Fall 2001

RPM News

▲ Remedial Project Manager News ▲

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

In This Issue

Reducing the Generation of Investigation Derived Waste

Introduction

Wastes generated during an environmental site investigation include soil cuttings, drilling mud, development and purge water, decontamination fluids and solvents, field analytical reagents, and disposable personal protective equipment. These wastes are commonly referred to as investigation derived waste or IDW, shown above stored in 55-gallon drums. Handling these wastes at the end of a field program is often an afterthought. However, with a little upfront planning, the project team can utilize some simple techniques and methods to minimize waste and to handle the waste that is generated more efficiently. The result is less time, less waste, and ultimately less cost.

As anyone who has been involved in field investigation activities knows, delineating the nature and extent of contamination generates waste. This fact is inevitable and to some extent, out of your control. However, the amount of waste generated and how the waste is handled isn't. Although IDW is generated during environmental site assessments, with the overall goal of environmental protection, it has the ironic capability of creating additional environmental impacts. As such, we need to be good stewards of our environment and practice good IDW management techniques.

Considerations and Suggestions

The objective of this article is to raise awareness and to provide practical guidance on IDW management. IDW management can be effectively performed if you plan your work, select the appropriate equipment, and evaluate disposal options up-front.

Planning

During the planning stage of an investigation, one goal should be IDW minimization. This goal includes ways to eliminate or minimize waste generation, consideration of the type of waste being generated, and most importantly how to dispose of the IDW appropriately. The best way to meet this goal is to use the Data Quality Objectives (DQO) process during generation of the Field Sampling Plan to ensure that only necessary and useful samples are collected. The Field Sampling Plan should present the investigation plan in the form of a site conceptual model that can be refined as the work progresses to better focus data collection efforts and minimize the number of required samples.

Another way to meet the goal is to develop an IDW Minimization Plan. The plan doesn't need to be a separate document, it should be made part of the Field Sampling Plan so that your field crew knows what is expected and how they will carry out the work. The plan should look at the form of the waste being generated (solid versus liquid), chemicals expected to be present and their concentration, how much waste will be generated, and how to sample the waste so it can be disposed of appropriately.

Be sure to discuss IDW minimization with your project team before the field work begins and if necessary get up-front regulatory buy-in on how the IDW will be handled and disposed. Use DQOs during the preparation of the IDW Minimization Plan to determine how much, how many, and what type of samples are required for

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Remedial Project Manager News

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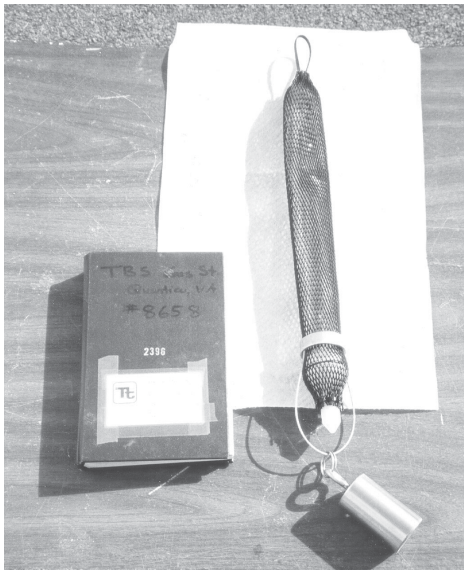

Figure 1. Typical passive diffusion bag used for groundwater sample collection (notebook shows approximate scale).

IDW characterization. Consider the cost of reducing IDW versus the liability of disposing IDW in a landfill, as well as overall pollution prevention goals. Also, when selecting equipment, evaluate disposable or dedicated equipment versus decontamination of sampling tools.

Phased Investigation/Equipment Selection

By implementing a flexible field investigation plan that utilizes real time data, the field team can optimize the sample locations and numbers of samples collected to adequately characterize a site. The use of phased site investigations can also result in less IDW generation and better contamination delineation.

Early investigation phases may be non-intrusive and may be performed using geophysics or aerial photography, for example. Later phases may be performed with minimally-intrusive techniques such as direct push technology (DPT), soil gas samples, or using a Membrane Interface Probe, (MIP). Consider using discrete/ "no purge" sampling techniques (e.g., Diffusion samplers, Hydrasleeve‰, etc) (Figure 1) to eliminate well purging or prepacked wells installed using DPT which generate very little waste as compared to conventional drilling. Also, for permanent wells requiring multiple rounds of investigation, make use of dedicated sampling equipment to reduce decontamination waste. Low flow sampling techniques can also be an effective way to minimize the generation of purge water. This technique assures groundwater parameters are stable (i.e., representative of the aquifer) versus simply removing multiple volumes of well water prior to sampling.

Waste Disposal

When planning a field investigation consider methods of combining similar wastes from sites to reduce waste. Instead of drums consider rolloffs or large volume storage tanks (Figure 2). Better yet, pre-characterize the IDW and if clean, dispose of the soils on the ground at the site or with prior approval, discharge to the local treatment plant. Knowing the various options for waste disposal prior to field activities will aid in more cost effective implementation of the investigation.

Conclusions

Understand the objectives of IDW Minimization, plan ahead, select investigation techniques and equipment that reduce IDW generation, and evaluate various disposal options. Through the use of DQOs during up-front planning and open communication with regulators and disposal facilities, the quantity of waste that is generated and requires disposal can be reduced. The result of this reduction ultimately saves time and money not to mention future liability concerns for all of us.

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Figure 2. Rolloff box containing Investigation Derived Waste (IDW).

Soil Excavation Using Large-Diameter Auger Drilling Technology

MCB Camp Pendleton, CA

By Southwest Division, NAVFACENGCOM and Wheeler Environmental Corporation

Figure 1. Large-diameter drilling rig with a 4ft. diameter auger at Camp Pendleton site.

Remedial project manager from Southwest Division (SWDIV)takes advantage of large diameter auger drilling rig as a cost effective excavation tool to remove contaminated soil adjacent to buildings and around sensitive utilities trenches, eliminating the need for shoring and open excavations.

Site Description

Gasoline from two underground storage tanks (USTs) at a former gasoline service station leaked and contaminated the soil and groundwater in an area that is very confined. The site, located adjacent to a Marine Corps Exchange Uniform Shop (Building 520400), is confined on three sides by the uniform shop, a hillside, and a street. Additional complications in the vicinity of the contaminated area include sensitive underground utilities, fiber optic cable conduit and a large water main.

Gasoline-impacted soils extended horizontally over an area approximately 20 feet by 25 feet and extended vertically to the top of an aquifer confining layer located approximately 30 feet below ground surface (bgs). During site investigation activities, groundwater was first encountered at approximately 40 feet bgs and would rise to approximately 25 feet bgs. Soil beneath the site consists primarily of sands and silty sands with a 3-foot thick layer of cobbles and boulders up to 2 feet in diameter present between 17 and 20 feet bgs.

Problems with Standard Excavation Methods

Several problems were encountered when trying to evaluate the use of conventional excavation methods using an excavator with shoring, benching and sloping. To reach 30 feet bgs with an excavator, benching or sloping would be required to ensure all contaminated soil could be removed, especially if contamination extended deeper than anticipated.

Driving pilings for shoring was a problem because of the 3-foot-thick cobble layer at 17 feet bgs and, more importantly, the aquifer confining layer would be penetrated. This could potentially compromise the integrity of the confining layer, allowing groundwater to enter the excavation and possibly contaminate the aquifer.

Trench box-type shoring was not the best option because the cross-beam supports would be awkward during excavation activities and personnel would have to enter the excavation, significantly increasing health and safety concerns. Sloping and benching could only be considered for the two sides of the excavation without underground utilities.

If benching or sloping were used, the utilities would eventually be exposed and, therefore, would need to be supported. The fiber optic cable was encased in a 2 foot by 3 foot concrete-filled trench. The potential impacts to Base operations if the fiber optic cable was impacted in any way discouraged attempts to design an aboveground support system that would be guaranteed not to fail. Rerouting the fiber optic cable was also not a realistic option.

Space to stockpile excavated soils was very limited on three sides of the site because the site is cut into a hillside. The base's main north-south road is the only level surface adjacent to the site. Because the uniform shop needed to stay open for business, use of the shop's asphalt parking lot was severely limited also.

Soil Excavation with a Large-Diameter Auger Drilling Rig

The work at this site was performed by Foster Wheeler Environmental Corporation under SWDIV's Remedial Action Contract. After reviewing several different methods for soil excavation, the best method found to remove gasoline-impacted soils was a large-diameter auger drilling rig (Figure 1). Anderson Drilling, located in Chino Hills, California, routinely performs large hole drilling for freeway overpass supports for California Transportation Department. They provided a 4-foot diameter auger drilling rig and drilled 35 large-diameter borings to the top of the confining layer at approximately 30 feet bgs; removing 563 cubic yards of impacted soils. The auger holes were backfilled with a slurry at the end of each day which eliminated open excavations in a busy foot and vehicle traffic area. The slurry is a mix of 1.5 sacks of cement with 1 cubic yard of sand, and when cured, meets all compaction requirements, but is still relatively soft enough for potential future construction and trenching activities.

Cost Comparison

If an excavator and shoring could have been effectively used at the site, subcontractor costs were estimated to be approximately $152,000. The cost estimate from Anderson Drilling was $125,955, a cost avoidance of approximately $26,000.

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Making the Best Use of Intangibles

By Engineering Field Activity North East, NAVFACENGCOM

Many times, for many reasons, personnel are required to modify or supplement their workload when they become involved with a different federal facility. This usually means different types of cleanup, different work schedules, different funding issues, and different people to deal with. Issues that were critical, or at least of major concern in one project, may be no more than of passing interest, hardly worthy of mention in another. Similarly, issues that were very minor in nature now take on monumental proportions. For example, on a Base Realignment and Closure (BRAC) base, timing of completing the environmental work may be critical as the new landowners try to coordinate land takeover with aligning potential buyers, renters, users, etc. This isn't an issue at a base that is remaining operational. However, a BRAC base, especially one that's on the National Priorities List (NPL), can usually budget for and receive the funds necessary to perform its environmental investigation and cleanup easier than those that are remaining open. While the cleanup at a non-closing base is as important, generally there are more bases chasing fewer dollars, so funding becomes critical and methods to fund the work becomes more creative.

Although these topics are frequently viewed as differences, they're really just variations of very similar issues. When taking over a new facility, it's better to look for the commonalties. For example, while the prime contaminants of concern vary among facilities (although (VOCs) shows up at many of them), the process by which we investigate and remediate them are very similar. Funding, whether BRAC or Environmental Restoration, Navy (ER,N), is still an art where we artists work with dwindling supplies, short notice pull backs, burn rate, etc.

All of these tangible issues are certainly important, as the failure of any one of them can bring the project to a halt. However, it's the intangible, dealing with the people, that best defines whether or not you'll be successful in completing your project within the time and budget you've set.

Different people bring a whole new array of agendas and personalities to the table. Environmental Protection Agency's (EPA's) policies can differ between regions and between project managers; same thing for state agencies. Many technical committees have consultants to represent the townships within which the federal facility is located, or community groups interested in how the Navy conducts its cleanup. Again, though, it's to your benefit to look for the common threads that you've experienced and worked through before to help you deal with your new assignment.

As the lead agency in addressing environmental cleanup at naval facilities, it is the Navy's task to provide the various deliverables to the regulators/consultants for their review and comment. Do you involve them early in the process? You should, as this is a great way to reduce either the effort of a work plan or findings of an investigative report before tasking the contractor to prepare it. All parties will know what to expect. Make them a part of the process from the beginning, rather than giving them a "cold" document for their comment/review later. Remember, while we're coming from different sides, we have (or should have) the same goals. Do all that you can to downplay the "Us vs Them" scenario.

Next, no matter how thoroughly you've incorporated their vision of what they want in these documents, (within your vision of it) they invariably will make suggested changes. Let's say that your document is absolutely correct in its concept, scope, execution, or results. You don't need to change a thing about it. Should you, just because a regulator suggests that you do? It depends. Adding a few samples in order to build consensus may have a much bigger long-term impact than the initial cost of the work. Also, by agreeing to a predetermined objective in the work plan, the number of samples becomes a function of how "best" to accomplish the objective. It will become easier to work as a group to modify the work plan to best satisfy the agreed upon objective. It also helps build the "team" attitude and shows a willingness to listen and incorporate change. Would it hurt to add several monitoring well locations? Maybe not, but cost may be a factor. Be sure that the regulators are sensitive to funding constraints. After all, they are facing the same thing, so they will probably be able to relate quite easily, but you should be careful not to appear to limit investigation solely because of low funding. How about a compromise where you offer to move one or more of the proposed wells closer to where they wanted to place the additional ones, and still satisfy the data quality objectives of the work?

Data evaluation is another area of compromise. Many times the Navy believes that it has all of the data it needs to accurately evaluate the field conditions and move on to proposing a remedial/removal action, modifying an existing remedy, or taking no action at all. Keep in mind that there are no absolutes. Since we can't peel back the top layer of the ground and peer into the underlying strata, the best we can hope for is a comfort level from which we can make reliable and supportable decisions. We call this engineering judgment. Is this comfort level 80%, 85%, or 90%? All we know is that it's something less than 100%. The discussion comes in when deciding how close we are to 100% versus how much closer we can get with additional sampling. Recognizing this will help all sides to be more receptive to what the others are saying.

These are a few of the many areas where how we interact with our counterparts will determine how successful or painful our experience with them will be. The good news is that it's our call.

Innovative Solution Found To Clean Up A Sticky Problem

Defense Fuel Supply Point (DFSP), Yorktown, VA

By Atlantic Division, NAVFACENGCOM

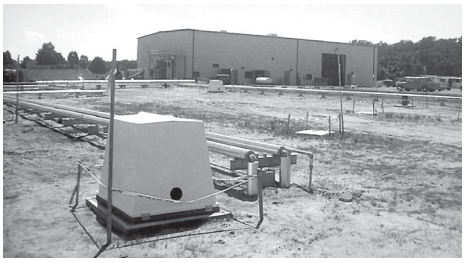

Figure 1. In the foreground is one of the many well enclosures for getting steam into the ground and the oil and water out, via pipes leading to and from the support building in the background.

YORKTOWN—The Atlantic Division and its Remedial Action Contractor, IT Group, have developed an innovative solution to clean up a sticky environmental problem at the Defense Fuel Supply Point (DFSP), Yorktown, Virginia.

Navy Special Fuel Oil (NSFO) is a thick, heavy oil used in the past on Navy ships because its high flash point made it safe to store onboard. The Navy now uses diesel fuel marine (DFM), a much cleaner and easier to use fuel. DFSP Yorktown, established in 1917, had eight 3.2 million-gallon underground concrete tanks to store NSFO. Over the years an estimated three million gallons of the oil leaked from the storage tanks, which were closed in 1985 and demolished in 1996.

Because NSFO is thick and heavy, it is very difficult to remove from the 17-acre site at a depth of approximately 20 feet. Several methods have been tried over the years and the most successful is closed loop steam heating, which lowers NSFO viscosity so it can be collected in trenches and pumped from below ground (Figure 1).

The best and most economical heat source, steam, radiates heat through underground pipes, decreasing the viscosity of the oil, and enabling it to flow easily. A pilot test, conducted in 1991, recovered 140 gallons in 14 days of operation, and proved the steam process is ideal compared with other methods tried. Potable water is heated to 220 degrees Fahrenheit in a boiler producing the steam. Manholes supply direct steam through pipes to underground trenches where the oil is located (Figure 2). The piping system is a closed loop where the steam condenses back to water, recycling the water. This allows the system to use a reduced amount of water. This method of heating is similar to hot water baseboard heating in homes.

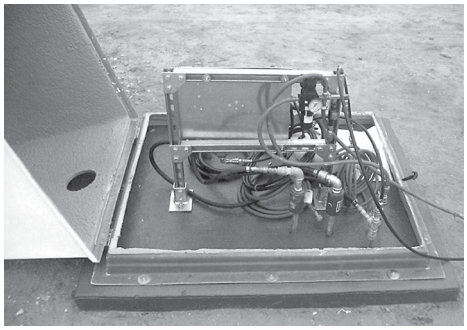

Figure 2. Close up of inside of a well enclosure.

The oil and groundwater are pumped separately from the trenches, and sent to the treatment building where they are processed (Figure 3). The oil is containerized and transported off site to a reclamation facility, which pays seven cents a gallon for the recovered oil. The water is treated in the treatment facility and discharged to the York River under a Corrective Action Plan General Permit issued by the Virginia Department of Environmental Quality (DEQ).

"This is truly a one-of-a-kind operation. Nearly ten years of preliminaries are now culminating in system construction and operation," said environmental engineer, Steve Chambliss.

"We're targeting three acres in the direction the plume is moving," said John Conway, Engineer in Charge. "We're attacking the leading edge of it."

The project has completed phase one of four phases and is currently in the second phase which will establish groundwater control over the plume prior to the initiation of Phase Three – Steam Heating. The four phases are required by DEQ due to the site's immense size and this new technology.

Phase One, the Product-Only Skimming Phase, started in April 2000. This phase utilizes skimmers to recover only the oil so that the plant does not have to deal with cooling and disposing of the water. The site recovered 3,000 gallons in one month.

Phase Two, Groundwater Depression, began around the end of July. By mid-August 2000 the project had recovered approximately 10,000 gallons of NFSO with approximately 20 gallons per minute (gpm) of treated groundwater being discharged to the York River.

"We've met or exceeded all of our requirements," Conway said. "I think we can go forward."

Phase Three, Turning on the Heat, will occur this fall; and Phase Four, Groundwater Discharge, placing the groundwater back into the ground, is still being evaluated.

To date, the project has spent $7.4 million of Environmental Restoration, Navy (ER, N) funding. Conway estimates it will take about 15 years to complete the clean up, now that the system is in full operation.

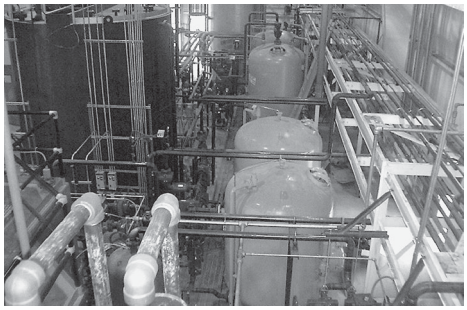

Figure 3. Interior of support building for closed loop steam heating remediation process.

AS/SVE Cleanup Logistics Yield Big Dividends

Marine Corps Logistics Base (MCLB) Barstow, Yermo Annex

By Southwest Division, NAVFACENGCOM

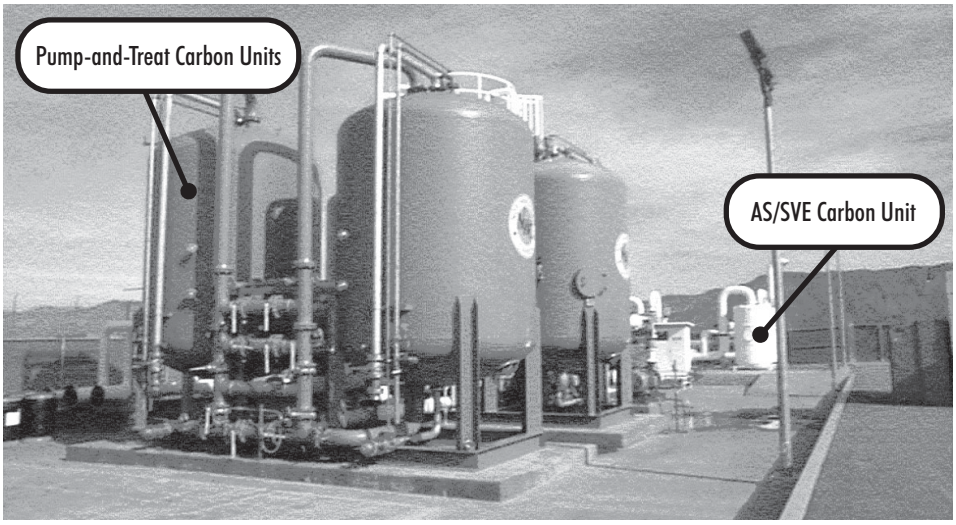

Figure 1: Treatment pad for pump-and-treat and AS/SVE systems.

Executive Summary

While working alongside more conventional pump-and-treat systems, air sparge/soil vapor extraction (AS/SVE) technology has been found to yield superior, cost-effective results in groundwater cleanup efforts employed at Marine Corps Logistics Base (MCLB) Barstow Installation Restoration Operable Unit 1 (Yermo Annex).

Scope of the Groundwater Cleanup Problem

To ensure the protection of human health and the environment, the Operable Unit (OU) 1 and 2 Record of Decision (ROD) signed on April 22, 1998, requires MCLB Barstow to address groundwater and vadose zone contamination at the Yermo Annex. OU 1 comprises the groundwater at Yermo Annex, which is contaminated with volatile organic compounds (VOCs), primarily trichloroethene (TCE) and tetrachloroethene (PCE). The OU 1 plume of contamination originated from several sources, including Building 533, the Waste Disposal Area; the Oil Storage/Spillage Area and Industrial Wastewater Treatment Plant; Building 573, the Maintenance Center and surrounding perimeter area; and the two Yermo Annex municipal landfills. The OU 1 plume was approximately 12,000 feet long (longest measurement), 4,000 feet wide, and approximately 40 feet into the groundwater. Over time, TCE and PCE leached into the groundwater, resulting in contamination in the parts per billion (ppb) range. (Past concentrations have run as high as 490 ppb, with a trend of significant decreases in concentrations over time.) The major risk associated with OU 1 is ingestion of contaminated groundwater underlying the affected on-base and off-base areas. There are two Areas of Concern associated with OU 1, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Area of Concern (CAOC) 26 and CAOC 16. CAOC 16 is contaminated with VOCs including Freon. CAOC 26 is contaminated with VOCs.

A Two-Fold Approach

The selected remedy for OU 1 consists of a pump-and-treat Groundwater Extraction, Treatment, and Recharge System to contain the plume along the base boundary, with enhancement from two Air Sparge/Soil Vapor Extraction (AS/SVE) Systems near the source areas, CAOC 16 and 26. Also, institutional controls are implemented that include access restrictions to prevent the on-base use of untreated groundwater for domestic use.

The Pump-and-Treat System Contains and Treats the Plume at the Base Boundary

The pump-and-treat system works by providing hydraulic containment of dissolved groundwater plumes at Yermo Annex. The systems withdraws groundwater from 13 extraction wells and then conveys it to a treatment compound (Figure 1), where the water is treated with granular activated carbon (GAC) and finally discharged into infiltration galleries. As of July 15, 2001, approximately 1.44 billion gallons of contaminated groundwater have been extracted and treated by the pump-and-treat method, removing approximately 103.8 pounds of total VOCs since the initial startup in 1996. The pump-and-treat system costs approximately $270,000 per year to operate. Although this is a costly and immense operation, it has accomplished the intended results: the plume has been contained.

The Air Sparging/Soil Vapor Extraction Systems at CAOC 16 and 26

The air sparging and soil vapor extraction system is highly effective in plume treatment at CAOC 16 and 26. These systems work by volatilizing the VOCs in the groundwater so they move into the unsatur-

ated soil zone, where the soil vapor extraction system removes the VOC contaminated air. A schematic of the process is shown in Figure 2. First, air is injected through air sparging wells into the groundwater to volatilize the VOC contaminants into the soil. Then, the contaminated air is vacuumed out of the soil by soil vapor extraction wells. The removed contaminated air is treated with vapor phase carbon and filtered to remove organic compounds, then discharged into the atmosphere.

The CAOC 16 System: Results That Speak Volumes

The CERCLA Area of Concern (CAOC) 16 AS/SVE system began reducing contaminant mass in the vadose and saturated zones near and downgradient of Building 573, the Waste Disposal Area, in June 1999. Very significant totals of approximately 487 lbs. of Freon and 4,825 lbs. of VOCs have been extracted as of July 15, 2001. Freon concentrations have decreased to negligible levels, indicating that this chlorofluorocarbon was localized and limited in the subsurface. (Initially, in 1998, Freon had caused the system to shut down due to quick carbon breakthrough, but this temporary setback was quickly overcome). Concentrations of VOCs have also generally decreased over the last two years. Cumulative rates are not yet asymptomatic, indicating that continued operation is necessary. VOC concentrations in the three combination wells (YCW16-1, YCW16-2, and YCW16-3) show a significant decrease in spite of their distance from the SVE wells.

VOC Emission Rates Remain Low Thanks to Efficient, Effective AS/SVE Systems

VOC emission rates have remained below the Mojave District Air Quality Management District's allowable levels (36 lbs/day for VOCs, 600 lbs/day for Freon). The annual cost to operate the CAOC 16 AS/SVE system is approximately $180,000. Compared to the pump and treat system, the AS/SVE systems are much more efficient, economical, and effective.

The CAOC 26 System: VOC Concentrations Down an Average 98.7%

The CAOC 26 AS/SVE system was installed to reduce contaminant mass in the vadose and saturated zones at CAOC 26. Started in December 1996 and operated through December 1998, this system extracted an estimated 1140 lbs of VOCs. Regulators approved a Technical and Economical Feasibility Report in March 2001 that allowed AS/SVE system shut down, since intended goals listed in the OU 1 and 2 ROD were achieved. Since shut down, the CAOC 26 soil vapor monitoring network has been sampled on four occasions. The results? Total VOC soil vapor concentrations have slightly increased since the final shutdown; however, the total VOC concentrations have decreased by an overall average of 98.7 percent since initial soil vapor sampling performed in October 1996. In addition, the VOC soil vapor concentrations appear to have stabilized. In conclusion, powerful, cost-effective air sparge/soil vapor extraction technologies, working in conjunction with a more costly, yet effective conventional pump-and-treat system, have functioned together to effectively contain and reduce contaminants in the groundwater plume at the Yermo Annex.

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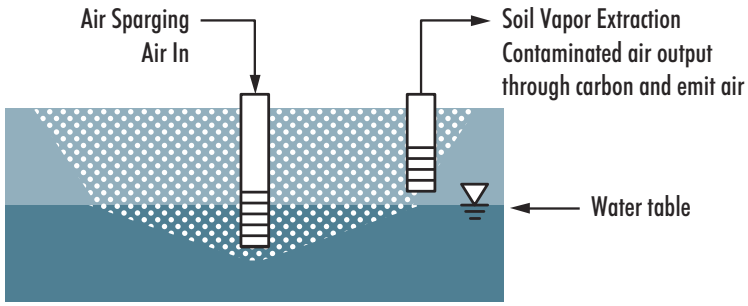

Figure 2: Air Sparge/Soil Vapor Extraction System Process.

Technology Transfer (T2) News

ANNOUNCING! NAVFAC's Technology Transfer (T2) News is coming to you soon. T2 efforts are conducted by the Navy environmental community and supports the Navy's efforts to increase the use of innovative technologies to reduce environmental cleanup costs.

T2 News will appear in future RPM Newsletters and through a web site that has been developed, which serves as the source of the most up-to-date NAVFAC T2 information. The web page resides on the Environmental Restoration and BRAC Web Sites.

http://enviro.nfesc.navy.mil/erb/restoration/technologies/tech_transfer/m

Recycled Napalm Successfully Converted to Industrial Use

By Southwest Division, NAVFACENGCOM

Executive Summary

What to do with the napalm? It was a persistent question that ended in three previous failed attempts back in 1982, 1985, and 1987. In 1994, the Navy considered six disposal options that eventually culminated with the creation of the Navy Napalm Removal Project (NNRP) in 1996. The goal of the NNRP was to transition the napalm stockpile from a munition to a safely recycled fuel. Maintained outdoors on three non-contiguous sites at the 8,000-acre Seal Beach Naval Weapons Station Fallbrook Detachment, the napalm stockpile consisted of approximately 34,653 ten-foot long, cigar-shaped, individually crated aluminum canisters of Napalm B (Figure 1). NNRP team members disassembled approximately 100 napalm canisters a day at Fallbrook and shipped the Napalm B, shredded wooden crates, and aluminum shipping containers to recycling sites outside of California. Southwest Division, Naval Facilities Engineering Command (SWDIV) in San Diego, California, undertook this enormous project—spearheaded by Remedial Project Manager (RPM) Bob Schard—in 1996 and successfully completed it on April 4, 2001.

Figure 1: The United States' napalm stockpile once covered over 62 acres of land at the NWS Seal Beach, Detachment Fallbrook in Fallbrook, California. Approx. 35,000 canisters were stored for 30 years on three outdoor sites.

What Is Napalm and What Are Its Hazards?

Napalm B, developed after World War II, is a safer form of the original napalm, which contained *na*pthene and *palm*itate. Napalm B, whose ignition can be well controlled, is a homogeneous mixture consisting of approximately 46% polystyrene, 33% gasoline, and 21% benzene. Napalm is less hazardous than gasoline because it is less flammable. Moreover, the high polystyrene content in napalm "jellies" (thickens) it, thereby preventing percolation of gasoline and benzene components into soils if the material is spilled. Napalm B qualifies as a Resource Conservation and Recovery Act (RCRA) hazardous waste due to its toxic and ignitable characteristics.

A Controversial Subject

The NNRP faced controversy from the start, beginning with the original plan for napalm disposal in the Midwest. Environmentalists raised safety concerns regarding the transport of 3.3-million gallons of napalm two-thirds of the way across the country to Pollution Control Industries (PCI) in East Chicago, Indiana. There, the napalm was to be converted into fuel for cement kilns. Congressional and local activist anxiety about shipping napalm through residential neighborhoods led to PCI backing out of the project in 1997.

Understandably, "napalm" is a politically charged word, due to its often-debated use in the Vietnam War. Moreover, many members of the media were unaware of the composition and hazards of napalm, and often the public was unduly alarmed. In fact, napalm posed less danger than many fuels routinely shipped by train, such as gasoline. One persistent rumor claimed that the Fallbrook napalm stockpile was a huge public safety hazard just waiting to go off. Fears such as these were strong enough to cause project schedule setbacks and cost escalation.

History of the Problem and NNRP Objectives

During the 1980s, the Navy attempted to dispose of the napalm stockpile through Defense Reutilization Marketing Office (DRMO) sales contracts based on the premise that the value of salvageable materials would exceed overall demilitarization and disposal costs. However, none of the three removal efforts proved successful. During 30 years of outdoor storage, some canisters began to degrade, causing napalm leakage. In March 1996, the Department of Navy (DoN) signed a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Action Memorandum (AM). By agreement with the California Environmental Protection Agency (EPA), Department of Toxic Substance Control, no waste stream treatment would occur in the State of California. The AM stated that the removal action was undertaken to remove the threat of release of hazardous substances to the environment. The primary objective of the removal action was to *safely, permanently, and responsibly* dispose of the napalm stockpile. The secondary objective was to *recycle/reuse* each waste stream to the maximum extent possible and without creating additional waste. The project has enjoyed a great success in the accomplishment of these goals.

How the Napalm Stockpile was Removed and Disposed

On-Site Work Performed at Fallbrook

- The napalm canisters were individually removed from the storage areas to a Materials Separation Area built on-site at Fallbrook (Figure 2). Munitions were separated into three waste streams: napalm; shredded aluminum; and shredded wood.
- Specially designed, computer-controlled sealed machinery performed the separations inside the Materials Separation Area,

which contained a continuously purged, nitrogen-filled environment and included continuous off-gas treatment and monitoring.

Transport to Other Facilities

- The napalm, shredded canisters, and shredded wood were shipped for off-site processing at facilities permitted to accept and process CERCLA waste.
- United States Department of Transportation (USDOT)-approved 6,000-gallon iso-tanks transported the napalm, which was primarily shipped by rail. Shredded aluminum canisters were transported in sealed 55-gallon drums, and the shredded wooden crates were placed in covered 40-yard shipping containers.

Modification, Treatment, and Disposal

- Aluminum was treated with a toluene wash and subsequently transported to smelters for recycling.
- Napalm was mixed at a 50-50 ratio with pure toluene and the toluene wash, forming a Blended Specification Fuel (BSF) for use in industrial boilers and furnaces.
- Shredded wood was burned in a boiler to produce useful steam. Recovery of the energy value of the wood was found to be a superior alternative to other possible treatment or disposal methods.
- Prime Contractor: Battelle Memorial Institute
- Stockpile Owner and Major Claimant: NAVSEA

The DoN considered the energy content of the large napalm stockpile to be too valuable to waste. However, there were problems to be overcome both scientifically and politically before the napalm could be used as an energy source. The scientific problems included: solubility in a proper fuel matrix, methods to ensure complete combustion, and safety in transportation and handling. The political problems included addressing safety issues raised by public officials and environmental activists involving the transport of the napalm. Not only did the Navy assure the public of the safety of the shipments, but it also emphasized that the EPA approved NNRP activities.

Blended Specification Fuel: Napalm-Toluene-Powered Industrial Boilers and Furnaces

The napalm could not be burned directly as a fuel, because the high heat content exceeded permit conditions of industrial boilers and furnaces. Additionally, due to the high plastic content, there was concern that normal spray nozzles on industrial combustion equipment would clog. However, if napalm could be blended with a carefully chosen diluent to form some other fuel matrix that maintained the plastic in homogeneous suspension, then commercial disposal and heat recovery of the material could be achieved. Other important considerations on the choice of diluent were that it provide a higher flash point for safer handling, as well as lower viscosity and heat content. The GNI Group of Deer Park, Texas determined toluene as the optimal co-solvent. Toluene maintained solubility of the polystyrene, reduced the viscosity, increased the flash point, and, at approximately a 50/50 mix, arrived at the proper heat content for use as an energy source. The blended specification fuel formed from the napalm-toluene mixture was used in place of other fossil fuels at a hazardous waste incinerator and another facility that regenerated spent sulfuric acid.

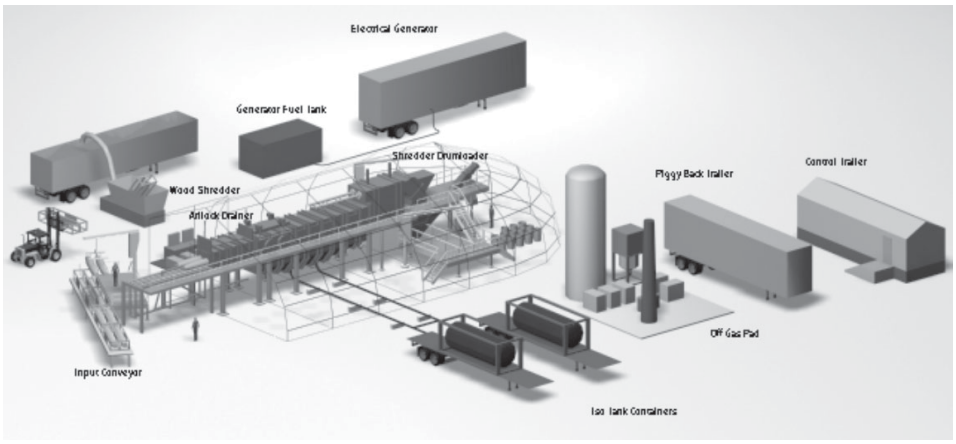

Figure 2: This diagrammatic representation of the munitions separation plant constructed in Fallbrook illustrates the various components necessary to prepare the three waste streams for containerization and transport.

Figure 3: The Hon. Robert B. Pirie, Jr., Acting Secretary of the U.S. Navy, talking with the press at NWS Seal Beach, Fallbrook Detachment's "Last Canister Event" held to celebrate the final demilitarization of the United States' napalm stockpile on April 4, 2001.

"Good Riddance!"

The safe and successful operation of the NNRP built a great deal of goodwill between the Detachment Fallbrook and the surrounding community. After five years of sustained efforts on the part of many individuals and organizations and approximately $50M of direct funding, the project came to a close on April 4th, 2001 (Figure 3). During the ceremonial processing of the final two canisters of napalm, Acting Secretary of the U.S. Navy, Robert B. Pirie, Jr.—undoubtedly speaking for the community and the entire military, if not all Americans—exclaimed: "Good Riddance!"

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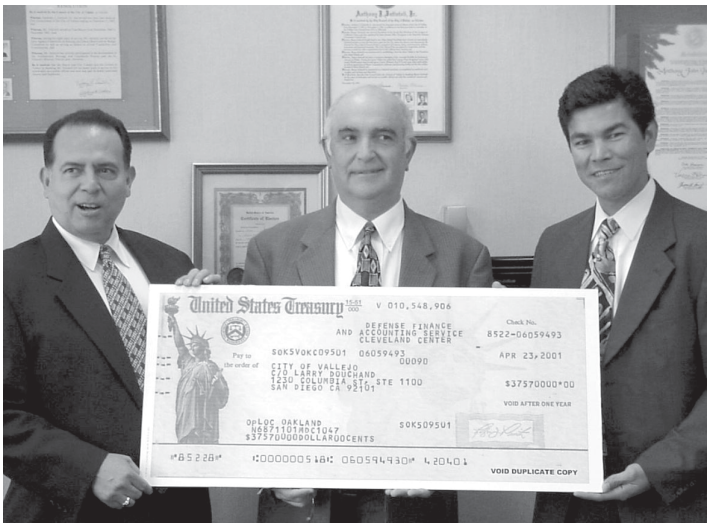

Jewel in the BRAC Crown:

The Transformation of Mare Island Naval Shipyard into a Lively New Community

From left to right: Vallejo City Manager David Martinez, Mayor Anthony Intintoli, Jr., and Navy BRAC Environmental Coordinator Jerry Dunaway display the first of the three payments under the Environmental Services Cooperative Agreement for the Eastern Early Transfer Parcel on Mare Island (photo taken last April).

A Proud History

Mare Island Naval Shipyard (MINS) is located approximately 25 miles northeast of San Francisco on the western edge of Vallejo, California. Mare Island is approximately 3.5 miles long and one mile wide, comprising 5,460 acres of which 1,650 acres are developed uplands. Tidal and nontidal wetlands comprise the remaining acreage. Established by the Navy in 1854, MINS was the oldest naval base on the west coast; the facility has played a pivotal role in the evolution of ship technology, from sail power to the transformation to nuclear propulsion. The naval facility once had extensive shipyards and hospital areas. For more than 100 years, MINS was used for the construction, repair, and maintenance of ships; for the past 40 years, nuclear submarines were also built and repaired at the base. Ship construction and repair activity reached their peak during World War II, when the shipyard population reached 46,000 workers. Their output exceeded tonnage production of any shipyard in the world. And, at that time the shipyard set an impressive shipbuilding record that has never been broken: the construction of the destroyer USS Ward in just 17 days. Some 50 years later, in December 1995, employment shrunk to 1,500 workers. Before MINS was closed on April 1, 1996, the shipyard could boast a proud record of 512 ships built and hundreds repaired.

Origins of the "Mare Island Experiment"

While proud of its legacy, Mare Island, like any large military base, is undergoing a complex and lengthy cleanup process. A key to the transformation of Mare Island from a military base to Vallejo's newest place to live and work was due to proactive planning among a coalition of various civic, government, and private groups working in concert with the Base Realignment and Closure (BRAC) Cleanup Team (BCT). The media dubbed this joint effort the "Mare Island Experiment," a plan to redefine this once top-secret naval facility and turn it into a master-planned community of neighborhoods, industries, ecological preserves, and historic districts. These public and private groups are continuing their successful mission, bringing about expedited land reuse that's benefiting the entire community: the Mare Island Experiment is the Department of Defense's most ambitious early transfer attempt to date. Achievements garnered by the BCT and various other groups led Tom Huetteman (Chief, Navy Section, Environmental Protection Agency [EPA] Region 9) to comment: "Mare Island has been one of the fastest reuse efforts in the Bay Area." How do they do it? Key to this success has been good planning and timing. Shortly after base closure, the community immediately began to develop an accelerated reuse plan.

Accelerated Economic Redevelopment: The Eastern Early Transfer Parcel

From the start, partnering and community involvement initiatives set the stage for streamlined reuse of the extensive property holdings at Mare Island. Because the final cleanup and transfer of the base might take years, leasing became the quickest way to reuse the base. To that end, the local reuse authority formed the Mare Island Futures Group in 1993, with members representing business, labor, government, education, environmental organizations, and private citizens. By the beginning of the year 2000, Mare Island had a final reuse plan, an Environmental Impact Study and an Economic Development Conveyance Memorandum of Agreement (EDC) with the City of Vallejo. A significant portion of the Island was leased to over 50 industrial and commercial tenants by then. In 1998, the City of Vallejo had selected Lennar Communities as their master developer for most of the Island, and soon after Lennar Mare Island was formed. The challenge was solving the environmental legacy of the oldest naval shipyard on the West Coast. After more than 140 years of industrial use, there were low levels of hazardous waste in the soil and groundwater. With significant political support and encouragement, Vallejo charted a unique partnership with the Navy to pursue "early transfer" for practically all the EDC parcels. This 1998 addition to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is anticipated by many to accelerate economic redevelopment years ahead of schedule. Application of this alternative disposal process at Mare Island has been a test of legitimacy for the process, due to the numerous environmental challenges created by the shipyard's long history of continuous use.

The Environmental Report Card So Far

Much environmental work had been completed at the Island under the radiologi-

cal and ordnance programs, because these were scheduled as "smart priorities" in the 1993 BRAC listing. Since closing in 1996, over 100 underground storage tank (UST) sites have been assessed, tanks removed, and site conditions documented. Hundreds of polychlorinated biphenyl (PCB) sites dot the Island, in view of the fact that the highly energy-dependent facility used hundreds of electrical transformers. All PCB transformers have been removed or retrofilled, and an extensive cleanup program completed a large amount of the work. The remaining long lead-time item was the Installation Restoration (IR) program encompassing over 40 sites, and in the year 2000, after conducting several removal actions, this program was nearing the remedial investigation reporting phase. However, regulatory coordination and support for the Navy's cleanup programs were insufficient, and funding fluctuated. Getting to the Record of Decision (ROD) for this difficult and complex facility is years away. Lennar, the City, and the community were monitoring these developments.

Eastern Early Transfer Parcel: Evolving into to a Vibrant New Community

As one of three early transfer packages conceptualized by Vallejo, the Eastern Early Transfer Parcel was slated for Lennar Mare Island. Starting in May 2000, Southwest Division Naval Facilities Engineering Command (SWDIV) began an aggressive schedule to develop the concept into reality. The three early transfer packages were developed in parallel, and the City submitted the Lennar early transfer proposal first in November 2000. As the largest early transfer conducted to date, many regulatory and community eyes watched and commented on the progress. (It should be noted that the Lennar Eastern Early Transfer Parcel consists of less than half of the developed Island.) The parcel encompasses over 670 acres right in the heart of the developed Island—including numerous heavy industrial shipyard facilities and several residential and historic areas. Redevelopment is beginning and, already, interim leasing is attracting a growing daytime population. The 670-acre parcel is becoming integrated into Mare Island's cornucopia of historic waterfront buildings, manicured parks, stately old mansions, and monumental manufacturing facilities. The intriguing elements of the Navy shipbuilding legacy—dry docks, gantries, cranes, warehouses and industrial buildings—are being incorporated into the overall plan for energizing business and employment on the island. This economic development initiative is reconnecting the island to the City of Vallejo and the thriving Bay Area. Distinct neighborhoods will complement these activities to create a diverse community.

Work Continues

What's left is the regulatory closure of 31 IR sites, 86 UST sites, and over 450 PCB sites, as well as attaining compliance with various other requirements at this state-lead site. To accomplish this, the Navy negotiated a $78 million Environmental Services Cooperative Agreement (ESCA) with the City and awarded the first payment of $37.5 million in April 2001. The City then contracted with Lennar and their environmental partner, CH2MHill to complete the cleanup.

SWDIV published the Finding of Suitability for Early Transfer (FOSET) for public comment in January 2001, but due to several very challenging and critical comments received from agencies, community members and activists, SWDIV further refined the FOSET for republishing in June. This included coordinating efforts with agencies and, at the same time, formulating defensible positions to counter significant legal challenges. By August 1, 2001, the final FOSET was signed and compiled into the covenant deferral request package for submittal to Governor Davis following reviews in Washington. The future looks promising for Mare Island. The teamwork and creative thinking applied by the Navy BCT, private companies, and the City of Vallejo have demonstrated that planned economic growth and effective cleanup efforts can benefit all parties involved.

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Partnership Ensures Success of NURC

PEARL HARBOR - The harmonies echo across the coasts in a happy concerto. In the Pacific, Pacific Division Naval Facilities Engineering Command (PACDIV) blends experts in unexploded ordnance, environmental and contracting to form harmonious tunes. Across the miles on the mainland, Southern Division Naval Facilities Engineering Command (SOUTHDIV) composes fine work from its symphony of talented players. Together, this orchestra of professionals resonates success for the Navy's Unexploded Ordnance Response Contract (NURC).

Since 1999, PACDIV has served as the program manager for ordnance and explosives (OE)/unexploded ordnance (UXO) cleanup at Navy and Marine Corps installations, a task that involves forging strong ties with the other field divisions. In the ongoing project to clear OE and UXO from the 200-acre site at Naval Air Station/ Joint Reserve Base (NAS/JRB) New Orleans, PACDIV UXO deputy program manager Jeff LeFebvre noted the dynamics of the relationship between PACDIV and SOUTHDIV, the Navy technical representative for the project. He has nothing but praise for SOUTHDIV. "SOUTHDIV has assigned an exceptional team to lead this effort," noted LeFebvre.

Harold McGill, Navy technical representative and remedial project manager for SOUTHDIV oversees the project, now on its second phase (Figure 1). Providing him with fieldwork status is the on-site representative at New Orleans, Paul Mullins, who monitors the contract work.

Other key players include Marion Fannaly, NAS/JRB New Orleans head of Environmental Planning who ensures regulator

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"Partnership Ensures Success of NURC" continued from page 11

compliance and safety requirements are met, and safety officer Ed Bauman who keeps the site secure and safe in all production efforts. Richard Stanley, SOUTHDIV's administrative contracting officer, is the contractual lead who works closely with PACDIV to assure consistency regarding programmatic contract issues.

Phase II consists of the ordnance and explosives clearance of approximately 90 acres and is located just north of Phase I. This site will receive a tier 2 sweep that consists of a surface and subsurface clearance of one foot. Phase II fieldwork began in March and is scheduled for completion this month. Successful execution and creative solutions have resulted in a projected under run savings of about $90,000 from the Phase I work.

PACDIV's Frank Caluya, the UXO technical lead, works closely with the SOUTHDIV technical rep to define scope, submit key documents for quality control, and assists in assuring customer goals and satisfaction are met or exceeded. Other PACDIV players are Fred Roudebuch, Jackie Sanehira and Lisa Amaki in Acquisition.

Figure 1. Site Inspection - ECC project manager Jim Witte, SOUTHDIV's Harold McGill, and ECC senior project manager Larry Ronan inspect a wooded area where ordnance and explosives were discovered.

LeFebvre said quality control meetings are held every week to keep all players on the same sheet of music. "I can say with confidence that this project is the smoothest operation we have had the privilege to work on. The SOUTHDIV and NAS JRB New Orleans team are extremely professional and a joy to work with."

PACDIV awarded the NURC contract to Environmental Chemical Corporation in August 1999. The cost-plus award fee contract was competitively procured with 44 offers solicited and five proposals received.

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