2011 CNO/SECDEF Environmental Award Nomination
Naval Air Weapons Station China Lake

Environmental Restoration – Installation

INTRODUCTION

Naval Air Weapons Station China Lake (NAWSCL) is where the Navy and Marine Corps have developed or tested nearly every significant airborne weapon system in the past five decades. NAWSCL is the Navy's largest single landholding, representing 85 percent of the Navy's land for Research, Development, Acquisition, Test, and Evaluation (RDAT&E) use and 34 percent of the Navy's land holdings worldwide, encompassing 1.1 million acres. Located in the California Mojave Desert 150 miles northeast of Los Angeles, the land ranges in altitude from 2,100 to 8,900 feet and varies from flat, dry lake beds to rugged pine-covered mountains. The vast majority of the land is undisturbed and provides habitat for more than 340 species of wildlife and 650 plant types.

VX-9 Over NAWSCL

NAWSCL's history began with the establishment of the Naval Ordnance Test Station (NOTS) in 1943 supporting California Institute of Technology's wartime rocket development program. Today, NAWSCL is the Department of Defense (DoD) and Navy premiere location for cutting-edge weapon RDAT&E missions. NAWSCL's tenants include the Naval Air Warfare Center Weapons Division (NAWCWD), two Air Test and Evaluation Squadrons, two Explosives Ordnance Disposal Detachments, a Marine Aviation Detachment, a Center for Seabees and Facilities Engineering Learning Site, a Branch Health Clinic, the Navy's Geothermal Program Office, and numerous small tenant activities. NAWSCL facilities are also used by the other military services (Marine Corps, Air Force, and Army), other government agencies (such as the Department of Energy and NASA), commercial customers pursuing independent testing or research and allied forces. The current estimated annual operation tempo includes 9,800 aircraft flights, 1,600 Unmanned Aerial System flights, and 2,300 Range Ground Operations.

NAWSCL is home to approximately 4,400 civilian employees, 1,000 military personnel, and more than 1,500 contractor employees. The City of Ridgecrest adjoins NAWSCL and had a population of 27,616 in 2010, including many NAWSCL employees. Inyokern (population 1,099) is located 10 miles west of Ridgecrest and is economically oriented toward the agricultural economy of the area. The area between the two cities is commonly referred to as China Lake Acres (population 1,876). This area is located along the southern edge of NAWSCL and contains many residences with private groundwater wells.

BACKGROUND

The end-to-end weapons system development activities conducted at NAWSCL for the past five decades have been extensive and varied. These activities have been distributed throughout the installation's 1.1 million acres, with only a few areas of concentrated activities. As a result, the environmental restoration requirements present unique challenges to identify and remediate these widely distributed sites. NAWSCL has 89 Installation Restoration Program (IRP) sites and five Military Munitions Response Program (MMRP) sites.

The primary focus of environmental restoration at NAWSCL is protection of groundwater that is the sole source of drinking water for the installation and surrounding communities. Extensive studies have been conducted to determine the hydrogeologic connections between groundwater at IRP/MMRP sites and the domestic production wells. No contamination of any supply wells has occurred, and the remedial actions implemented

to date have been designed to ensure that none occurs in the future. Other important environmental restoration priorities at NAWSCL are protection of human health from direct exposure to contamination and protection of sensitive ecological receptors both from contamination and from disturbance during response actions.

Desert Tortoise (Gopherus agassizil)

Environmental compliance activities at NAWSCL are guided by an Environmental Management System (EMS) established in 2009 in conformance with ISO 14001:2004 standards. NAWSCL has identified three significant environmental aspects: compliance with natural and cultural resource protection requirements during ground disturbing activities; compliance with natural and cultural resource protection requirements during facility maintenance and modification activities; and minimization of natural resource consumption (specifically groundwater).

NAWSCL has an experienced staff in all areas of environmental compliance to support the installation's mission. The staff is lead by John O'Gara who is "dual-hatted" as the NAWSCL Installation Environmental Program Manager (IEPM) under the Commander, Navy Region Southwest (CNIC) and as the Head, Environmental Management Division (EMD) under the Naval Facilities Engineering Command, Southwest (NAVFAC SW). IRP/MMRP activities at NAWSCL are managed by Michael Cornell and Michael Staggs from the NAVFAC SW Environmental Business Line, Desert Integrated Product Team; Thomas Dorfmeister from the NAWSCL Public Works Department (PWD) Facility Engineering and Acquisition Division (FEAD); and James McDonald from the PWD EMD.

Expertise within the EMD and other NAWSCL organizations is accessed through an established project review process. This process was formalized in 2005 under NAWS Instruction 11100.1. This instruction requires that all projects involving ground disturbance or facility alteration be evaluated by a Shore Facilities Project Review Board (SFPRB). Environmental restoration investigations, removal actions and remedial actions undertaken are all reviewed by the SFPRB for impacts to the installation and mission. Review subjects include natural/cultural resources, explosive safety, police/fire response, and security. All other projects that come before the SFPRB are also reviewed by the EMD to ensure that they are not affected by IRP/MMRP sites. This includes sites that are still under investigation and those that have land use controls (LUCs) established by a Record of Decision (ROD). Nancy Army and Josh Nazeck are the EMD representatives for SFPRB.

Projects with natural and cultural resource protection requirements identified through the SFPRB are surveyed by a team of biologists and archeologists lead by Tom Campbell. Natural resource concerns addressed in part by a Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service (USFWS) in 1995. The BO allows NAWSCL to manage the endangered desert tortoise habitat on the installation without consulting with the USFWS on every project. This agreement must be upheld by NAWSCL every year to remain in effect. The yearly report for 2009 documented over 200 project reviews, 63 in tortoise habitat that required field surveys. The EMD also provided 56 tortoise training briefs to personnel involved the projects. These reviews and briefings included four IRP/MMRP projects.

Due to the extensive use of energetic materials in support of NAWCL's RDAT&E mission, explosive safety is a vital concern. Expertise at NAWSCL is brought in through project reviews by the Explosive Safety Officer, Nick Wiruth and through site support by NAWCWD's Land Range

Operations Branch. The RDAT&E mission generates a significant amount of Material Potentially Presenting an Explosive Hazard (MPPEH). In order to properly manage this material NAWSCL has established procedures and assigned responsibilities for the assessment, processing, storage, and transportation of MPPEH. These procedures include documentation of MPPEH as either Material Documented as Safe (MDAS) or Material Documented as an Explosive Hazard (MDEH) for public release as scrap metal, disposal as domestic trash, or on-station use or evaluation. EMD responsibilities under the MPPEH program are managed by Lauren Zellmer.

NAWSCL has worked with its tenants to implement these MPPEH procedures for all activities conducted on the installation. NAWCWD relies on its Land Range Operations Branch, headed by John Foster, for the majority of the MPPEH work. These highly trained personnel collect MPPEH generated through weapons tests, manage a collection facility, perform demilitarization tasks and arrange for safe public release of MDAS.

NAWCL has made extensive use of local engagement and outreach though the Restoration Advisory Board (RAB). The RAB also provides valuable expertise to environmental restoration at NAWSCL. The RAB has met at least bi-monthly since its establishment in 1995. The extensive involvement in the entire IRP/MMRP response process has developed consistent two-way communication with all stakeholders. Agency representatives include the Department of Toxic Substance Control (DTSC), Regional Water Quality Control Board (RWQB), Kern County Water Agency, Kern County Environmental Health Services Department, and the Indian Wells Valley Water District. Community representatives include current employees of the Navy and long-term residents of the area with membership in many local organizations such as the Audubon Society and the Pleistocene Society (a local travel and environmental issues organization).

CAPT Jeffery Dodson, NAWSCL Commanding Officer serves as the Navy Co-Chair of the RAB. This provides a highly visible example of the importance NAWSCL places on community involvement. The NAWSCL IRP Installation Coordinator, James McDonald, is a resident of an adjacent community and has worked on the NAWSCL IRP for 21 years. The results of this extensive public involvement are seen during the public comment period for decision documents. All decision documents developed for NAWSCL (listed below) were finalized with minimal comments. Stakeholder concerns were all addressed in the steps leading up to the decision documents, leaving no remaining controversial issues. The RAB and all public involvement activities are coordinated by the NAWSCL Public Affairs Officer, Peggy Shoaf.

Environmental restoration activities at NAWSCL are guided by a Federal Facility Site Remediation Agreement (FFSRA). This agreement was signed by the Navy, the California DTSC and the Lahontan RWQCB in November 2003. The FFSRA also serves as the Corrective Action Consent Agreement required by NAWSCL's Hazardous Waste Storage Facility Permit, last updated by the DTSC in 2010. Schedules for implementation of the FFSRA are included in a Site Management Plan (SMP). The last major revision of the SMP was in 2006 and the schedules are updated annually.

Environmental restoration activities at NAWSCL have produced the following decision documents:

- Site 13, Oily Waste Disposal Area, Action Memorandum
- Site 23, K-2 South Disposal Area, Action Memorandum
- Site 31, Public Works Pesticide Rinse Area, Action Memorandum
- Site 32, Golf Course Pesticide Rinse Area, Action Memorandum
- Site 47, Michelson Lab Industrial Sewer System, Action Memorandum
- Site 49, SWPL/CLPL Industrial Waste Ponds and Sumps, Action Memorandum
- Site 50, Airplane Oil Disposal Trench, Action Memorandum
- Site 6, T-Range Disposal Area, Record of Decision

- Site 12, SNORT Road Landfill, Record of Decision
- Armitage Field Operable Unit (Sites 1, 2, 3, 44, 45, 50, 58), Record of Decision

A major initiative involving environmental restoration at NAWSCL is the Indian Wells Valley Cooperative Groundwater Management Group (CGMG). Groundwater is the only source of drinking water in the Indian Wells Valley. The resource is shared by the Navy, the Indian Wells Valley Water District, several privately organized producers and individual well owners. These water producers, along with the Kern County Water Agency, individual well owners and concerned citizens formed the CGMG to manage groundwater production and to research additional supply areas. A technical subgroup reviews and monitors the membership's efforts to better understand local groundwater resources. This group is also responsible for an extensive well monitoring program and a water recharge study. NAWSCL has provided significant support for the monitoring program by hosting Seabee well drilling classes. Since the inception of this program nearly 100 wells have been installed throughout the Indian Wells Valley.

Groundwater Monitoring Well Drilling

Communication with the CGMG is vital for environmental restoration activities at NAWSCL. The technical subgroup is chaired by Michael Stoner, the geologist for NAWSCL. Information is shared between the CGMG and the Navy's environmental restoration managers so that each can benefit from the other's actions. One of the milestones of this cooperation was the implementation of a base-wide hydrogeologic characterization study by the IRP. This study was completed in 2003 and still plays a major role in the current success of the IRP. The extensive experience of the cooperating agencies that make up the CGMG has contributed to wide acceptance of the base-wide hydrogeologic characterization study findings by the public and regulatory agencies.

PROGRAM SUMMARY

The purposes of environmental restoration activities at NAWSCL are to:

- Support NAWSCL's unique RDAT&E mission requirements by ensuring that impacted lands meet strict environmental and safety standards when response actions are complete and by making remediated properties available for reuse to the maximum extent practicable.
- Ensure that environmental cleanup actions address the most significant sites first. Restoration actions are prioritized based on relative risk to human health and the environment; munitions response actions are based on the MMRP site prioritization protocol.

Goals:

- Achieve remedy in place (RIP) for all high priority IRP sites by FY2014.
- Achieve 90 percent response complete (RC) of IRP and MMRP sites at active installations by end of FY2018.
- Achieve 95 percent response complete (RC) of IRP and MMRP sites at active installations by end of FY2021.

Program Status To Date:

- Ensured that effective long-term solutions were put in place including Site Closeout at five sites, Response Complete at 10 sites and Remedy in Place at 22 sites. This represents 55 acres returned to the Installation to date.
- Estimate costs to completion $49.8M.
- On track to meet progress goals for 2014, 2018 and 2021.

ACCOMPLISHMENTS

Major environmental restoration accomplishments at NAWSCL from October 1,

2009 through September 30, 2011 include the following activities:

Site 6 Remedial Action

Site 6 (T-Range Disposal Area) was used for the disposal of waste propellants from nearby laboratories. The propellants, along with associated solvents and packing materials were burned and the residue pushed into unlined trenches. Sampling investigations showed that contamination had not migrated from the trenches. Hydrogeologic investigations had shown that no groundwater was present at the site (up to 200 feet below ground surface) so a groundwater monitoring program was not required. This determination relied heavily on coordination with the CGMG during the base-wide hydrogeologic characterization study.

The combination of waste characteristics and the environmental conditions allowed the Navy to select in-place closure remedy; consolidation of waste into two areas and installation of multi-layered caps over the disposal trenches. The remedy was implemented between November 2010 and February 2011. The caps will prevent exposure to human and ecologic receptors from the burn reside waste.

Construction of Site 6 Multi-layer Cap

Residual metal items from the burn operations meet the definition of MPPEH. Before the remedy could be implemented, scattered MPPEH needed to be removed from the work areas. This was accomplished by the NAWCWD Land Range Operations Branch in September – October 2010 under their previously approved Range Cleanup Standard Operating Procedures. Their clearance of the site, and continued support through the remedial action was accomplished with only $30,000 of IRP funding. Taking the same action through the normal contracting methods would have added at least another year to the schedule and increased the cost to an estimated $300,000 for ordnance removal technicians to support the remedial action. James Wecker was the Land Range Operations Branch site supervisor for the MPPEH clearance.

Implementation of this remedial action required an extensive review by the SFPRB. Site 6 is in a relatively undisturbed area that serves as a buffer for the nearby T-Range Aeroheat Facility. Cultural and natural resource surveys were necessary to comply with NAWSCL policies. The cultural resource surveys were accomplished by making use of previous surveys done for the ordnance test facilities. The natural resource surveys were conducted in January and October 2010 by Tom Campbell and Anna-Maria Easley, biologists with NAWCL's EMD. A special burrowing owl survey was also conducted by Susan Williams of Epsilon Systems Solutions Inc., under contract to NAWCWD. Prior action by the SFPRB had established a borrow pit near Site 6. The availability of this nearby resource was integrated into the Remedial Design. Nearly all of the cap material came either from within Site 6 or from this borrow pit. Use of the existing resource minimized the travel time and reduced fuel usage for the haul trucks. It also resulted in no new ground disturbance in order to obtain the cap material.

Coordination with the T-Range Test Manager, Mark Hall, and Test Conductor Warren Jaul was started during the SFPRB, and continued through the implementation of the remedial action. This close cooperation lead to a special site access arrangement. Remedial activities at Site 6 were outside of the required exclusion area, so evacuation was not necessary during T-Range operations. However the gate normally used to secure the T-Range facility also blocked access to Site 6. The T-Range management agreed to establish a temporary gate just past the Site 6 access road so that remedial operations could continue without interruption and without

impacting their mission. This saved an estimated 12 full working days when the remediation crew would have been on standby during T-Range tests.

Monitored Natural Attenuation

NAWSCL has successfully initiated a monitored natural attenuation (MNA) groundwater remediation remedy at the Armitage Field OU. Initial rounds of groundwater sampling show a strong contaminate reduction trend. The MNA alternative selection was selected because the hydrogeologic model developed through the IRP showed that it was protective of the nearby drinking water aquifer.

These previously described fuel removal projects are part of the remedial action at the Armitage Field OU (encompassing the seven IRP sites. The Navy selected monitored natural attenuation (MNA) and institutional land use controls (LUCs) to prevent human exposure to shallow groundwater until natural degradation processes reduce contaminants below levels of concern. Removal of free product is a necessary first step to ensure that additional contaminates are not dissolving into the groundwater. Monitoring has been conducted since 2007 and over the last 8 quarterly events, significant reductions in contaminates have been demonstrated. trichloroethylene (TCE) concentrations of 150 micrograms per liter (µg/L) in 1999 have decreased to 15 µg/L in September 2011. Similarly, tetrachloroethene (PCE) concentrations of 110 µg/L have decreased to 24 µg/L. Overall, concentrations of solvents in 17 of the 25 monitoring wells have decreased to below the remedial action objective of 5 µg/L.

Armitage Field is located in a transition zone between alluvial formations used for drinking water supply (deep aquifer) and the China Lake playa formations (shallow aquifer) which are unsuitable for that purpose. An important part of the MNA remedy is to ensure that Armitage Field contamination in the shallow aquifer does not migrate to the deep aquifer. The lack of contamination in the deep aquifer was established during the previous phases of the IRP and through the base-wide hydrogeologic characterization study. The current results of the MNA sampling have been presented to the RAB in January 2011 and the remedial action continues to have that group's support.

Basin Plan Triennial Review

In October 2009 the Lahontan RWQCB adopted a priority list for its Basin Plan triennial review. A Basin Plan modification requested by NAWSCL was one of the ten projects included on the priority list. California RWQCBs each develop a Basin Plan to designate beneficial uses of water within their boundaries and to set standards that will maintain the water quality necessary for these uses. The Basin Plan designates municipal (drinking water) and agricultural uses for two areas within NAWSCL where the naturally occurring water quality is not suitable for those purposes. This is a result of the State's policy that designates these uses for all areas as a starting point for all Basin Plans. If studies show the water is not suitable for this use, the RWQCB can remove the use designations and associated water quality objectives from the Basin Plan.

The Basin Plan modification prioritization process started with a request from the Lahontan RWQCB for public comments on the Basin Plan triennial review. NAWSCL had been working with the Lahontan RWQCB on several IRP sites with poor naturally occurring water quality. The Lahontan RWQCB was bound by the Basin Plan to require cleanup to drinking water standards at these sites. This would greatly increase the remedial action costs at no benefit to the protection of human health. NAWSCL and the Lahontan RQWCB agreed that a Basin Plan amendment to remove municipal and agricultural use designations from these aquifers that are naturally impaired would be a good solution to the problem.

NAWSCL and NAVFAC SW developed a Basin Plan amendment to be submitted as a triennial review public comment. The amendment relied on information gathered through the IRP site investigations and the base-wide hydrogeologic characterization study. NAWSCL EMD submitted a draft copy of the amendment to the CGWG and RAB for review. Based on the established relationships and shared technical

expertise of these groups, the amendment was agreed to with minimal comments.

Once NAWSCL's triennial review comment was adopted by the RWQCB work began on preparation of the full Basin Plan modification request. This process continues to date and is expected to be completed in the upcoming year. The acceptance by the RWQCB of the proposed removal of beneficial use designations from impaired groundwater as a priority for the current triennial review is a major milestone for environmental restoration at NAWSCL.

Solar-Powered Fuel Skimmers

In June 2010 solar-powered fuel skimming equipment was installed in 11 wells at Site 44, the former fire-fighting training facility (part of the Armitage Field Operable Unit). The fuel-skimming units are powered by solar panels and use two methods for fuel removal. One method is a standard skimmer pump and the other uses belts that rotate into the fuel area, then return to an extraction system at the top of the well head.

Solar-Powered Belt Skimmer

This second method is useful for low-flow formation such as Site 44. The belts can operate continuously during daylight hours to remove any fuel that flows into the extraction wells. The belts can continue to operate even if no fuel is present in the well. Skimmer pumps are susceptible to pumping unwanted groundwater if the fuel layer is removed too quickly. Since the power for the belt comes at no additional cost once the solar panel is purchased, continual operations of the belt has minimal operating costs. This initial fuel skimming installation will be expanded to the full extent of the floating product at Site 44 once the optimal operating parameters are determined. During the first six months of operation this equipment removed over 400 gallons of fuel.

Review by the SFPRB for this project in November 2009 allowed for construction without delay once the contract was in place in June 2010. As with Site 6, NAWSCL EMD personnel completed the required natural and cultural resource surveys quickly. Well-established procedures and relationships with the relevant regulatory agencies ensured that the project reviews were completed within the IRP schedule.

Small and Small Disadvantaged Businesses in Environmental Restoration.

NAWSCL selected a number of small and disadvantaged 8(a) businesses to conduct a significant number of IRP projects. These include the 8(a) disadvantaged business of St. George Chadux for the Armitage Field OU MNA remedy, the 8(a) firm of Tri-Eco for groundwater monitoring of the former gas stations, and the 8(a) firm Richard Brady and Associates for the specialized investigative approach to evaluate releases of fuel from leaking underground tanks and supply lines.

CONCLUSION

Work accomplished by NAWSCL in support of its mission has also significantly contributed to the goals of the Navy's IRP. The combined efforts of personnel working at NAWSCL, the IRP project managers from NAVFAC SW, local agencies and citizens has produced significant environmental restoration achievements during FY10 and FY11. The firm foundation set by these efforts will continue to provide further achievements in the years to come.