, and community groups to bring forth the best mix of new technologies and management techniques to ensure the best cleanup solutions.

We must work smarter to better understand the scientific basis of the cleanup challenge and apply the appropriate technology to it. We should carefully assess the risk/benefit while always keeping in mind the overall cost. Flexibility and an open mind are key with all stakeholders as we explore cleanup options.

The Navy and Marine Corps are staunch stewards of the environment and understand the need to balance those responsibilities without compromising our operational capability and national security mission. SMART Programs and Technologies are important tools to meet this challenge.

Rear Admiral A. A. Granuzzo, U. S. Navy Director,
Environmental Protection, Safety and Occupational Health Division (N45)
Office of the Chief of Naval Operations

Innovative environmental restoration technologies used throughout the Navy are identified, developed, and demonstrated through a variety of programs and initiatives. Among them are the Navy Environmental Leadership Program, the Naval Facilities Engineering Service Center's Innovative Technology Demonstration Program, the Bay Area Conversion Action Team Environmental Technology Partnership, the Cleanup Review Tiger Team, and the Alternative Restoration Technology Team. With them, SMART cleanup can be carried out as needed, virtually customized to fit individual situations to expedite task completion. In the following pages you'll read about some of our SMART programs and the innovative technologies they employ to get the cleanup job done.

NELP

- Deals intelligently with environmental issues
- Provides responsible leadership that is responsive to the Navy and the public.
- Provides a catalyst to promote environmental awareness and knowledge.
- Serves as the focal point for innovative environmental initiatives for the Navy.

NELP

Navy Environmental Leadership Program

The Navy Environmental Leadership Program (NELP), located at Naval Station Mayport, Florida, and Naval Air Station North Island, California, is instrumental in developing and demonstrating cost-effective, innovative environmental technologies and management tools that can be transferred to and adopted at other Defense Department installations. NELP was established to find new ways to manage Navy and Marine Corps environmental programs. For cleanup, this means getting the job done better, faster, and cheaper.

Among the innovative cleanup technologies demonstrated at NAS North Island was the cone penetrometer test, or CPT. It was used to characterize the extent of contamination at an industrial waste treatment plant. A steel cone was pushed into the ground hydraulically while measurements were continuously collected and transported to the surface. The data were interpreted and analyzed. CPT technology enabled the Navy to adequately characterize the site by constructing a thorough picture of the subsurface. Without this technology, the Navy could not adequately characterize the site because conventional drilling and sampling techniques could not obtain complete subsurface information. The CPT is more cost effective than conventional drilling methods and it is easier to use. The CPT produced results in one day, while conventional drilling and sampling methods can take up to five days.

The Navy also successfully used an emerging solvent washing technology to clean up five tons of PCB-contaminated soil at NAS North Island. Based on promising preliminary results, the Navy began full-scale implementation of the technology to speed cleanup of other sites also contaminated with PCBs.

for more information,
visit the NELP web site at:
www.nelp.navy.mil/

NFESC

Naval Facilities Engineering Service Center

The Naval Facilities Engineering Service Center (NFESC) at Port Hueneme, California, provides the Navy with specialized engineering, scientific, and technical products and services, and is oriented toward the transfer of technology through consultation and technical assistance, patent license agreements, cooperative research and development agreements, and direct rapid response to requests for support.

As a member of the Naval Facilities Engineering Command (NAVFAC) team, NFESC solves problems through engineering, design, construction, consultation, test and evaluation, technology implementation, and management support. It employs existing technologies where it can, identifies and adapts breakthrough technologies when appropriate, and performs research and development

NFESC selected MCB Camp Lejeune to perform a pilot study using surfactants (detergents) at a dry cleaning facility to remove dense nonaqueous phase liquids (DNAPLs—oils and oily residues) from the soil. If not removed, these substances threaten to contaminate Camp Lejeune's drinking water. Using surfactants to dissolve and disperse DNAPLs is similar to using dishwashing detergent to remove cooking grease from a skillet.

Surfactants will increase the ability of the DNAPLs to dissolve, allowing extraction wells to pump and remove them from the soil.

when required to meet Navy and Marine Corps needs.

For the cleanup program, NFESC seeks new technologies and methodologies to mitigate environmental impacts from current and past DON operations. It has taken a streamlined, flexible contracting approach, often using innovative contracting vehicles. For example, employing the Broad Agency Announcement (BAA) program, NFESC solicits proposals for applied research for creative technology solutions. To be eligible for consideration and for possible award of a demonstration contract, technologies and methodologies must be in the advanced development stage, must not require further research or design development prior to field demonstration, and must be capable of full-scale implementation if the demonstration is successful.

for more information,
visit the NFESC web site at:
www.nfesc.navy.mil/

The DSMOA program ensures cooperative arrangements between the states and the Armed Services and fosters true partnership among the regulators and the regulated. Our experience with the DSMOA program has demonstrated that state involvement on a cooperative partnership basis can actually save federal cleanup dollars and result in more efficient and timely cleanups.

Dan Morales,
Attorney General,
State of Texas

Defense and State Memorandum of Agreement

DSMOA

The Defense and State Memorandum of Agreement (DSMOA) is a mechanism used to foster partnerships with states. It provides a means of reimbursing states and territories for the oversight services they provide in support of investigation and cleanup efforts at DOD facilities. It also establishes a procedural framework for payment. While DSMOA represents a commitment between DOD and a state, it doesn't obligate or commit funds. Actual funding is provided by a cooperative agreement (CA) that

provides a specific two-year plan for cleanup activities in the designated state and a projection of activities for the ensuing four years.

The DSMOA program is an integral part of SMART cleanup of Navy and Marine Corps installations. It is an improved way of doing business because it standardizes the way states and the DON approach the cooperative agreement process for cleanup oversight.

Some of the services that qualify for reimbursement through cooperative agreements include technical review, comments and recommendations on documents or data; identification and explanation of state requirements; site visits; participation in public education and community involvement activities such as RABs and TRCs; independent quality assurance; activities associated with preparing and administering the DSMOA/CA agreement; and other state services listed in installation-specific agreements.

The DSMOA partnership has moved environmental cleanups out of court and made them a reality. This is an example of how government should work and how the citizens of Maryland expect it to work.

Richard W. Collins, director, Waste Management Administration, State of Maryland

The DSMOA applies to all active and closing installations, beginning at the site identification stage and continuing through site closeout. For the Navy, DSMOA resulted in cost avoidance, expedited cleanup, and improved community relations. States helped the DON save millions of dollars in cleanup costs by suggesting more appropriate cleanup methods, reducing the amount of sampling or analysis required, reviewing documents more quickly, and openly exchanging information and transferring technologies.

for more information,
visit the DSMOA web site at:
www.environmental.usace.army.mil/environmental/access/dsmoa.html

Cleanup Review Tiger Team

In FY 96, the Naval Facilities Engineering Service Center established a Cleanup Review Tiger Team (CURTT) to find ways to better manage risk, minimize cost, accelerate cleanup, and still protect human health and the environment. The team, comprised of experts from the Naval Facilities Engineering Command, the U.S. Army Corps of Engineers, the

U.S. Geological Survey, the Western Governors Association, and private sector consultants led technology application peer reviews at each Engineering Field Division/Activity. The review effort included discussions with 150 RPMs who are responsible for approximately 460 sites. The reviews focused on high-cost projects, where use of innovative technologies and approaches is most likely to produce quality improvements. The teams made site-specific findings and recommendations, as well as a number of general recommendations for improving the quality and performance of the Environmental Restoration Program. Follow-up Tiger Team reviews were conducted in FY97 & FY98 for additional high-cost sites. The findings and recommendations of the Tiger Team effort have improved program execution, reduced remediation costs at numerous sites and accelerated environmental cleanup efforts.

Perhaps more importantly, the Tiger Teams help to focus attention on where the greatest opportunities are for cost control. Conventional wisdom has looked at cost saving alternatives during remedy selection. i.e., choosing whether to use innovative technologies in place of more conventional cleanup solutions. The Tiger Teams found that in reality, the opportunity for cost avoidance is far larger in the earliest phases of investigation, where geostatistics, sampling plans, data quality objectives, exposure values, land use assumptions, health risk assessments, and ecological risk assessments can drive cleanup standards. These factors frame the level of cleanup that is required and what cleanup remedies can be considered to meet those needs.

Alternative Restoration Technology Team

In FY96 the Navy chartered an internal advisory group, the Alternative Restoration Technology Team (ARTT), to promote the use of innovative technologies to save time and money. ARTT, chaired by NFESC and composed of various representatives and organizations throughout the Navy and Marine Corps chain of command, is responsible for the following activities:

- Identifying barriers to implementing innovative technologies.
- Recommending process changes to eliminate or minimize the impact of barriers to implementing technologies.

- Proposing policies and procedures for developing and implementing new technologies.
- Identifying potential sites and innovative technologies for demonstration projects.

Through these efforts, ARTT has enhanced the cleanup program by providing the Navy with a centralized, focused, and efficient approach to information and technology transfer.

An example of a technology that has successfully transitioned to the fleet is the Site Characterization and Analysis Penetrometer System-Laser-Induced Fluorescence (SCAPS-LIF), a truck-mounted technology designed to obtain real-time, in-situ subsurface data on petroleum contamination. Cost and time savings can exceed 40 percent compared to drilling wells. SCAPS-LIF was developed jointly by the Navy and the Army. Last year the EPA, the state of California, and the Western Governors Association agreed that SCAPS-LIF is a proven technology suitable for use at sites within their jurisdiction. This certification is an important step toward nationwide use of this cost-saving technique.

for more information,
visit the ARTT web site at:
www.nfesc.navy.mil/enviro/ps/artt/arttgallery.htm

Bay Area Defense Conversion Action Team Environmental Technology Partnership

The Bay Area Defense Conversion Action Team (BADCAT) was formed in early 1994 as a public-private partnership of the Bay Area Economic Forum. Members include the Bay Area Regional Technology Alliance, the California Environmental Protection Agency, the U.S. Environmental Protection Agency, the Department of the Navy, Chevron Research and Technology Company, San Francisco State University Center for Public Environmental Oversight, and other technical experts. BADCAT works to speed up the cleanup and conversion of closing Bay Area bases through the application of new environmental technologies. It works collaboratively to develop an integrated economic strategy to mitigate the negative impact of military base closures and defense downsizing throughout the Bay Area.

BADCAT's Environmental Technology Partnership (ETP)—an alliance of the DOD, local base reuse authorities, real estate developers, and other interested parties and stakeholders—is composed of representatives from regional, state and federal environmental agencies, private companies, and regional organizations. Its goals are: to address barriers to and gaps in environmental technology development and commercialization; to help expedite cleanup, transfer of property, and economic conversation of Bay Area bases; and to stimulate growth of the region's environmental technology industries.

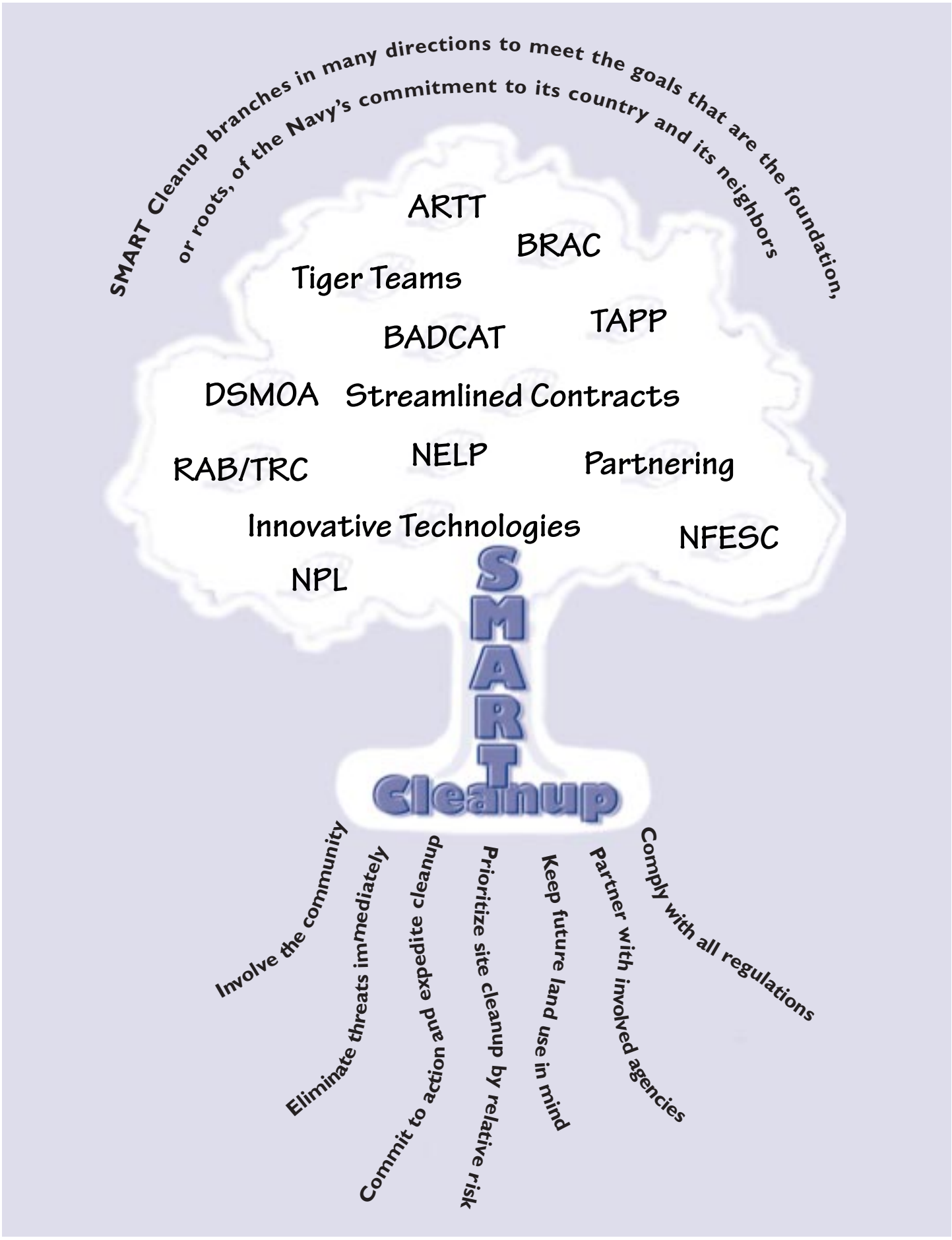
for more information,
visit the BADCAT web site at:
www.cedar.ca.gov/badcat/

The Navy has taken the lead in the Environmental Technology Partnership (ETP) process by soliciting opportunities to demonstrate new SMART technologies at Hunters Point Naval Station and at Mare Island Naval Shipyard. Two technologies were demonstrated at Hunters Point Naval Station in January 1997: X-ray fluorescence detection and chemical soil washing.

X-ray fluorescence detection is a process that makes certain contaminants glow when struck by X-rays. In this process, a soil sample is bombarded with X-rays. At the atomic level, this causes electrons associated with the various elements in the soil to become excited. Each contaminant will give off different amounts of electrons. A measuring device called a mass spectrometer is then used to measure these electron emissions and determine what contaminants are present and at what level. Analysis of soil samples using this technique has proven to be very accurate and results are obtained within 15 minutes. This provides significant benefits over the 48 to 72 hours for a standard lab test.

Chemical soil washing floods contaminated soils with a solution that picks up contaminants as it moves toward an area where they are collected and removed. The volume of contaminated soil has been reduced by 90 percent in some tests—a significant savings in disposal costs over a more traditional method, like dig-and-haul, which requires soil to be taken to a landfill.

In October 1997 in-situ low-temperature thermal desorption was demonstrated at Mare Island Naval Shipyard. Thermal desorption involves heating soils to temperatures between 200°F and 1,000°F. At these temperatures, nearly all soil contaminants are vaporized and destroyed. Since remediation occurs in-place, thermal desorption technology offers greater cost benefits compared to other technologies requiring excavation of the soil. These technologies are now being certified in California. All three offer great potential for cost-effective, safer, and more reliable remediation of common Bay Area contaminants.


SMART Cleanup branches in many directions to meet the goals that are the foundation, or roots, of the Navy's commitment to its country and its neighbors
ARTT
BRAC
Tiger Teams
TAPP
BADCAT
DSMOA
Streamlined Contracts
NELP
RAB/TRC
Partnering
Innovative Technologies
NFESC
NPL
SMART Cleanup
Involve the community
Eliminate threats immediately
Commit to action and expedite cleanup
Prioritize site cleanup by relative risk
Keep future land use in mind
Partner with involved agencies
Comply with all regulations

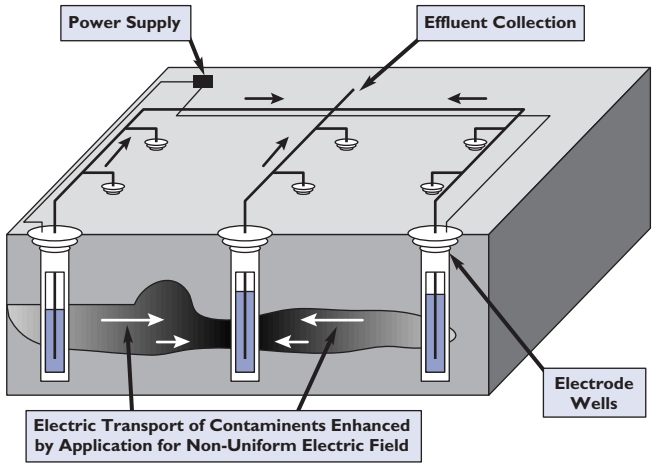
SMART Technologies

We are moving steadily toward our goal of cleaning up all our sites by the end of fiscal year 2014. We continue to work with our Navy and Marine Corps personnel, affected communities, supporting contractors, and regulatory agencies to ensure success. As a team, we develop solutions and workable schedules that provide the greatest benefits to all and move the program towards completion. New technologies we developed, supported, and put into use dramatically improve our ability to identify and clean up hazardous waste sites.

SMART means leaning forward on the cutting edge to demonstrate new treatment technologies—matching new or improved processes to our unique cleanup challenges. It also means coupling the right treatment technology—new and innovative, or more traditional technologies—to provide the best overall solution to cleanup challenges. Treatment technologies can be chemical, biological, or physical processes used to permanently change the condition of hazardous waste or contaminated materials. They destroy contaminants or change them so that they are either less or no longer hazardous. The Department of the Navy is taking an aggressive role to demonstrate and apply cost-effective, state-of-the-art cleanup solutions. The following is an overview.

Electrokinetic Extraction of Toxic Metals

Electrokinetic extraction of toxic metals, also known as electro-migration, involves the application of an electric current into soil. The process generates acid, causing the toxic metals to dissolve into a fluid.

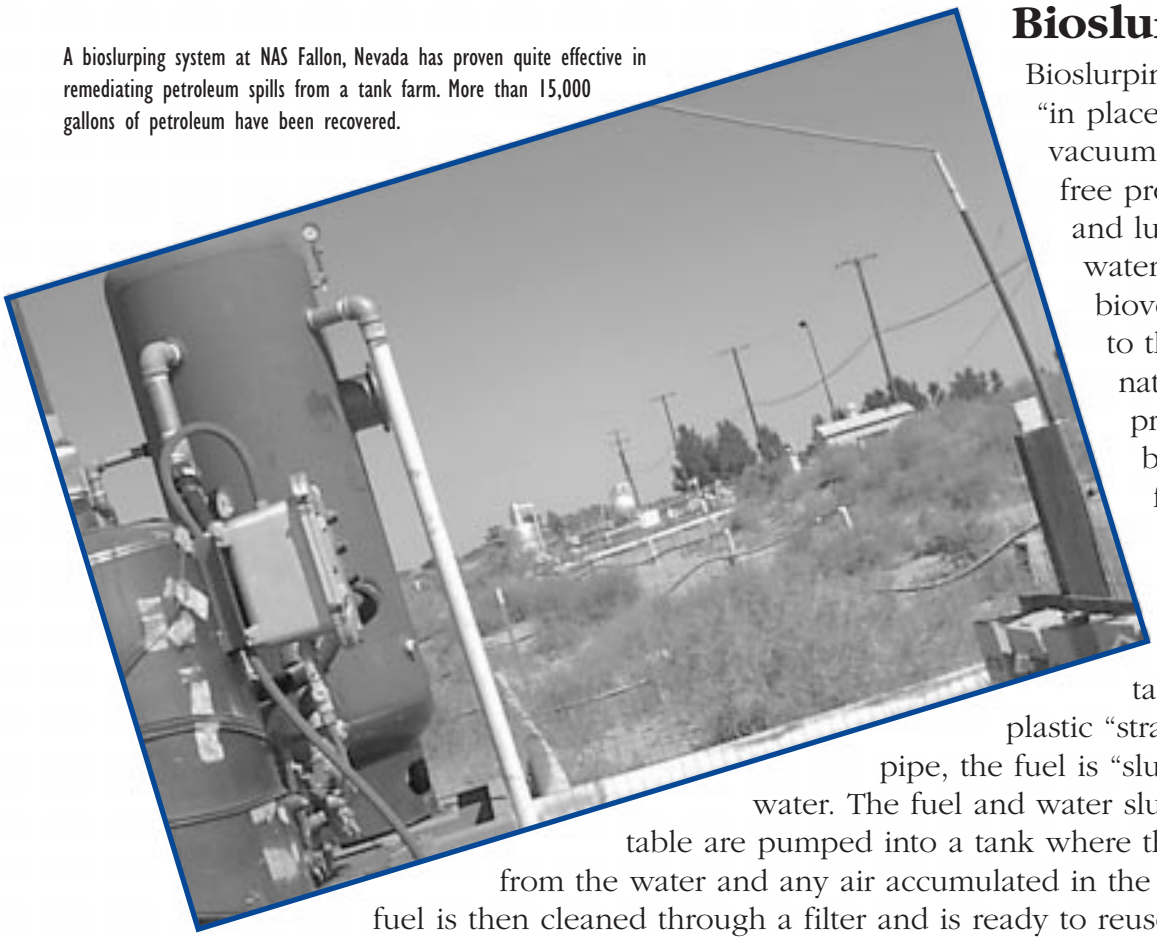


Schematic of Electrokinetic Process

At NAWS Point Mugu, California, the employment of electromigration technology will result in cost savings of 40% to 90% over other accepted cleanup technologies such as excavation and off-site disposal.

The dissolved toxic metals then move through the soil toward electrodes of opposing charge, much like the positive and negative charging posts in a car battery. Metals with a positive charge are collected at the cathode (negative post), while metal ions with a negative charge are collected at the anode (positive post).

Electrokinetic remediation offers several advantages over some cleanup methods that are in widespread use today. First, electrokinetic remediation is less invasive, more energy efficient and less costly than currently available metals remediation technologies, (such as dig-and-haul, which requires the excavated soil to be put in a landfill). Second, electrokinetic remediation is extremely effective in fine-grained soils where other techniques are not feasible. Finally, there are no air emissions associated with this technology, which is a critical issue in certain parts of the country.



A bioslurping system at NAS Fallon, Nevada has proven quite effective in remediating petroleum spills from a tank farm. More than 15,000 gallons of petroleum have been recovered.

Bioslurping

Bioslurping is a new in situ or "in place" technology that teams vacuum-assisted recovery of free product (petroleum, oils, and lubricants floating on the water's surface) with bioventing (adding oxygen to the soil to stimulate natural, organic processes). How does bioslurping work? First, a four-inch-diameter plastic pipe is inserted vertically into the ground from the surface to the water table. Sliding a one-inch plastic "straw" inside the larger pipe, the fuel is "slurped" off the top of the water. The fuel and water slurped up from the water table are pumped into a tank where the fuel is separated from the water and any air accumulated in the slurping process. The fuel is then cleaned through a filter and is ready to reuse. The air and water are reinjected into the ground to oxygenate and clean the soil further.

Windrow Composting

Composting is a process by which organic wastes are broken down by microorganisms, typically at elevated temperatures. The increased temperatures result from heat produced by microorganisms during the degradation of the organic material in the waste. Although similar in process to a backyard compost pile where leaves, grass clippings, and food waste are turned into fertile soil for gardens, composting of soils contaminated with hazardous wastes is a new concept. It offers the potential for substantial cost savings over more conventional hazardous waste treatment methods, is relatively simple to operate, and offers high public acceptability.

Windrow composting—where compost is placed in long piles known as windrows and periodically mixed using mobile equipment—has the potential to be an effective and economical composting alternative. Windrow composting has been demonstrated using the following basic steps. First, contaminated soils are excavated and screened to remove large rocks and debris. The soil is transported to a composting pad with a temporary structure to provide containment and protection from weather extremes. Additives such as straw, alfalfa, manure, agricultural wastes, and wood chips are used for bulking agents and as a supplemental carbon source. Soil and additives are layered into windrows. The windrow is thoroughly mixed by turning with a commercially available composting machine. Moisture, pH, temperature, and contaminant concentration are monitored. At the completion of composting, the windrows are disassembled and the compost is taken to the final disposal area. Often soils can be recycled and used as clean fill dirt for other construction projects.

Windrow composting at NSWC Crane, Indiana. This innovative technology–where compost is placed in long piles known as windrows and periodically mixed using mobile equipment–has the potential to be an effective and economical composting alternative.

Granular Activated Carbon

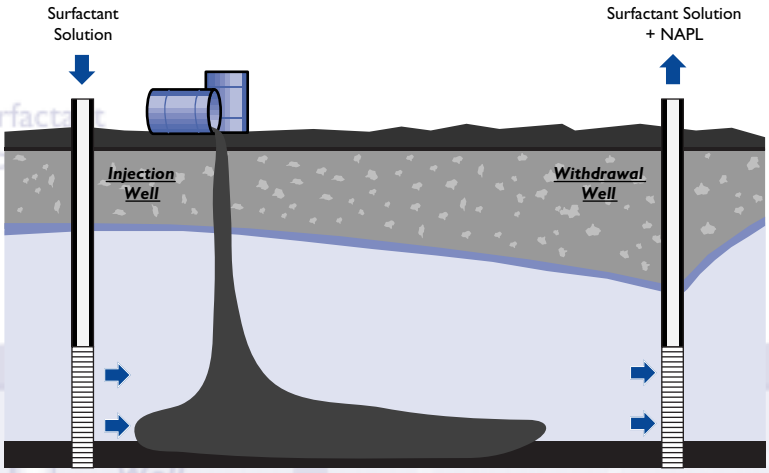
Granular activated carbon (GAC) is used in different types of water treatment systems to remove odor, color, and taste associated with chlorine, suspended solids, and dissolved organic contaminants. Most commonly associated with water filters for home use, activated carbon can be made from coal, walnut shells, or peat. The type of activated carbon used is determined by the size of the largest molecule that is being filtered.

GAC systems generally are composed of two beds operating in series. Primary filtration of contaminated water occurs in the first bed. When it becomes saturated, it is replaced and the second bed becomes the primary filter.

The Navy saved thousands of dollars and hours of remediation time with the installation of a GAC system at NAS Agana, Guam. GAC is being used to make the groundwater aquifer a safe source of drinking water for the base and nearby communities.

A cost comparison made between a GAC, air stripping, and an ultraviolet oxidation system revealed that GAC achieves the same results as the other technologies, but at a much lower cost.

In addition to its low cost, GAC was chosen because it is a proven treatment technology to remove low concentrations of TCEs; it requires minimal maintenance; it generates little noise; and it does not require an expensive enclosure building.



Schematic of SEAR technology. SEAR is currently being conducted at MCB Camp Lejeune, North Carolina. The demonstration site is located at the base drycleaning facility where DNAPL contamination resulted from past disposal and usage of PCEs. SEAR's success will result in full-scale cleanup of a serious threat to Camp Lejeune's drinking water supply.

Surfactant-Enhanced Aquifer Remediation

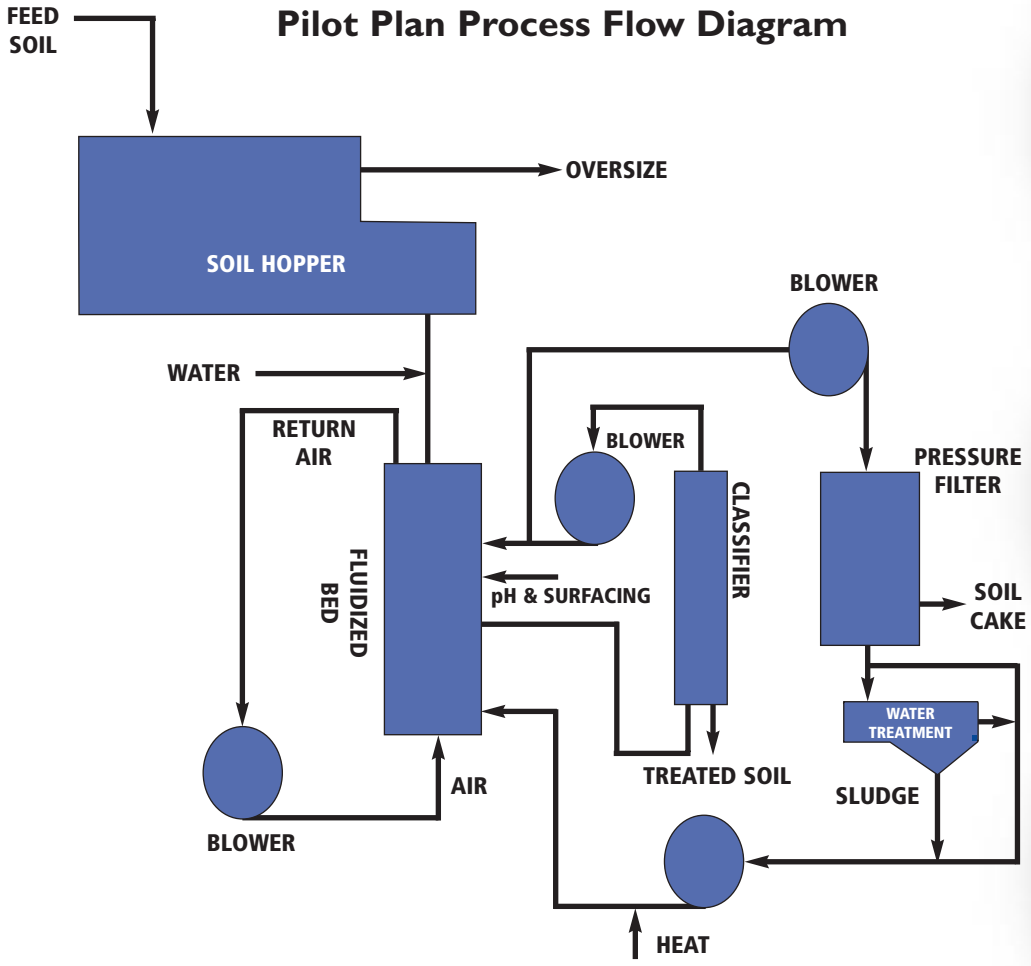
Surfactant-Enhanced Aquifer Remediation (SEAR) technology is used to clean up contamination of soils and groundwater caused by oils and solvents. Commonly found in the vicinity of an original spill or leak where they have become trapped, these compounds dissolve slowly, breaking down through natural organic processes. Because these oils and solvents form strong bonds

with water, conventional pump and treat systems are limited and relatively ineffective in removing them.

In SEAR, a solution of surfactants—the primary ingredient in many soaps and detergents—is injected through a well into the subsurface containing the contaminant. This increases its ability to dissolve. Just like soap used in washing greasy dishes, the surfactant causes the oil to dissolve and float to the top where it is removed by an extraction well. With surfactants, contaminant removal can be accomplished in weeks or months, compared to years or decades as with conventional pump-and-treat systems. Oil and solvent recoveries as high as 99 percent have been reported.

Chemical Soil Washing

Recently, chemical soil washing technology has emerged as a potentially successful alternative for treatment of soils containing heavy metals (antimony, copper, chromium, lead, and zinc), petroleum



products, or both. Often the treated soil can be returned to the site and the recovered contaminants can be disposed of, treated, or recycled.

Chemical soil washing systems consist of physical separation and chemical washing units called fluidizers and classifiers. The fluidizer bed is an enclosed vessel that blasts air through a heated mixture of chemicals and soil. It is the injection of this rapidly moving stream of air that imparts a fluidlike state to the soil mixture, allowing it to "flow" easily through the processor. In the classifier, fine soil particles are separated from coarse soil particles by pumping a chemical solution upward. The fine soil particles, which are expected to contain most of the contamination, are carried upward by the flow. The coarse soil particles, being heavier, settle to the bottom of the classifier. During this process, the chemicals wash the contaminants into the solution. This solution is then heated to near-boiling temperatures and surfactants (detergents) are used to dissolve petroleum-based contaminants, and pH (with acid or base) is used to dissolve heavy metals.

The coarse soil may be returned to the site after verification that contaminants are reduced to acceptable levels. The fine soil is separated from the chemical solution using a pressure filter and may be retreated or disposed of in a landfill. The chemical solution is treated and then recycled into the system.

In-Situ Thermal Desorption

In-Situ Thermal Desorption (ISTD) is a new remediation process aimed at removing volatile and semi-volatile organic compounds, including PCBs, chlorinated solvents, pesticides, and petroleum wastes from soils.

The ISTD heat treatment system can be installed in either of two ways. The first system uses a thermal blanket, which heats surface soils to a depth of up to three feet. Nearly all soil contaminants in this zone are vaporized and destroyed by soil temperatures of 450-840 degrees Fahrenheit. Any remaining vapors are captured and cleaned in a vapor treatment system.

Laboratory results from the application of ISTD technology, demonstrated at the former Mare Island Naval Shipyard (pictured above), show that levels of PCBs as high as 2,300 parts per million (ppm) have been reduced after treatment to levels of less than 0.033 ppm. The Mare Island demonstration was sponsored by BADCAT/ETP.

The second ISTD heat treatment system uses thermal wells in which heating elements are placed in wells drilled vertically or horizontally into a contaminated zone. The thermal well process can take up to 30 days to remediate contaminants depending on the level and depth of contamination and the soil type.

The ISTD heat treatment cost ranges from $100 to $300 per ton compared with about $1,000 per ton for the excavate, haul, and dump cleanup process.

In summary, just as one size doesn't fit all, SMART is like having a toolbox with a variety of treatment tools that can be adapted to fit the special circumstances of each cleanup site.

The Navy's Roadmap to Environmental Restoration

Step One: Assess the Risks

The Navy's environmental restoration process usually starts with a **Preliminary Assessment** that identifies potentially contaminated sites. It is conducted by the Naval Facilities Engineering Command at a Navy or Marine Corps base. The task is to collect and review existing information on operations and disposal practices to determine if these practices have resulted in sites that may need to be cleaned up.

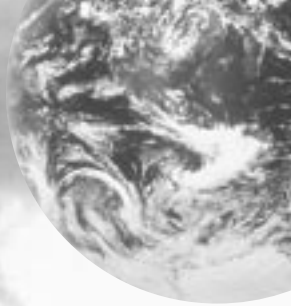
Step Two: Inspect the Sites

If a site is identified as potentially contaminated, a **Site Inspection** is done. This adds to the information already collected and, if necessary, involves the sampling and gathering of other field data to find out if further study or action will be needed. Information from both the preliminary assessment and the site inspection are used by the EPA as part of a Hazard Ranking System to determine whether a base is eligible for placement on its National Priorities List (NPL). The NPL is a compilation of sites nationwide that pose the greatest potential threat to human health or the environment. If a Navy or Marine Corps installation is placed on the NPL, DON then enters into a Federal Facilities Agreement with the EPA, as required under DOD policy. This agreement specifies the roles and responsibilities of the regulatory agencies and the Navy/Marine Corps and sets the scheduled milestones for cleanup. Even if an installation is not placed on the NPL, the environmental restoration process is still carried out as part of the DON's cleanup committment.

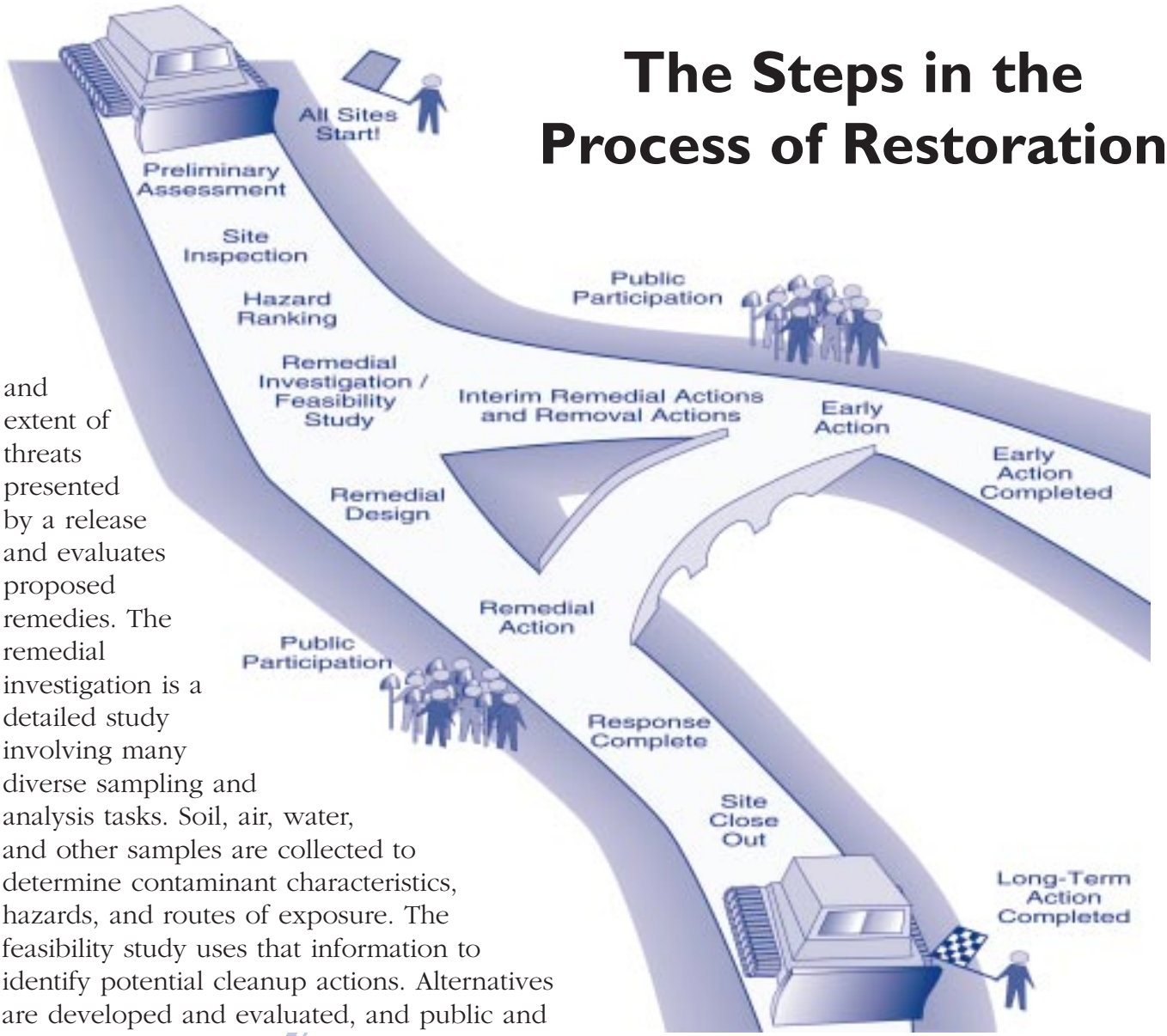
Restoring sites to a condition where they pose no threat to human health or the environment is the goal of the Navy's Environmental Restoration Program.

Step Three: Remedy and Feasibility Investigations

If a site is verified as posing a risk to humans, animals, or plants in the site inspection, it then proceeds to the **Remedial Investigation/ Feasibility Study** step. At this stage, the DON determines the types



The Steps in the Process of Restoration



and extent of threats presented by a release and evaluates proposed remedies. The remedial investigation is a detailed study involving many diverse sampling and analysis tasks. Soil, air, water, and other samples are collected to determine contaminant characteristics, hazards, and routes of exposure. The feasibility study uses that information to identify potential cleanup actions. Alternatives are developed and evaluated, and public and regulatory agency comments are considered. This step concludes with selection of a remedy or a recommendation for no further action.

Interim Remedial Actions and Removal Actions can be done at any time during site investigation or cleanup if there is a release that may present an imminent, substantial threat to human health or the environment, to reduce a site's overall risk, or to stabilize a site until cleanup can be finished. The DON increasingly uses interim remediation to respond quickly to site contamination, reduce study costs, and speed cleanup.

If a site is identified for cleanup, the next requirement is **Remedial Design**, which entails preparing the technical drawings and specifications for the chosen action. The remedial design thus provides the blueprint for the cleanup step.

Step Four: Action!

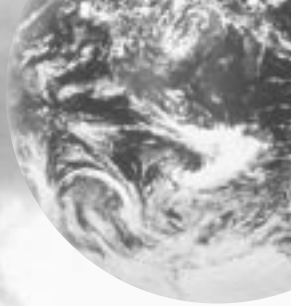
Remedial Action is the actual cleanup step where a variety of treatment tools are used to restore a site. Because of the Navy's commitment to getting the job done, it plans to spend at least 60 percent of its Environmental Restoration, Navy funds on cleanup each year.

Step Five: Response Complete

As the cleanup effort reaches its end, there are two critical milestones that are most desired:

- **Remedy in Place (RIP)**: The proper long-term cleanup treatment system is constructed and is operating as planned.
- **Response Complete (RC)**: The cleanup work is complete by the DON's stringent standards.

Finally, when no further actions are considered appropriate by the Navy because a site poses no threat to human health or the environment, and, if required, regulator consent is received, it is considered as "**Site Closed Out**." At National Priorities List bases, the EPA must concur with this decision. A site may be closed out at any time during the assessment or cleanup phase when sufficient information has been gathered to support that decision.



SUCCESS STORY

Base Closure Brings New Opportunities

Live, work, or play, Mare Island offers it all: a golf course, on-site rail for industrial uses, and a planned 190-acre business park. Strategically located in Vallejo between San Francisco, Sacramento and the Napa Valley, Mare Island features office space; mid-industrial facilities; ship building and repair; movie and television production facilities; and a surprisingly tranquil charm. Amenities include a park with a gazebo adjacent to historic homes, a chapel featuring world-renowned Tiffany stained glass windows, trails, a marina, and playing fields. High-speed ferries link Vallejo with San Francisco.

After its transfer to the city and to private interests, the former Navy base will be Vallejo's newest place to live, work, shop, and play.

Like many large military bases, Mare Island is undergoing a lengthy and complex cleanup. More than 100 years of use as a heavy industrial shipyard left the base with low levels of hazardous waste in soil and groundwater. To facilitate rapid reuse while cleanup activities continue, the Navy and the city of Vallejo turned their attention to the leasing of the base to the city. However, before any leasing would be allowed, a comprehensive environmental survey was required to address all potential concerns associated with the past operations of the base as a shipyard. Successful completion of that effort required a close partnership among the Department of the Navy, the U.S. Environmental Protection Agency (EPA) Region 9, and the California Department of Toxic Substances Control (DTSC). A key to the success of their efforts was the use of state-of-the-art technology to identify areas of contamination quickly and accurately. More than 100,000 samples from 200 sites were taken and analyzed, revealing 30 sites that required cleanup. The environmental baseline surveys were completed in just two-and-one-half years, so that the base property could be leased once the base had closed—a credit to the teamwork and dedication of all involved. Bolstered by strong Navy support and cooperation, the city developed an ambitious reuse plan that would transform Mare Island into a unique combination of industrial and commercial property, residential areas, recreational facilities, and open spaces. Through the use of creative leasing approaches, several businesses attracted by the facilities at the base are already operating at Mare Island. The new businesses, in turn, have brought more than 1,000 new jobs to the Vallejo area.

Occupational safety and health in the work place was the theme of a fair held at Mare Island to educate employees about safety. Attendees included representatives from the Navy reserve center, the California Highway Patrol, and a drug-sniffing beagle.

Partnering and Community Involvement Lead to Quick Reuse

When the announcement was made that Mare Island Naval Shipyard was to be closed by April 1996, the community immediately began to develop a reuse plan. The local reuse authority formed the Mare Island Futures Group, with members representing business, labor, government, education, and environmental organizations as well as private citizens. The group worked to develop a broad outline for the reuse of Mare Island. Its goals were (1) creating jobs, (2) preserving the history of Mare Island, and (3) ensuring that individuals affected by the closure would be provided new employment training and job opportunities.

Because final cleanup and transfer of the base could take many years, leasing became the quickest way to reuse the base. At first, sites and buildings were leased individually, generating a large amount of paperwork and delaying the reuse process. The delays discouraged several potential lessees. The cleanup team worked to solve this problem. Together they developed a process for leasing that involved dividing the base into 10 large parcels, then leasing the parcels to the city, regardless of whether they were ready for reuse. Occupancy restrictions were placed on those properties requiring additional work. The cleanup team then developed a one-page form to streamline the process of lifting or revising restrictions once cleanup was completed. That approach makes property available for reuse within days rather than months, after all the work on that property is completed. This allowed the city and the cleanup team to move from a reactive to a proactive process under which the city could market property aggressively.

St. Peter's Chapel, on the former Mare Island Naval Shipyard, was built in 1901 at the cost of $5,000. It is the Navy's oldest memorial chapel. It has the largest single collection of Tiffany glass on the West Coast (29 stained glass windows), and is listed on the National Register of Historic Places. Still in use today, weddings are performed in the chapel regularly.

SUCCESS STORY

Another important step in revitalizing the community was retraining shipyard workers. Colleges and universities in the region offered classes to former employees. The Navy also trained 300 shipyard employees to perform cleanup work, providing them with continued employment after the shipyard closed.

In August 1996 the Mare Island Market Center opened to introduce prospective tenants to the reuse opportunities at the island. The marketing venture has attracted a wide variety of tenants, including federal agencies, other public-sector organizations, and private-sector companies.

In some cases, federal and local agencies benefited directly from the cleanup and reuse occurring at the base. For example, the U.S. Fish and Wildlife Service received transfer of more than 670 acres of nontidal wetlands where it plans to establish a national wildlife refuge and research center. In addition, the U.S. Forest Service established its new regional headquarters at the base, the Vallejo Unified School District now uses three buildings, and the city of Vallejo added a ferry boat maintenance and fueling facility.

"The Bay Area has the largest cluster of BRAC bases in the country, as well as a very high price tag, approximately $1 billion, to clean them up. We at Mare Island and other Bay Area bases have incredible resources to draw upon that include experienced contractors, educational and research institutions, and innovative technology developers. I think that by working with the contractors, universities, and technology developers to conduct research and development of new technologies, this will ultimately produce quicker, better, and less expensive cleanups here at Mare Island and in the Bay Area and around the country,"

Bob Pender, the lead Remedial Project Manager at Mare Island.

Private companies also have begun leasing properties at the base. One innovative use was undertaken by the motion picture industry. Three feature films recently were shot at the base, providing publicity for the redevelopment effort, producing income and jobs for the community, and paving the way for other nontraditional reuse options.

As of June 1997 tenant activities at the base generated more than 1,000 new jobs, with a payroll of more than $60 million.

Former officer housing at the Mare Island Naval Shipyard, California is now rented to civilians.

Golf Course at the former Mare Island Naval Shipyard, California..

Economic redevelopment at the base is expected to continue for the next 30 years, which will allow Mare Island to remain a driving force in the economic growth of the entire area.

The teamwork and creative thinking applied by the Navy, EPA, the state, and the city of Vallejo are promoting the use of new technologies and are encouraging the planned economic growth in the area. In a community shaken by the loss of its largest employer, the accomplishments at Mare Island demonstrate how effective cleanup efforts can benefit all parties involved.

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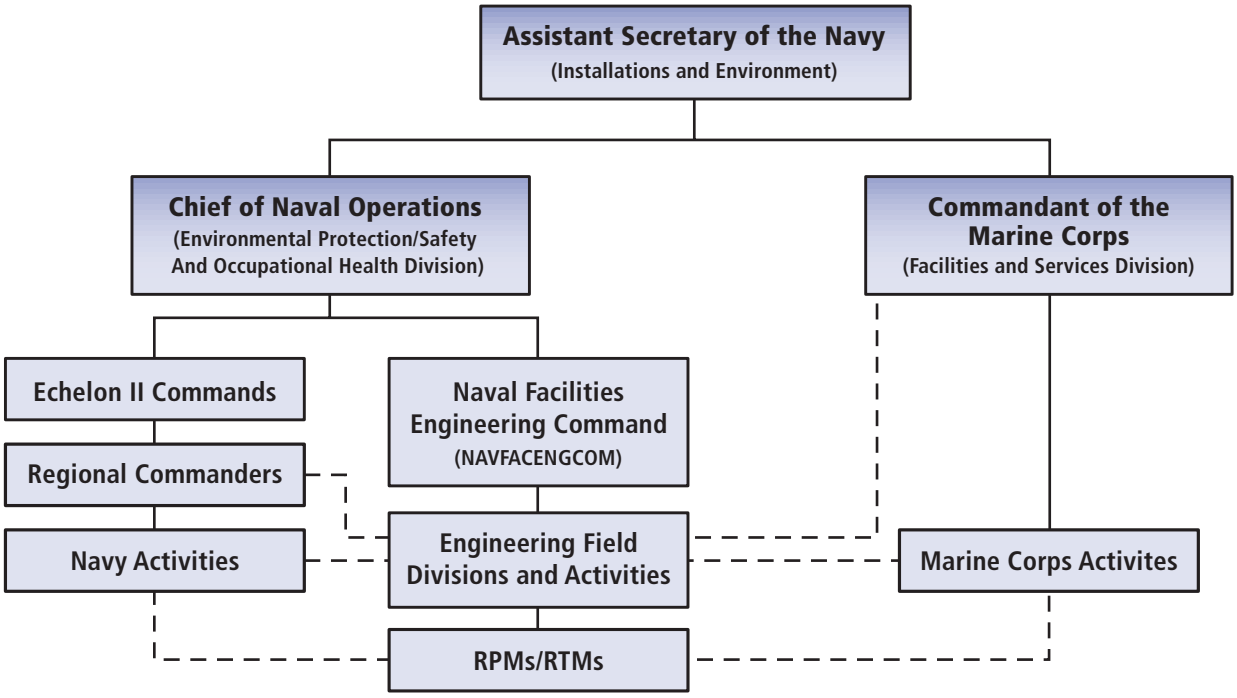
The Navy At A Glance

Department of the Navy



NAVFACENGCOM Cleanup Roles

- Environmental Support & Project Execution
- Base Realignment & Closure
- Contracting
- Design and Construction

Engineering Field Divisions and Activities