

INTRODUCTION

On 1 October 2009, Hampton Roads, Virginia's, first Joint Base, Joint Expeditionary Base Little Creek-Fort Story (JEBLCFS), was established. JEBLCFS comprises the former Naval Amphibious Base (NAVPHIBASE) Little Creek and former Army Garrison of Fort Story (*Figure 1*). The JEBLCFS Navy Environmental Restoration Program (NERP) contributes to maximum military readiness by providing sustained superior service. NAVPHIBASE Little Creek, now known as Joint Expeditionary Base Little Creek (JEBLC), was commissioned in 1945 and the Army Garrison of Fort Story, now known as Joint Expeditionary Base Fort Story (JEBFS), was established in 1914. Together, the Joint Expeditionary Base is the major east-coast operating base supporting Overseas Contingency Operations. Resident commands provide front-line support personnel (such as Sea, Air, Land (SEAL) Teams, Explosive Ordnance Disposal (EOD), and Riverine Squadrons, and the training venues that hone the skills of those front-line operators. JEBLCFS provides support and services to 130 shore-based resident commands and 24 home-ported ships. JEBLCFS consists of nearly 4,000 acres of land and more than 7.5 miles of beachfront training area with 61 piers. It is the only bare-beach Joint Logistics Over-The-Shore training site within the Department of Defense (DoD), is home to the only east coast Advanced EOD Training facility, and meets nearly all Department of the Navy (Navy) Special Warfare training requirements.

Accomplishments

JEBLCFS is located in the Atlantic Coastal Plain within the Tidewater Region of southeast Virginia (*Figure 2*), within the Chesapeake Bay watershed. JEBLCFS and the surrounding area are used for industrial, recreational, commercial, and residential purposes. The terrain within and adjacent to the facility is low-lying, relatively flat, and contains several freshwater lakes and saltwater bodies. JEBLCFS lies adjacent to the Chesapeake Bay, a substantial source of recreational opportunities and commercial industry, which is also North America's largest and most biologically diverse estuary. Recreational and commercial fishing are vital activities within the bay.

Figure 1 - Joint Expeditionary Base Little Creek-Fort Story



BACKGROUND

Program Summary

Comprehensive environmental restoration (ER) activities at JEBLC began in 1984 under the Navy Assessment and Control of Installation Pollutants (NACIP) and Installation Restoration (IR) programs, later termed the NERP. The NACIP program was changed in 1986 to reflect the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as

Figure 2 - Joint Expeditionary Base Little Creek-Fort Story Location





amended by the Superfund Amendments and Reauthorization Act. On May 10, 1999, JEBLC was placed on the National Priorities List (NPL) with the United States Environmental Protection Agency (USEPA) designated as the lead regulatory agency; a Federal Facility Agreement (FFA) was finalized in October 2003. JEBFS was not placed on the NPL; however, an IR program was developed in 1987 to address contamination from past waste management practices. Actions taken by the NERP at JEBFS are conducted under CERCLA with the Virginia Department of Environmental Quality (VDEQ) designated as the support regulatory agency. With the joining of the facilities in 2009, the Navy assumed responsibility for managing both properties. Because JEBLC is listed on the NPL and JEBFS is not, Naval Facilities Engineering Command (NAVFAC) team members and supporting members agreed the programs would be maintained separately, but that community involvement activities concerning the ER programs would be merged.

Team

Program management for the NERP at JEBLCFS is conducted through the Hampton Roads Integrated Product Team within NAVFAC, Mid-Atlantic Division (MIDLANT). Mr. Matthew Stepien, the Remedial Project Manager, is supported by technical, acquisition, and legal professionals across the NAVFAC MIDLANT organization, as well as the Tier I Partnering Team (Team) composed of personnel from the Navy, USEPA, VDEQ, and environmental consulting firms (*Table 1*). The team works under the guidance and tutelage of the Tier II Partnering Team, which consists of representatives of their respective agencies.

Table 1

	<p>Mr. Matthew Stepien Joint Expeditionary Base (JEB) Little Creek-Fort Story Remedial Project Manager (RPM) FY 2015</p> <p>Mr. Bryan Peed Joint Expeditionary Base (JEB) Little Creek-Fort Story Remedial Project Manager (RPM) FY 2014</p> <p>Ms. Sharon Waligora, P.E. Environmental Division Director, JEB Little Creek-Fort Story Public Works Department (PWD)</p>
	<p>Mr. Paul Herman, P.E. Virginia Department of Environmental Quality (VDEQ) JEB Little Creek RPM</p> <p>Mr. Wade Smith VDEQ JEB Fort Story RPM</p>
	<p>Mr. Jeffrey Boylan United States Environmental Protection Agency (USEPA) JEB Little Creek RPM</p>
	<p>Ms. Cecilia Landin, P.G. JEB Little Creek-Fort Story Activity Manager</p> <p>Mr. Nathaniel Price, P.E. JEB Little Creek-Fort Story Project Manager</p>

The team was chartered to streamline closure of ER sites by using consensus-based site management strategies following the CERCLA process. The Team collectively developed and regularly updates written guidelines to support their objective, which includes ground rules, goals, roles and responsibilities, and conflict resolution procedures, in addition to the mission statement developed by the team members:

“The Partnering Team is committed to working together and communicating openly to identify and clean up CERCLA waste and Military Munitions Response Program (MMRP) sites in a timely, innovative, and cost effective manner. Our fundamental goal is to protect human health and the environment.”

Community Involvement

Community involvement and education in the decision making process regarding the Navy’s

restoration progress at JEBLCFS is supported by the Restoration Advisory Board (RAB). The Navy publishes notices for public and RAB meetings and document reviews in the local newspaper

Position Description

The fundamental goal for the JEBLCFS NERP is to implement innovative, site-specific remedial actions (RAs) to protect human health and the environment. The Tier I Partnering Team, in collaboration with the Public Works Department (PWD), is committed to working together and communicating openly to identify and cleanup ER sites in a timely and cost effective manner using innovative remedial techniques that maximize protection of human and ecological resources while minimizing impacts to military readiness and civil works missions.



The key challenge for the JEBLCFS NERP during this achievement period was development of a closeout strategy and implementation of remedial action for the remaining ER site to achieve facility construction completion in FY 2015. The remaining site was the most complex because of the media contaminated and physical site characteristics.

ACCOMPLISHMENTS

Accelerated Environmental Cleanup

The JEBLC FFA, finalized in November 2003, listed 10 sites for Remedial Investigation/ Feasibility Study activities with a Record of Decision (ROD) needed for site closure; 17 sites as requiring further evaluation through desktop audits or site screening process investigations; and 105 sites as requiring no action under CERCLA. As a result of the transfer of the former Army Garrison of Fort Story to the Navy, the NERP acquired 11 additional IR sites. In December 2014, the ROD for the final site under investigation was signed. Today, all IR sites at JEBLC and JEBFS have signed decision documents and remedies in place and functioning, where required.

As a whole, during this achievement period the NERP at JEBLCFS completed a time critical removal action (TCRA), established an action decision document and remedy-in-place (RIP) for one site, and initiated Remedial Action (RA)-Operation activities for one site (detailed in *Table 2*), while continuing RA-Operation activities for 7 sites. Additionally, the second Comprehensive Five-Year Review (FYR) for JEBLC was completed. The NERP at JEBLC has worked to accelerate environmental cleanup achieving facility construction completion four months ahead of the Navy’s end of Fiscal Year (FY) 2015 goal (*Figure 3*). The JEBLC Preliminary Closeout Report was signed on May 11, 2015. During this achievement period, approximately 31 acres have been made available for potential reuse. Of the 31 acres, 29 acres have no land use restrictions and 2 acres have land use restrictions.

Table 2

Document	Number Completed During Achievement Period
Action Memorandum	2
Removal Action Work Plan	1
Construction Completion Report	1
Focused Feasibility Study	1
Proposed Plan	1
Record of Decision	1
Land Use Control Remedial Design	1
Interim Remedial Action Completion Report	1
Comprehensive Five-Year Review	1
Preliminary Closeout Report	1
Sampling and Analysis Plan	3

Figure 3 - Facility Construction Completion Ceremony





Achieved RIP for Solid Waste Management Unit (SWMU) 3: Following completion of a non-time critical removal action (NTCRA) at SWMU 3 in FY 2013, consisting of sediment dredging, the need for continued removal activities to prevent re-contamination was recognized. Development of a site closeout strategy utilizing both the mechanical removal of site media as well as innovative treatment technologies (see Innovative Technology Demonstration and Validation and Implementation, as follows) for the remediation of metals in remaining sediment and address potential onshore source areas was expedited. A TCRA Action Memorandum was signed and the TCRA work plan was finalized in June 2013. TCRA field efforts, including additional sediment removal, placement of a reactive amendment, soil removal, and shoreline reconstruction, were initiated in October 2013. In December 2013 a second Action Memorandum was signed to document a partial change in project scope. TCRA activities were completed in March 2014 and a Construction Completion Report was finalized in September 2014. In addition to the execution of removal activities, a Pre-Feasibility Study Sampling and Analysis Plan (SAP) was issued and groundwater sampling was conducted in August 2014 to assess the current site conditions for evaluation of alternatives to address volatile organic compounds (VOCs) in groundwater. A Focused Feasibility Study was finalized in October 2014. The Proposed Plan was issued for public comment in October 2014 and the ROD was signed in December 2014 documenting monitored natural attenuation of groundwater and land use controls (LUCs) as the final remedy for the site. No further action was determined to be warranted for surface water, sediment, and soil following completion of the FY 2013 NTCRA and FY 2014 TCRA. A LUC Remedial Design was completed in March 2015 and the Interim Remedial Action Completion Report documenting RIP was signed in July 2015.

Innovative Technology Demonstration/Validation and Implementation

SWMU 3 TCRA: The remediation of sediment at SWMU 3 met with various challenges that made removal of all impacted media difficult to implement without the use of significant funding and disruption to JEBLC's mission and Morale, Welfare, and Recreation activities associated with an adjacent marina. Although able to implement a dredge removal action across 2.8 of 4.7 acres of impacted sediment at the site, due to proximity to bulkheads and piers, the remaining 1.9 acres of the site were inaccessible for dredging without the use of significant engineering controls (such as sheet piling) or complete demolition and rebuilding of adjacent structures. Through open discussion between the Team, including the USEPA Biological Technical Assistance Group, a site closeout strategy was developed for SWMU 3 that utilized a treatment technology to address contamination in these areas. Through the placement of powdered activated carbon (PAC), delivered to the sediment surface as part of a dense granular aggregate (AquaGate+PAC), the bioavailability of sediment contaminants was reduced in the upper biologically active zone, the primary source of exposure to benthic organisms and the water column. The addition of the amendment is designed to sequester contaminants in the sediment that would otherwise enter pore water through dissolution. The use of amendments to actively sequester contaminants in sediment was less energy-intensive, less expensive, and less disruptive than conventional remediation technologies such as dredging utilized across the remainder of the site. Unlike a capping technology, use of the amendment does not require post-placement maintenance. Following completion of the TCRA in March 2014, it was agreed the ecological value associated with excavation by dredging of contaminated sediment to the extent feasible, coupled with the placement of the reactive amendment, compensate for and effectively mitigate any potential ecological risks remaining at the site. Therefore, no post-amendment monitoring is required, further reducing the life-cycle costs of the SWMU 3 remedy.

Partnerships Addressing Environmental Restoration Issues between DoD and other Entities

Through the formation of the JEBLC Restoration Advisory Board (RAB) in 1994, the NERP has continued to educate the community about ER activities at JEBLCFS and encourage community involvement in the decision-making process. In addition to the Tier I Team members, the Executive Officer (XO) serves as the senior Navy official at the RAB meetings. The NERP's forthright conveyance of site status information through RAB meetings and informational booklets has fostered a positive relationship with the community. As the RAB



has evolved, the commitment of the community to environmental stewardship has remained constant, with two of the original RAB members still serving as active participants. Public RAB members vocalize their support and have provided positive feedback on the Navy's initiative to implement RAs in protection of human health and the environment, use innovative management approaches, and institute better business management processes. In addition to community involvement in RAB meetings, the NERP has interacted with the community through a JEBLCFS public website, an information repository housed at a local library, and public document presentation meetings.

NAVFAC, in partnership with USEPA and VDEQ, collaborates with the Public Works Department (PWD) to ensure the NERP is being successfully implemented at JEBLCFS while maintaining military readiness. JEBLCFS NERP weekly updates are provided to the PWD and subsequently to the mission command to ensure open communication. The Commander, Deputy Commander, XO, and the Public Affairs Officer (PAO) actively support the NERP, are routinely briefed on ongoing restoration activities, and are active participants in the RAB.

During implementation of RA-Operation at Site 11a, the Former Vehicle Repair Shop and Waste Oil Storage Tank, an increase in VOC concentrations adjacent to an occupied barracks building was observed and was determined to warrant investigation of current indoor air conditions to ensure the protection of barracks residents. The Team collaborated with PWD, the PAO, and the Navy Marine Corps Public Health Center to promote open lines of communication regarding potential risks with barracks residents. Prior to conducting indoor air sampling, fact sheets were distributed to all barracks residents and an evening poster session was held within the Quarter Deck to educate residents on the potential risks, allowing residents to ask questions and express any concerns (*Figure 4*).

Figure 4 - Site 11a Vapor Intrusion Evening Poster Session



The Team has collaborated with the PWD, EOD Explosive Safety Unit, and Commander, Navy Expeditionary Combat Command, to review and agree upon work plans, including materials specifications and inspection protocols, to facilitate the use of previously unused land at IR Site 7, the Naval Amphibious Base Landfill, for the construction of an equipment laydown area while maintaining the integrity of the existing soil cover. Use of this land will free up valuable property across other areas of the facility.

Small businesses work with the JEBLCFS NERP through both prime contractor and subcontractor opportunities. The Navy compensated approximately \$185,000 in FY 2014

and FY 2015 for RA-Operation activities to the small disadvantage business Osage of Virginia, an environmental contractor for the Navy. In addition to prime contract opportunities, the Navy's large business contractor, CH2M, awarded subcontracts for JEBLC of more than \$100,000 to small businesses during FY 2014 and FY 2015 in support of the Navy meeting its small business goals.

The remaining three sites were determined to be currently protective; however, issues were identified that may impact future protectiveness. As part of the FYR, the potential for the presence of an emerging contaminant is evaluated based upon a sites historical use. In particular, during this FYR period human health risk-based screening levels associated with exposure to 1,4-dioxane, a common stabilizer used with trichloroethylene (TCE) and 1,1,1-trichloroethane (1,1,1- TCA), were issued. Based upon the historical use of TCE at IR Site 11, the Former School of Music Plating Shop, and the presence of elevated levels of 1,1,1-TCA in groundwater at the site, it was determined that 1,4-dioxane may be present in groundwater. LUCs currently in place prevent



exposure to groundwater; however in order to determine the remedy’s long-term protectiveness the FYR recommended the presence or absence of 1,4-dioxane be determined. A SAP was finalized in April 2015 and groundwater sampling was completed in May 2015. Data indicated that 1,4-dioxane is not present at Site 11 and the remedy was determined to be protective in the long-term.

IR Site 11: Site 11 remedial implementation, consisting of the injection of emulsified vegetable oil to promote the degradation of VOCs in groundwater, was completed in 2009 and has since been followed by RA-Operation. As part of RA-Operation, three rounds of groundwater long-term monitoring (LTM) was conducted during this achievement period. During the course of RA-Operation, a change in groundwater flow direction has been observed resulting in the potential for migration of VOCs outside of the LUC boundary. To ensure the continued protection of human health, two new downgradient monitoring wells were installed and sampled in September 2014. Data indicate that LUCs remain protective and the new wells have been permanently added to the LTM program.

IR Site 11a: Site 11a remedial implementation, consisting of the injection of emulsified vegetable oil to promote the degradation of VOCs in groundwater, was completed in September 2013 and has since been followed by RA-Operation. As a part of RA-operation, groundwater and vapor intrusion LTM is required to ensure continued protection of human health and the environment. In November 2014, a LTM SAP was finalized that provides the criteria used to evaluate remedy performance, establish sampling location and frequency, decide when additional substrate application is warranted, and determine when to conclude the LTM program. The decision logic in the SAP allows the number of samples and the sampling frequency to decrease over time; thereby, decreasing the overall sampling and analysis cost associated with the LTM program as the footprint of impacted groundwater decreases while maintaining the protection of human health and the environment.

IR Site 12: Site 12 remedial implementation, consisting of the injection of emulsified vegetable oil to promote the degradation of VOCs in groundwater, was completed in 2007 and has since been followed by RA-Operation. As part of RA-Operation, three rounds of groundwater LTM and a fourth round of substrate injection was conducted during this achievement period. Since implementation of the remedy, an 85 percent reduction in total contaminant of concern (COC) concentrations and a 99 percent reduction in parent product tetrachloroethylene concentrations has been recognized (*Figure 5*).

Figure 5 - Reduction in PCE Concentrations in Site 12 Groundwater



IR SWMU 3 TCRA: A TCRA was completed at SWMU 3 in March 2014 to prevent remaining sediment from re-contaminating areas cleaned up during the FY 2013 NTCRA, address localized areas of elevated lead concentrations in soil, and reduce potential ecological risks associated with exposure to site COCs in sediment. Approximately 1,300 cubic yards of contaminated sediment and 300 cubic yards of contaminated soil were removed from the site (*Figure 6*). Following completion of removal activities, the site was restored through the placement of clean sand across the sediment removal area; shoreline reconstruction including a stormwater retention feature to retain and filter upland runoff; and backfilling the soil removal area with clean fill. Additionally, divers were used to distribute a reactive amendment across the sediment surface of inaccessible areas (see *Innovative Technology Demonstration and Validation and Implementation*).

Following completion of the FY 2013 NTCRA and FY 2014 TCRA, risks to human health and the environment from exposure to sediment and soil were mitigated and no further action for these media was determined to be warranted.

Green Remediation

The NERP has sought to implement sustainable remedial solutions by using “green” remedial technologies and available resources. The enhanced reductive dechlorination RAs at Sites 11, 11a, 12, and 13 utilize a vegetable oil substrate to enhance the natural microbial populations in groundwater, resulting in the enhanced degradation of COCs. The systems treat the contaminants in situ and, with the exception of the material for injection system construction and the injections themselves, do not require additional energy consumption to further degrade contaminants.

Another example of green remediation is the use of reactive amendment to address inaccessible areas at SWMU 3. First, eliminating the need to protect or reconstruct bulkheads and piers adjacent to the remediation area significantly reduced the project’s materials production and consumption. Secondly, the project’s overall volume of waste products was significantly reduced by eliminating the need for disposal of demolished structures as well the disposal of excavated sediment. And lastly, the overall carbon footprint of the project was significantly reduced through reduced materials/waste transportation and material production needs.

Figure 6 - SWMU 3 Time-Critical Removal Action Activities

