Executive Summary

Introduction

This Engineering Evaluation / Cost Analysis (EE / CA) Report has been prepared to support a removal action at Site LF01 at Bellows Air Force Station (AFS), Oahu, Hawaii. These efforts are part of the EE / CA for Operable Unit 1 (OU1) at Bellows AFS, which is being conducted in support of Installation Restoration Program (IRP) activities administered by the 15th Air Base Wing (15 ABW) Civil Engineer Squadron / Environmental Restoration Element (CES / CEVR) located at Hickam Air Force Base (AFB), Oahu, Hawaii. The work is being performed through the Air Force Center for Environmental Excellence (AFCEE) under delivery order F41624-97-D-8019-0005.

The EE / CA has been conducted in accordance with the U.S. Environmental Protection Agency's *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (U.S. EPA, 1993). The *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP) subpart (E), "Hazardous Substance Response," and the Hawaii Department of Health's *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan* (HDOH, 1996) were also consulted for guidance.

The next step in the decisionmaking process for Site LF01 will be the preparation of an Action Memorandum, which will describe the removal action selected for the site. The schedule for the removal action will depend on the timely regulatory approval of the Action Memorandum for Site LF01 and the availability of Air Force funding. Following implementation of the removal action and documentation that Site LF01 does not pose unacceptable risks to human health and the environment, No Further Response Action Planned (NFRAP) Category IV documentation will be prepared to recommend site closure.

Project Background

Site LF01 is a former landfill in the west-central portion of Bellows AFS, west of abandoned Runway 36 (Figure ES-1). A portion of Site DP17, immediately to the south of Site LF01, has also been included as part of Site LF01. The site is approximately 700 feet northwest of Waimanalo Stream and 3,300 feet west of Waimanalo Bay.

Site LF01 is located within a former coral borrow area excavated during World War II to provide coral fill for the expansion of Bellows AFS. Various sources (i.e., historical documents and drawings, environmental reports, and former Bellows AFS personnel) indicate that landfilling may have occurred at Site LF01 from World War II through the 1970s. An IRP Phase I Records Search (Engineering-Science [ES], 1984) reported that waste disposal at the "installation landfill" may have included hazardous materials such as oil,

paint thinner, and acid from military shop operations between 1943 and 1946; however, no documented evidence of such disposal at Site LF01 was presented in the ES report. The area encompassing Site LF01 was extensively quarried for coral fill during World War II, making simultaneous refuse and quarry operations at the site unlikely (CH2M HILL, 1998).

Aircraft operations and related activities at Bellows AFS ended in the 1950s, and since then the installation has been primarily used for military training exercises and recreation. It is expected that the installation (including Site LF01) will continue to be used for training exercises and recreation in the foreseeable future.

In 1999, more than 1,000 of the approximately 1,600 acres at Bellows AFS were transferred to the U.S. Marine Corps. Site LF01 is located within the Marine Corps Training Area Bellows and is generally inaccessible to the public. A variety of terrestrial avian and mammalian wildlife species use the site habitats (second-growth forests and shrublands) for foraging, nesting, and cover.

Site LF01 was one of four sites included in the EE/CA for OU1 at Bellows AFS; the other three sites (DP06, DP17, and SD22) have since been closed under the designation of NFRAP Category III. For Site LF01, a field investigation was conducted, soil and groundwater samples were collected and analyzed, and a screening-level risk evaluation was performed based on the findings of those activities and previous investigations. The results are documented in the Informal Technical Information Report (ITIR) for Site LF01 (CH2M HILL, June 15, 2001).

Based on the screening-level risk evaluation, lead in surface soil was identified as a chemical of concern (COC) posing potential risks to current and future occupational receptors (i.e., personnel involved in military training exercises) at Site LF01. Three metals in surface soil (lead, mercury, and zinc) were also identified as COCs posing potential risks to current and future ecological receptors. In the absence of other factors, the risks estimated for both human and ecological receptors at Site LF01 are marginal and would not warrant further action. However, Site LF01 in its current condition presents potential risks to occupational receptors in the form of physical hazards including broken glass, metal, and other debris at the surface, and potentially dangerous materials (e.g., pressurized canisters) in the landfill materials. Therefore, the marginal human and ecological risks potentially posed by metals in surface soil, combined with the physical hazards present at the site, are sufficient cause for further action.

Removal Action Objectives and Scope

The removal action under consideration in this report has the following objectives (RAOs):

- Mitigate current and future potential for human and ecological exposure to elevated levels of metals in surface soil through cost-effective measures.

- Mitigate current and future potential for site worker exposure to physical hazards in surface soil and in landfill materials (e.g., broken glass, metal debris, pressurized canisters) through cost-effective measures.
- Minimize impacts to current site operation and surrounding land uses during implementation of the removal action.
- Plan for "reasonably anticipated future land uses" in the removal action strategy. Reasonably anticipated future land uses include current Air Force categories (military training and outdoor recreation).

The scope of this removal action is to implement measures designed to mitigate potential threats to human health and the environment posed by chemical and physical hazards identified in surface and landfill materials. The identified RAOs are evaluated with respect to the overall IRP cleanup objectives, which are to provide permanent and cost-effective remedies for contaminated environmental media and to permanently and significantly reduce the toxicity, mobility, and/or volume of hazardous waste, thereby reducing potential risks to human health and the environment.

Preliminary Screening of Potential Technologies

A wide range of potential response actions were initially considered for Site LF01, and a preliminary screening of those response actions and associated technologies was performed to determine which of these would be viable at the site. U.S. EPA's *Treatment Technologies Screening Matrix* (1999), a technology application matrix for various types of media requiring treatment, was used as the primary source for identifying and screening potential response actions and associated technologies. The technologies were screened for their suitability and potential applicability at Site LF01.

Site- and waste-specific characteristics at Site LF01 were also considered in the screening, along with current and reasonably anticipated future land uses associated with the site. Evaluation of the preliminary response actions and selection of the retained potential technologies were based on available information about the site and professional judgment.

Identification and Evaluation of Alternatives

Based on current site conditions, the RAOs for the site, the preliminary screening of potential technologies, and current Air Force and HDOH policy, three removal action alternatives were identified for Site LF01:

1. No Action (Alternative 1)
2. Soil/Landfill Materials Excavation and Disposal/Recycling (Alternative 2)
3. Soil/Vegetative Cover with Long-Term Monitoring of Groundwater (Alternative 3)

In accordance with U.S. EPA's *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (1993), all the alternatives were evaluated in terms of three criteria: effectiveness, implementability, and cost. The alternatives are summarized below.

Alternative 1: No Action. Under this alternative, required under the NCP for inclusion in the analysis of alternatives, contaminated soil and landfill materials at Site LF01 would be left in place and no action would be taken. This alternative has no associated costs.

Alternative 2: Soil/Landfill Materials Excavation and Disposal/Recycling. Under Alternative 2, the surface soil and landfill materials constituting the chemical/physical hazards at Site LF01 would be excavated and transported offsite. It is assumed that approximately 8,500 cubic yards (12,800 tons) of soil and landfill materials would be removed. For cost estimating purposes, it is assumed that up to 40 percent of the landfill materials (concrete and metal debris) may be recyclable; that up to 40 percent of the materials may be disposed of at an off-island hazardous waste landfill; and that the remaining 20 percent of the materials would be disposed of at an on-island solid waste landfill. The assumption that up to 40 percent of the landfill materials may need to be disposed of as hazardous waste is based on worst-case estimates of samples that may exceed toxicity characteristic leaching procedure (TCLP) criteria. Following excavation, confirmatory soil samples would be collected and analyzed to verify that the removal action had been successfully implemented. Site restoration would then be performed, including the placement and grading of 2 feet of clean soil (approximately 4,300 cubic yards) and 6 inches of top soil (approximately 900 cubic yards), and the planting of drought-resistant vegetation. The estimated cost of implementing Alternative 2 is $5,171,100.

Alternative 3: Soil/Vegetative Cover with Long-Term Monitoring (LTM) of Groundwater. Under Alternative 3, Site LF01 would first be cleared of its existing vegetative cover. Two feet of clean soil (approximately 4,500 cubic yards) and 6 inches of top soil (approximately 1,100 cubic yards) would then be imported, laid over the top of the landfill at the site, and planted with drought-resistant vegetation. Alternative 3 would also involve operation and maintenance (O&M) of the cover, and LTM of groundwater in the vicinity of Site LF01. Finally, to ensure that the integrity of the landfill cover was maintained, institutional controls in the form of signs, gates, and an Excavation Management Plan (prohibiting excavation and digging of soil without a pre-approved health and safety plan, requiring the use of personal protective equipment [PPE], and other appropriate precautions) would be developed as part of Alternative 3. The estimated cost of implementing Alternative 3 is $1,049,500.

Recommended Removal Action Alternative

Based on the individual and comparative analyses of alternatives, Alternative 3 (Soil/Vegetative Cover with Long-Term Monitoring of Groundwater) is the recommended removal action alternative for Site LF01. Alternative 3 would be the most cost-effective action alternative for achieving the RAOs for the site, and would minimize worker exposure to site hazards.